

**FACTORS INFLUENCING THE LIQUIDITY OF  
SECONDARY BOND MARKET IN KENYA<sup>1</sup>**

**BY**

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## DECLARATION

This is my original work and to the best of knowledge has not been presented for the award of any degree award in any other university.



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## APPROVAL

This paper has been submitted for examination with our approval as university supervisors.



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## **DEDICATION**

I dedicate this research report affectionately to My wife, Lilian, My son, Ivan, My daughter, Carrie, My parents, Mr and Mrs Lilimona Nyongesa, My brothers and sisters, and My friends and colleagues, who have been my constant source of inspiration and who have given me the drive and discipline to tackle tasks with enthusiasm and determination. Without their love and support this project would not have been made possible.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

<b>BI.IR</b>	<b>Bank Lending Interest Rate</b>
<b>CBK</b>	<b>Central Bank of Kenya</b>
<b>CMA</b>	<b>Capital Market Authority</b>
<b>CPI</b>	<b>Consumer Price Index</b>
<b>CR</b>	<b>Credit Rating</b>
<b>DD</b>	<b>Domestic Debt</b>
<b>DR</b>	<b>Deposit Rate</b>
<b>EADB</b>	<b>East African Development Bank</b>
<b>ED</b>	<b>External Debt</b>
<b>FER</b>	<b>Foreign Exchange Rate</b>
<b>FISMS</b>	<b>Fixed Income Securities Market Segment</b>
<b>GDP</b>	<b>Gross Domestic Product</b>
<b>GoK</b>	<b>Government of Kenya</b>
<b>IBs</b>	<b>Infrastructure Bonds</b>
<b>IMF</b>	<b>International Monetary Fund</b>
<b>KNBS</b>	<b>Kenya National Bureau of Statistics</b>
<b>NSE</b>	<b>Nairobi Securities Exchange</b>
<b>OLS</b>	<b>Ordinary Least Square</b>
<b>SMI</b>	<b>Stock Market Index</b>
<b>SR</b>	<b>Savings Rate</b>
<b>SSA</b>	<b>Sub-Saharan Africa</b>
<b>TBR</b>	<b>Treasury Bill Rate</b>



## ABSTRACT

The study uses time series data in a multivariate OLS model to determine the factors that influence bond liquidity in the secondary bond market in Kenya based on the internal characteristics of bonds and macro economic factors. The results show that bank lending interest rate, foreign exchange rate, savings interest rate and domestic debt are factors that influence the turnover of bonds and by extension its liquidity. Our findings suggest that to improve on liquidity, appropriate fiscal and monetary policies should be employed to encourage trading in the secondary bonds market. We suggest that such policies should be applied to manage the volatility of interest rate and exchange rate to improve on liquidity of the bonds and also to encourage borrowing using debt instruments to spur growth of the productive sectors through investment. The monetary authority should also create incentives to encourage investors to trade in the secondary market in debt instruments rather than buying and holding securities to maturity.

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 BACKGROUND INFORMATION

Capital market has continued to support both the private sector and government access to long term and affordable funding. The market consisting of bond and stock segments, play an integral part in any financial system by encouraging savings and facilitating optimal allocations of funds among competing ends within the financial system (Wright et al, 1995 and Williams, 2005). Jorge (1998), Shena & Starr (2002) and D'Souza et al (2006) emphasize the need for a developed and self sustained capital market within a financial system by presenting the alternatives to promoting financial development in Latin America. They point out the importance of the bond market and more so its role of transferring savings in an economy; providing yield curve of government securities that is paramount to guiding the future behavior of inflation and interest rates and establishing the benchmark for valuation of all other fixed-income securities. In addition, the bond market mitigates domestic financial risks by allowing firms to concentrate on their advantages in production. Building on that, Jorge (1998), Wright et al (1995), Batten and Szilagyi (2002) and Williams (2005) emphasize that not only is the bond market important but also that it should be liquid. Therefore it is imperative to understand the bond market and its liquidity so as to provide financial resources for development of an economy. The common interest of all stakeholders should therefore be one of fostering liquidity in the financial markets and more so in the bond market as the key to resource mobilisation.

The financial markets in most sub-Saharan African (SSA) countries are shallow, and have inadequate access to finance. Africa has experienced falling levels in growth of overseas assistance, down from 38% in 2008 to 0% in 2009 and 1% in 2010 (OECD data, 2011), underscoring the need for Africa to build a domestic source of sustaining economic development. As a result, mobilization of domestic resources as an alternative source of financing is becoming increasingly important in SSA, with SSA governments focusing on domestic markets in order to avoid renewed or unsustainable external indebtedness. Easy access to concessional financing had reduced the need to develop domestic bond markets in many SSA countries.

In terms of the composition of external finance, most SSA countries rely on the banking sector and less on the domestic bond market. A comparison of relative importance of the banking

sector, stock market and domestic debt market for a group of SSA countries in 2008 indicates that though there is considerable variation among countries, the banking sector is particularly important for external finance in almost all SSA countries. The stock market is important for South Africa, Nigeria, Mauritius, and Kenya. The domestic debt market is the least important of these three sources of finance in SSA countries. This could be an indicator that the SSA bond markets have limited transaction and hence cannot be relied on for savings mobilization and optimal resource allocation for maximum benefit. Therefore most of the SSA countries are not benefiting from the bonds markets as envisaged in the discussions above.

Although the domestic bond market in Kenya has significantly developed since its inception in early 90's, it has not been very active in its operations. For instance, although the overall budget deficit (including grants) in 2010/11 was projected at Kshs 188 billion, only Kshs 105.3 billion (3.8 percent of GDP) (Ministry of Finance, GOK, 2010) was financed through domestic borrowing, which included domestic infrastructure bonds of Kshs 31.6 billion (or 1.1 percent of GDP). The rest of the deficit was financed from net external financing amounting to Kshs 82.7 billion (3.0 percent of GDP) and limited concessional loans in order to contain debt to a sustainable level.

### **1.1.1 Bond Market in Kenya**

#### **History of Bonds**

The first Corporate and Treasury bonds were issued as capital market instruments and listed at the NSE in 1996 and 1997 respectively. Significant growth in these instruments began after the reorganization of the market in 2002 that resulted in the bonds being listed at the Fixed Income Securities Market Segment (FISMS) of the Nairobi Securities Exchange (NSE) (formerly the Nairobi Stock Exchange). The market operated mainly the short term bills and bonds until 2002 when the tenure of the bonds was increased and the corporate sector issued commercial papers as a form of working capital management.

The Central Bank was empowered to control interest rates in 2001. This contributed to low interest rates, increased liquidity in the financial system arising from uncertainties in the banking sector leading to banks scaling down their lending to the productive sector due to continued uncertainties in the new. The increased liquidity and new investment guidelines for the retirement benefits sector helped to stabilize the interest rates and supported the Treasury

and Central Bank effort to restructure and shift domestic debt to long term tenure. This saw an increase of 22% in investment in government securities by the banking sectors, rising to Kshs 93 billion up from Kshs 76.5 billion in 2000 (CMA,2001).

In 2001, the government through Treasury and Central Bank of Kenya restructured its domestic debt by restructuring national debt tenure. The Capital Market Authority strengthened itself further by licensing Authorized Securities Dealers to enhance trading and improve liquidity on the Fixed Income Securities Market Segment (FIMS).

### Primary Bond Market

Since inception of the bond market, the government has made several issues of securities of varying amounts annually in the primary bonds market as summarized in Table 1 and appendix 1 and 2.

Table 1: Bond issues in the Primary Bond Market

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
No of Issues	41	20	28	22	18	17	19	14	11	15	21
Value (Kshs Mn)	47,120	82,840	96,330	82,560	68,450	77,640	75,780	87,260	98,500	149,000	207,000

Source: CMA (various years)

Even though the analysis in Table 1 indicate that the number of issues have been almost constant over time, the amount of issues have been increasing in the primary market indicating the extent of government borrowing domestically, and hence the need for a vibrant secondary market to support the capital market in resource mobilization.

The turnover in secondary market increased from Kshs 35billion in 2002 to Kshs 450 billion in 2011, a more than 1,186% increase, demonstrating the growing importance of the fixed income security segment. The corporate bond remained less active in the early years as it had three issues of medium term notes, namely Shelter Afrique, Safaricom, and East African Development Bank (EADB), bringing the total corporate bonds issues to Kshs 7.35 billion (CMA,2003). By June 2011, eight institutions namely PTA bank, Barclays Bank, Mabati Rolling Mills, Shelter Afrique, CFC Stanbic, Safaricom, Housing Finance and Kengen Company had outstanding bonds of aggregate value of Kshs 57 billion (CMA, 2011).

To strengthen the market, the government has gradually and consistently issued bonds that have long tenure as part of restructuring domestic debt into long term dated securities. This has helped to raise the profile of debt in order to generate a stable yield curve and to develop the capital market.

**Table 2: Introduction of Bonds with Higher Maturity Period**

<b>Year</b>	<b>Bond tenure issued for the first time</b>
2002	4Yr, 5Yr and 6Yr
2003	7Yr, 8Yr, 9Yr and 10Yr
2007	11Yr, 12Yr and 15Yr
2008	20Yr

Source: CMA (various years)

### **Secondary Bond Market**

Analysis of trading in the secondary market indicate that ownership structure is dominated by institutional investors, accounting for 97% of the secondary market, who have adopted the buy and hold strategy (CMA, 2003), of these, over 50% are fund managers. The individual investors hold a paltry 4% of the market share (CMA, 2009). This is an indicator of liquidity challenges in the market. Besides, the market has been dominated by government treasury bonds accounting for about 92% of the secondary debt market and the corporate bonds accounting for 1% of the market (CMA 2009).

Over the years, performance of the secondary bond market has related inversely to the performance of equity market such that the former has declined and/or performed dismally when the equity market has performed well, as was the case in 2008 during the Safaricom Listing.

The Government has not only maintained its policy of issuing longer dated instruments in general but has successfully tested the market by issuing bonds offering a higher yield. In the hope of improving performance of the market, the government has automated trading and settlement through Governments fiscal agent, Central Bank of Kenya. This issuance of benchmark bonds and the lengthening of Government bonds maturity period to 30 years has

led to a more reliable yield curve. In addition, the government introduced infrastructure bonds (IBs) in 2009 pursuant to its deliberate policy to promote infrastructure financing.

### **1.1.2 Bond Issuing Process and Challenges to the Market**

To issue bonds in the listed market several requirements need to be met. They include adherence to the legal requirements of Capital Markets Act and Nairobi Securities Exchange (NSE) Rules and Regulations, getting an independent opinion and certification of the financial projections from the reporting accountant, getting a legal opinion on authenticity of all documentations, and getting the Information Memorandum which provide the prerequisite information for investors to use in decision making.

The borrowing institution provides information such as use of proceeds, key investment considerations, financial rating or health of the institution, industry analysis, issues of corporate governance and the experience and qualification of board of directors and management. This is to enable the lenders to understand the institutions to be invested in better against the macroeconomic indicators for purposes of assessing risk exposure.

Development of the bond market faces several challenges in Kenya today. First, banks have been lending directly to corporates through syndicated loans arranged at competitive terms which has led to the institutions using less of the bond instruments in seeking for funds.

Second, many market players have traded in equity instruments than in debt instruments as a result of lack of information on the operations of the market. Therefore, there is greater need for investor awareness and financial literacy levels among issuers and investors on the mechanics of bond issuance and trading since most of them have little or no knowledge in the operations of the bonds market.

Third, while the bond market participants need information on the credit quality of the issuer, there has been low or minimal use of credit rating in Kenya since there has been limited transactions in the area even in the corporate environment. Even though legally all bonds are required to be listed and traded at the NSE, the general perception has been that listing procedures and requirements for bonds are too stringent and costly to implement and that the process takes too long. Besides, most corporations have not been prepared to meet disclosure requirements in the issuing of securities which makes them opt for the guarantee option. Last, the market operates on delivery and payments system that has not been developed to support trading in the market.

## 1.2 Statement of the Problem

Bonds market has remained an important vehicle for mobilizing finance for long term projects, mainly infrastructure development (Ngugi and Agoti, 2009). Ngugi and Agoti (2009) emphasize that high levels of liquidity, efficiency and minimum transaction costs and volatility are desirable in the financial market growth process.

In the Kenyan debt market, the government controls 96% of the issues while the corporates control 4% of the market in issues. The secondary market is further dominated by the institutional investors who account for 97% and who prefer a strategy to buy and hold the securities to maturity. Individual investors account for only 3% (Ngugi and Agoti, 2009). Therefore the buy and hold strategy of institutional investors has constrained and curtailed participation of individual investors. The users of funds have relied less on the domestic bond market and more on the banking sector and stock market. While the primary market issues of bonds has been fully subscribed and sometimes even oversubscribed (see appendix I), secondary bond market turnover has increased intermittently; and has remained government dominated (CMA, 2009). Trading of the bond market is characterized by the buy and hold strategy, domination by the institutional investors and government securities, low volumes of trade in the secondary markets, less frequency of or no trades on the security exchange and dominance of the equities on the capital market, which are indicators of a liquidity problem in the bond market.

The preceding characteristics are an indicator that the debt market in Kenya like in many other SSA has not developed sufficiently. The development and maintenance of a liquid bonds market is critical in supporting mobilization of resources to finance long term development projects and to cushion institutions against assets maturity mismatch by using short term funds for long term projects. Given the importance of liquidity within the financial market and especially the debt markets, it is important to understand the drivers of the debt market liquidity as a key financial stability indicator.

Much of the research on bonds market in Kenya have not only discussed the development of bonds market but also its importance as a long term vehicle for financing. Ngugi and Agoti (2009) emphasize liquidity as one of the factors desirable for economic growth. The study analyses development of the local bond market in Kenya and the regional market but with little in-depth analysis of liquidity of the bonds as an important aspect.

### **1.3 Objectives of the Study**

The main objective of the study is to determine the factors influencing liquidity in the secondary bonds market in Kenya. Specifically, the study seeks to:

- (1). Analyse the influence of the bonds internal characteristics (such as credit rating, asset size, maturity, embedded features (e.g. convertibility, secured and warrant features etc)) to its liquidity;
- (2). Analyse the influence of macroeconomic factors (such as interest rate, inflation rate, exchange rate and stock index) on liquidity of bond market
- (3). Use the results of (1) and (2) above to make policy recommendations to support the maintenance of a liquid bonds market in Kenya.

### **1.4 Justification of Study**

The study is helpful in providing new information on the determinants of liquidity in the bonds market in Kenya to the government, investors, Central Bank of Kenya and other researchers. The findings of the study will support the Central Bank to manage the interest rates and to use government bonds as a monetary policy instrument to manage and stabilize the same.

The information generated by this study will support the government in developing a reliable yield curves to be used in pricing other financial instruments and as hedging or investment instruments. The information is also important in making relevant policy decisions to protect the interests of lenders and borrowers and to maintain a liquid bonds market while supporting financing through investment decisions with a view to enhancing savings mobilization in the market so as to support and maintain sustained economic growth.

Lastly, researchers will use it as a basis for further research in the fixed security market segments, more so in the establishment of factors influencing liquidity of the corporate bond market.



## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Introduction

The chapter explores theories on liquidity and reviews studies on liquidity of the bonds market. The study also reviews theoretical and empirical contributions and the research gaps to be filled.

#### 2.2 Theoretical Literature

Liquidity is important in restoring equilibrium in the financial system within an economy. Equilibrium in the financial system and more so in the debt market is explained not only by how firms finance their operations but also by factors that influence these choices as well as how these choices affect the rest of the economy. These issues are discussed in the subsequent theories.

##### 2.2.1 Information Asymmetry: Adverse Selection and Moral Hazard

Investors use financial intermediaries because of the risk exposure present in the information asymmetry between providers and receivers of funds. The information Asymmetry theory presumes that risks a user of funds is exposed to are manageable and that the funds are prudently utilized to create wealth for the lender. Frank and Goyal (2008), in the theory of Adverse Selection spelling that selecting whom to give more of your money is a very important part of controlling risk. The theory supports the premise that allocation of funds should be done to minimize the level of risk of loss for the investor. Frank and Goyal (2008) emphasises the issue of risk by advocating for the proper use of borrowed funds for the intended purpose to ensure that interest and principal are paid on a timely basis. This they argue will enhance wealth creation for investors. The theory points out that information symmetry on history of creditworthiness of users, potential users of funding and costs of funding increases the level of risk exposure thereby adversely affecting investment decisions.

Based on the theory, borrowers use equity finance and debt finance, through the issuance of stocks and the issuance of bonds to reduce the level of risk through restrictive covenants. This makes individuals and firms to divulge more information which makes them more willing to

put up with more collateral so as to restrict their behavior to maintain creditworthiness for purposes of getting external financing.

### **2.2.2 Trade-off Theory**

Built from Modigliani- Miller theorem, Trade-off Theory emphasizes that balancing the marginal costs and benefits and the effects of taxes and the costs of financial distress in engaging in high leverage finance is important for investors. Modigliani and Miller (1963) strengthened the theory by proposing that institutions should borrow until the marginal tax advantage of additional debt is offset by the increase in present value of the expected costs of financial distress to shield earnings from taxes. Trade-off theory suggests that institutions achieve significant interest tax savings by increasing their leverage (debt ratios) without any remote possibility of financial distress becoming an issue.

### **2.2.3 Pecking Order Theory**

Built from the Agency Theory, The Pecking Order Theory (Frank and Goyal, 2008), is a capital structure theory which explains the pecking order preference of different sources of financing. It explains for instance, why internal finance is much more popular than external finance and why debt is classified as the most attractive external finance option. The theory suggests that companies with high profitability use less debt because they have less need to raise funds externally and because debt is the 'cheapest' and most 'attractive' external option when compared to other methods of capital financing.

Pecking order theory is based on information asymmetry. When information differences exist between managers and investors, the theory argues that issuing high risk securities would involve large information costs. These costs are typically seen in the dilution of existing shareholder interests in a company if new shares are issued when they are undervalued. The pecking order theory infers that because of the high information cost correlated to the new high risk securities, companies will generally only issue equity as an absolute last resort

### **2.2.4 Gap-filling Theory of Corporate Debt Maturity Choice**

The theory by Robin et al (2008) argues that time series variation in the maturity of corporate debt arises because firms behave as macro liquidity providers, absorbing the supply shocks associated with changes in the maturity structure of government debt. In the theory when the government funds itself with more short-term debt, firms fill the resulting gap by issuing more long-term debt, and vice-versa. This type of liquidity provision is undertaken more

aggressively when the ratio of government debt to total debt is higher, and by firms with stronger balance sheets. The theory provides a new perspective on the apparent ability of firms to exploit bond-market return predictability with their financing choices.

It sheds light on market timing phenomena in corporate finance more generally. The theory is based on the following propositions.

- (a) that corporate issuance will fill in the supply gaps created by changes in government financing patterns. For instance, when the government issues more long-term debt, firms respond by issuing more short-term debt, and vice-versa. Consistent with this prediction, is a strong negative correlation between maturities of government and corporate debt.
- (b) that if time-series variation is allowed in the relative sizes of the government and corporate debt markets, when the government's share of total debt is larger, gap-filling behavior by firms will be more pronounced, because larger supply shocks imply a larger reward for liquidity provision.
- (c) that at a micro level, firms with the smallest costs of deviating from their maturity targets will be the most aggressive gap fillers i.e. a firm with a strong balance sheet (a firm that is relatively unconstrained in its investment behavior) is less likely to pay a price if it deviates from its maturity target, thereby taking on, for example, more interest rate or refinancing risk, than a firm with a weak balance sheet. Thus, there are expectations of firms with stronger balance sheets to have maturity choices that respond more elastically to changes in the structure of government debt.
- (d) that the origin of corporate market timing ability - corporate maturity choices have forecasting power for bond returns, but they do not specify the mechanism that drives this relationship. The theory suggests that corporate actions can be informative because they are a mirror of government supply shocks, which in turn are the primitive drivers of expected returns.

### 2.2.5 The Liquidity Theory of Asset Prices

The liquidity theory of asset prices (Hennessy and Josef, 2009) contends that an investment transaction often takes place because someone either has cash to invest or needs to raise cash. In the economy as a whole the difference between the amount of cash waiting to be invested and the need to raise cash can be substantial; moreover, an imbalance can persist for many months. Markets react accordingly, going up or down as the case may be towards equilibrium.

When a market is rising, people become optimistic and when market is falling, people become pessimistic. This makes investors to start acting as in a crowd. If the trend continues, crowd psychology becomes important to explain the booms and busts that follow.

The liquidity of a market is determined by the information symmetry between the different market players, capital structure and covenants attached, cost and benefits of borrowing, debt maturity structure and availability of cash for such investments. Based on this, the above theories anchor the study as they critically analyze the areas that are relevant to this study.

### **2.3 Empirical Literature Review**

Most studies about bond market liquidity have usually concentrated on either one aspect of liquidity or on several liquidity measures that capture different dimensions. In the measurement of liquidity, most studies use bid-ask price spread as the measure of liquidity (Bao, Pan and Wang, 2008) while others use multidimensional liquidity measures. There is need however to use different liquidity measures to capture the different aspects of liquidity (Fernandez, 1999).

Akharaphol and Sakkapop (2005) in a study of the Key determinants of liquidity in the Thai bond market used time series data to analyse the key areas for a liquid market. They point out that government securities play an important role in providing a basis for a robust and efficient financial system and that lack of liquidity in the bonds market remains a major obstacle to market development as it has made investors reluctant to trade bonds actively, with a large number of market players holding government bonds to maturity. The study identifies and analyzes the key determinants of liquidity in the Thai bond market as measured by bid-ask spreads on government bonds which are drawn upon to improve liquidity in the secondary market.

Flemming (2003) used descriptive statistics including mean, median, variance and standard deviations to explain the measures such as trading volume, trading frequency, bid ask spread, quote size, trade sizes, price impact coefficients and on-the-run/off-the-run yield spread. Using comparative liquidity measures such as correlation analysis and principal component analysis to show the relationship between the various measures, he concludes that bid-ask spread is a measure for assessing and tracking liquidity. In contrast, he concludes that quote size, trade size, and the on-the-run/off-the-run yield spread are only modest proxies for market liquidity

as the measures correlate less strongly with the episodes of reported poor liquidity and with the bid-ask spread and price impact measures.

Ngugi and Agoti (2009) analyse the importance of development of the bond market as a vehicle for mobilizing long term finance for government and private sector in Kenya. They discuss liquidity, efficiency and volatility as key components of development of a bond market. Using descriptive statistics of mean, median, maximum, minimum, standard deviation, skewness, kurtosis and probability to explain the measures of liquidity, they conclude that microstructure elements affect bonds differently across categories. Further, they establish that liquidity is higher in government bonds market than corporate bonds market. Overall, they rate treasury bonds to have better performance in the analyzed microstructure.

Lian (2008) in a study of the Asian crisis concluded that overdependence on the banking system could exacerbate problems for borrowers and therefore points out that having a deep and liquid bond market would offer borrowers the flexibility to diversity their sources of funding and provide them with a good alternative source to raising long-term capital for matching any long-term expenditure needs. He recommends that it is prudent and important to have an efficient repo market supporting secondary market activity as a key element in a liquid bond market. He points out that a deep and liquid repo market provides market players with a means of financing positions, and enables them to take long/short positions such as buying one bond and selling another to take advantage of yield curve arbitrage opportunities. He concludes that challenges facing further development of the debt market in Singapore include increasing market liquidity and the depth and breadth of the investor base.

Kholisoh and Hermawati (2011) attempt to establish a new method of measuring liquidity using trade base and order base intraday data one-month period before and after pre-opening session was implemented with 25 of the most active stocks in La Quinta company. Mechanics approach is used in formulating the measurement of liquidity. They measure Velocity ( $v$ ) as Average Order Price/Average time. They use t-test to compare two sample means of velocity before and after pre-opening session to test the significance. They conclude that velocity is an important measure of liquidity and therefore consider it pronounced in definition of liquidity measurement.

Guha and Kar (2006) use panel data from 450 firms to identify factors explaining the pattern of financing of manufacturing firms in India and the key determinants of their debt structure.

They found that corporate debt market in India has historically demonstrated poor participation from the firms and that the secondary market turnover through issue of corporate debt remains a rather small fraction of the total turnover, with the transaction through the government securities still overwhelming. They attribute the deficiency existing in secondary debt market in India to strong entry barriers to participation in trading of government securities since trades are over the counter and hence limited access; limited market liquidity as the parties have to search for counter parties and negotiate the best price and finally, to the fragmented nature of the market.

Huiping (2010) examined the various existing liquidity proxies plus a new measure, *Illiq Zero*, which could be interpreted as a no-trading-day, motivated by hypothesis that the performance of the Amihud measure depended on the trading activeness of the market. The measure captures both the price impact and the trading frequency dimensions of liquidity. The correlation analyses, with the effective bid-ask spread and the price impact of *Lambda* in all the emerging markets, showed strong evidence that the new liquidity measure is the best low-frequency liquidity proxy that can facilitate the cross-country analysis on the effects of liquidity.

Gady, George and Steven (2007) examine the effect of liquidity on corporate bond prices in the spirit of Acharya and Pedersen's (2005) Liquidity Adjusted Capital Asset Pricing Model. Using the model, they established that liquidity risk can affect expected returns in various ways: the commonality in liquidity with the market, the covariation of individual asset's return with the market liquidity, and last, the covariation of individual asset's liquidity with market returns. Using a large panel data set of corporate bond market transactions they examined whether these various sources of liquidity risks are priced in corporate bonds. They concluded that liquidity risk is priced in corporate bond market and illiquid corporate bond portfolios in the sample earned higher expected excess returns than liquid portfolios. Similar to Acharya and Pedersen's (2005) results for U.S. equity, they found that liquidity risk monotonically increases with illiquidity for corporate bonds. Their results indicate that illiquid portfolios have higher liquidity covariation with market liquidity, higher return covariation with market liquidity, and higher liquidity covariation with market returns.

Asani, Tarun and Avanidhar (2001) used joint time-series of daily liquidity in government bond and stock markets to examine common determinants of stock and bond liquidity over the period 1991 to 1998, to study the effect of money flows (bank reserves and mutual fund

investments) on transactions liquidity. They found that liquidity is positively and significantly correlated across stock and bond markets suggesting the existence of a common liquidity factor in stock and bond markets. They concluded that there was little theoretical work that had been done on time-series movements in liquidity, and that there was no theory linking movements in liquidity across equity and fixed-income markets.

Lin et al (2009), provides a rationale for incorporating liquidity in estimating term structure by examining forecasted errors over various horizons and among markets. The study uses time series forecasting models in the spirit of Diebold and Li (2006) to compare behavior of forecasted price errors. The findings suggest that information is transmitted from the less liquid bond markets to the more liquid ones, and is then efficiently reflected and released in prices from the more liquid markets.

Fleming (2002) makes use of a natural experiment of the U.S. Treasury Department to examine the relationship between Treasury security issue size and liquidity. He found out that Treasury bills first issued with fifty-two weeks to maturity and then reopened at twenty-six weeks were more liquid than comparable maturity bills that were first issued with twenty-six weeks to maturity. The relationship was less pronounced when bills were on-the-run than when they were off-the-run, and it persisted when controlling for other factors that affect liquidity. Further, he found that reopened bills had higher yields than comparable maturity bills, showing that the indirect liquidity benefits of reopenings were more than offset by the direct supply costs.

Lkhagvajav, Batnyam, and Gan-Ochir, (2008) used time series analysis to measure bonds market liquidity using total value traded, real income by real industrial product and financial intermediary development by total loan in banking sector. He concludes that monetary policy has an effect on development of bond market hence in turn the bond market liquidity.

Kyle (1985) considers a rise and fall in price that typically occurs with a buyer initiated or seller initiated trade. Kyle uses slope,  $\lambda$ , which relate to the price change to trade sizes. He estimates the slope by regressing price changes on net volume for the intervals of fixed time. He concludes that the measure is relevant to executing large trades or series of trades and hence together with bid - ask spread and depth measures provides a fairly complete picture of market liquidity.

William, Shih-Chuan, and David (2009) analyzed trading of government bonds in the emerging markets characterized by limited number of issues and liquidity concentration using the Vector Autoregression (VAR) model. The study incorporates liquidity in yield curves and price forecasts by taking into account differential information asymmetry across bond markets to produce more reliable estimates and forecasts. The study shows that liquidity concentration due to uneven trading activities does not only suggest distinctive levels of information asymmetry in different bond markets but also implies certain information dissemination among markets for various bonds, and in particular, that the information is transmitted from the less liquid bond markets to the more liquid ones, and then efficiently reflected and released in prices from the more liquid markets. He concludes that concentration and uneven distribution of liquidity is common in the fixed income security market, especially the less developed ones and that price shocks from the shorter term and less liquid issues tend to lead the corresponding shocks from trading in the longer term and more liquid issues, i.e. liquidity is taken into account in forming price forecasts. They therefore emphasize that liquidity is important in determining how information flows among markets to reduce asymmetry.

Adeegan and Bozena (2009) analysed determinants of the development of the bond market in sub-Saharan Africa. Using a panel comprising of 23 countries with data for the period 1990 to 2008 at an annual frequency for a maximum of 394 year observations, they found that GDP per capita and size of banking system, interest rate volatility and stability of exchange rates are significant determinants of the private and public markets. Overall, the results showed that a confluence of many variables drives the level of development of the domestic bond market in SSA, and that no single class of variables is wholly responsible for the underdevelopment of the domestic bond market.

Isaya, Owino and Mutai (2008) while discussing the effect of domestic debt on economy point out that domestic debt is contracted to finance the budget deficit, during implementation of monetary policy through open market operations and in financial markets development. They emphasize the need of a steady supply of a wide range of instruments to be traded in order to develop and deepen the financial markets. Using the Barro growth model, they conclude that foreign exchange is used to retire domestic debt without injecting liquidity in the system as the foreign exchange transaction absorbs liquidity and therefore management of domestic debt in Kenya would also benefit immensely from participation of foreign investors in the domestic debt market to promote competition thereby lowering the cost of domestic borrowing, and also



increasing the efficiency in the domestic debt market. They suggest that the government should provide a framework for capturing and monitoring investment in government securities for purposes of improving the monitoring of foreign direct investment so as to be able to implement measures to maintain confidence in the financial markets through prudent fiscal policy and adherence to the annual domestic borrowing calendar.

## **2.4 Overview of Literature**

The literature reviewed point out the importance of liquidity in trading of debt securities as measured using various variables and methods. Most of the studies reviewed used time series data in the analyses and relied on econometric models and made conclusions based on test statistics and descriptive statistics. The studies point out the various variables that are key determinants of liquidity including bid-ask spread, trading frequency, turnover, and macroeconomic variables. This suggests that there is no single variable found to be the driver of liquidity in the market. The studies also conclude that liquidity in secondary market is important and therefore supporting it avails the financing options to seekers of funds.

## CHAPTER THREE

### 3.0 METHODOLOGY

#### 3.1 Introduction

In this chapter, we discuss the theoretical and conceptual framework of bond market liquidity, the model for assessing bond market liquidity, and data type and sources.

#### 3.2 Theoretical Foundation and Conceptual Framework

##### 3.2.1 Theoretical Foundation

The Liquidity Theory of Asset Prices as postulated by Hennessy and Josef (2009) affirms that availability of cash to invest or needs to raise cash drives investment activities in the market. In the economy there is always an imbalance between users and owners of capital and therefore there needs to be a platform for matching of the parties. For a balance to be established, investors' need to make a decision based on available information and based on their their level of risk tolerance limits.

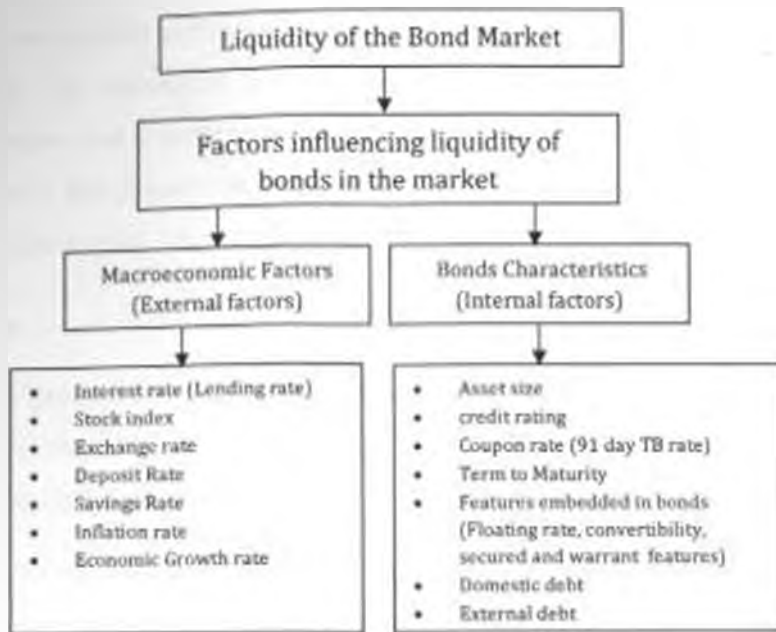
The investors make their investment decisions based on pecking order of the source of financing as well as on tradeoff between costs and benefits. Therefore information symmetry plays a critical role in enhancing the decision making process based on the above information requirements hence the basis of the analysis of factors influencing liquidity in this study.

##### 3.2.2 Conceptual Framework

The primary objective of the paper was to determine the factors that influence bonds liquidity. This was done by posing two different questions. First, we sought to establish whether internal characteristics of bonds namely, credit rating, the firms size, term to maturity, coupon rate (measured as Treasury Bill rate), embedded features (measured by floating rate feature, convertibility, secured and warrant features), influence bond liquidity. Second, we examined the impacts of macroeconomic factors on the overall bond market liquidity. The macroeconomic factors such as interest rate, deposit rate, savings rate, stock index, inflation rate, growth rate, fiscal debt, government debt and exchange rate of dollar in terms of Kenya shillings were considered.

The research focused only on the bonds traded in the Kenyan secondary bond market in Kenya for the period 2001 to 2011. A schematic flow of factors influencing liquidity is detailed in figure 1.

Figure 1: Schematic Analysis of Factors Influencing Liquidity of the Bonds Market



Liquidity of the market was measured using the secondary market turnover expressed as a function of macroeconomic and internal characteristics as summarized in schematic diagram in figure 1. This is presented in a functional expression as summarized in equation 1.

$$Y = f(A, CR, TM, TBR, EF, DR, SR, FER, CPI, FD, GD, GDPG) \dots\dots\dots(1)$$

Where Y – turnover, A – assets size, CR – credit rating, TBR – short term interests, EF – embedded features such as convertibility, secured debts, warrants etc, DR - deposit rate, SR – savings rate, FER - foreign exchange rate, CPI – inflation rate, FD – government domestic debt, GD – government external debt, GDPG – GDP growth rate.

### 3.3 Estimation Model

The model used in this study follows the one of Shanaka (2010) and Adelegan and Bozena (2009). Shanaka (2010) used short-term nominal policy interest rate (Sr), inflation ( $\pi$ ), fiscal deficit in percent of GDP ( $b_{it}$ ), gross general government debt in percent of GDP (D), broad money growth (M), GDP growth (Z), U.S. long-term nominal treasury bond yield USr, current account balance (CA) and foreign participation in the government bond market (FP) as the variables in his model while Adelegan and Bozena (2009) used economic size (EcSize), natural openness (Open), size of the banking sector (BankSize), and interest rate(Intrate) as the independent variables in their model.

This study adopted and used an econometric model, based on multiple regression analysis by combining the two models and modifying some variables to analyze the economic phenomena being reviewed. To understand quality of borrowing and capture the effects of the capital market performance and interest rate spread, the model was modified to include credit rating, stock market index and deposit and savings interest rates as part of explanatory variables in the multiple regression model. The modified model is expressed as:-

$$Y_{it} = \alpha_i + \beta_1 X_{it} + \epsilon_{it} \dots\dots\dots (2)$$

Where  $Y_{it}$  is the dependent variable the measure of liquidity,  $\alpha_i$  is constant term,  $\beta_k$  coefficient that measure that slope,  $X_{it}$  vector of variables for external and internal characteristics and  $\epsilon_{it}$  error term. Equation 4 is the expanded form of equation 3, so that:-

$$Y = \alpha + \beta_1 A + \beta_2 CR + \beta_3 DR + \beta_4 SR + \beta_5 I + \beta_6 BLR + \beta_7 SMI + \beta_8 CPI + \beta_9 FER + \beta_{10} GDPGR + \beta_{11} PD + \beta_{12} GD + \beta_{13} BLIR + \epsilon \dots\dots\dots (3)$$

Where:

Liquidity (Y) is measured by turnover of the secondary bond market as a percentage of GDP. Size of Assets (A) is measured by the logarithm form of the total assets in the audited balance sheet and total assets in the balance sheet of Central Bank of Kenya (CBK) is used as a proxy based on dominance of government bonds on market.

Credit rating (CR) of government is used to measure the credit worthiness of the borrower. A rating of 2 is used for investment grade, 1 for non-investment rating, otherwise 0 for cases of no ratings. The Treasury bill rate (TBR) is used as a proxy to measure the return to investors. The deposit and saving interest rate percentages (DR and SR) measures the foregone benefit by investing in bonds.

The borrowing cost from banks (Bank Lending Interest Rate (BLIR)) is the percentage lending rate effects of alternative borrowing. The logarithmic form of stock market index (SMI) is used to measure performance of the stock market. The effect of inflation is measured using Consumer Price Index (CPI) while foreign exchange (FER) is used to measure foreign participation. The effect of fiscal policy is measured using domestic debt (PD) and external debt (GD), as a percentage of GDP. The cyclical effect of the economy is measured by percentage Gross Domestic Product growth (GDPGR).

The following hypothesis were used to test the influence of variables on bond liquidity as indicated in equation 3.

$H_0$ : The internal and macroeconomic characteristics are not significant factors that influence the bonds turnover.

$H_1$ : The internal and macroeconomic characteristics are significant factors that influence the bonds turnover.

### 3.4 Data Types and Sources

The study used secondary data from monthly and annual reports of CBK, annual reports of CMA, statistical abstract and annual reports of KNBS and daily and annual reports of NSE. Data was obtained as follows: credit rating and bond issues in primary market from CMA, asset size, coupon rate, interest rate, inflation rate, exchange rate, fiscal debt, total government debt, interbank interest rates as quoted by commercial banks from CBK, stock index from NSE and GDP growth rate from KNBS. The data was analysed at two levels, the first level involved graphical and statistical analysis of the trends displayed by the indicators and the second level involved econometric modeling discussed in 3.3.

### 3.5 Econometric Tests

Augmented Dickey Fuller and Phillips Peron tests were performed to establish the existence of trends and stationarity, and the test results confirmed the existence of trends and stationarity in the data. Cointegration tests results indicated the existence of stationarity of a linear form among the variables. The granger causality and correlation tests were performed to establish the existence of any relationship between the dependent variables and independent variable. The tests results indicated existence of collinearity, and thus the variables were excluded from the estimation model. The results of the tests are presented from appendix 3 to 7.

## CHAPTER FOUR

### 4.0 EMPIRICAL ESTIMATION RESULTS

#### 4.1 Introduction

This chapter presents the empirical estimation results.

#### 4.2 Descriptive statistics

The analysis of the variables using descriptive statistics of mean, median, mode, standard deviation, skewness, kurtosis is summarized in Table 3.

Table 3: Descriptive Statistics

	BLIR	FER	SR	PD	Y
Mean	15.00	77.92	2.00	128.84	9.08
Median	14.00	78.26	2.00	116.00	4.71
Maximum	20.00	80.92	5.00	211.00	42.70
Minimum	12.00	73.36	1.00	81.00	0.14
Std. Dev.	2.45	1.63	1.22	35.86	11.09
Skewness	0.88	-1.01	1.09	0.88	1.70
Kurtosis	2.44	4.00	3.01	2.69	4.62
Observations	44	44	44	44	44

Skewness shows the distribution of mean, mode and median, the data is approximately symmetric in distribution as indicated by the skewness and minimal deviation from the mean. This means that the data used on average conforms to the normal distribution conditions.

#### 4.3 Regression Test Results

The regression results in Table 4 are based on 44 observations from the quarterly analysis of the explanatory variables. The F statistics clearly indicate that the changes in turn over did not occur by chance but due to the effect of the variables in the model. With the R square of 84% and adjusted R squared of 82%, the variables explain a larger proportion of turnover of bonds and hence its effect on the liquidity of the bond market. The analysis of the variables based on the regression results is discussed below.

**Table 4: Regression Results**

	Variable	Coefficient	T Test results
Bank Lending Interest Rate	BLIR	-1.934659	(-2.450479)
Foreign Exchange Rate	FFR	1.444918	(2.626482)
Domestic Debt	PD	0.317357	(13.56863)
Savings Interest Rate	SR	5.652010	(3.415726)
Constant	C	-126.6812	(-3.267568)
R-squared		0.839748	
Adjusted R-squared		0.823312	
F-statistic		51.09159	
Prob(F-statistic)		0.000000	
Number of Observations		44	

From the test results, bank lending rate, foreign exchange rate, domestic debt and savings interest rate are the key factors that influence liquidity of the bond market.

Savings and deposit forms the main methodology of pooling together of resources used in the financial markets for onward lending. Government bonds have remained the most important instrument for savings transformation. The saving interest rate entices members to save i.e. when the average returns are higher, the investors are inclined to save more monies to offer credit services. As indicated in the regression results, with the coefficient of 5.6 and t value of minus 3.4, there is a positive relationship between savings rate and bond turn over and the variable is statistically significant. The test results confirm that very low domestic savings has been a key constraint and impediment to financial market deepening and development of domestic bond markets and therefore a major constraint on domestic bond market development in most SSA countries. As the return on savings plays a big role in informing the investor with surplus funds on decision to make with regard to investment opportunities, the test result is an indicator that with low savings, investors have to access capital from elsewhere to finance growth and innovation.

Domestic debt is seen as an important determinant in the improvement of liquidity of the bonds. This is indicated by a coefficient of 0.32 and t value of 13.5, implying that domestic debt is positively related to turnover and is statistically significant. Thus domestic debt

influences the turnover of the bonds. This result is consistent with Claessens, Klingebiel and Schmuklerwe (forthcoming) and Grobetv (2012) findings of positive and significant coefficient of the domestic debt variable. The results also support Isaya, Maina and Mutai (2008) study that indicates government restructured bonds to minimise risks and to develop a secondary market for government securities to promote financial resource mobilization for both the public and private sector through the financial market.

The results further explain the deliberate effort by government that has increased the domestic debt and especially the treasury bonds as supported by Ngugi and Agoti (2009) who conclude that government bonds have higher liquidity than corporate bonds. However, even though trading in primary market, secondary market remains with less trade as investors adopt the buy and hold strategy for the shares. This in effect reduces the liquidity of bonds as they do not trade after issuance in the primary market more so for the government bonds.

Cost of capital as measured by the bank lending interest rate, is a key determinant of the source of financing in the domestic economy. The coefficient of minus 1.93 and t- value of -2.45 suggest that the bank lending interest rate is inversely related to turnover and the variable is statistically significant. This implies that the increase in market interest rate leads to reduced bond market liquidity as it does not only entice the savers and investors to use alternative investment vehicles it also acts as a deterrent to investors to borrow from the debt market as restricted by affordability. The tests results support the premise that credit seekers and providers use cost of lending to determine the use of the debt instrument. Further, this supports Hartelius, Kashiwase, and Kodresthe (2008) conclusion that interest rate has an effect on emerging market debt spreads. This therefore explains the fact that as the general interest rates increase, investors tend to invest in short term investments to safeguard against erosion in purchasing power of long-term fixed-rate assets; that limits the demand for debt instruments.

In the absence of adequate domestic resources, internal markets are used in sourcing for finances. The effect of foreign participation in the domestic market is measured by the foreign exchange rate. The analysis used the dollar rate and test results indicated a coefficient of 1.4 and t value of 2.6, thus the variable is not only statistically significant but also explains the changes in turnover of bonds. The results indicate that the depreciation of Kenyan shilling increases capital inflow and spurs investment in the debt market thereby enhancing the liquidity of bonds. The results are similar to Claessens, Klingebiel and Schmuklerwe



(forthcoming) and Grobety (2012) findings that exchange rate regime variables are mostly significant and have a positive sign. The results also support the Adelegan and Bozena (2009) study that finds interest rate volatility and exchange rate stability as significant determinants of private and public markets.

## CHAPTER FIVE

### 5.0 SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

#### 5.1 Summary of Findings

This study set out to determine factors that influence turnover of the bonds market hence liquidity. The test results based on 44 observations found that bank lending interest rate, foreign exchange rate, domestic debt and saving interest rate are significant determinants of liquidity of bonds. The regression results indicated that 88% of the turnover in bonds is explained by the four variables. The bank lending interest rate, being the cost of capital, was found to determine the source of financing. As the rate increases, the liquidity of the bonds declined as indicated by the inverse relationship.

Long term financing is built from domestic savings. The test results indicate that an increase in saving interest rate improves liquidity of the bonds. As more money is saved, it avails resources for onward lending to the members and in most cases through use of debt instruments. The increased return entices the members to put more funds in savings. These savings that are invested in bonds increase the domestic debt.

To absorb more of the saving, the government tends to borrow from the domestic market using bonds. As more instruments are issued in the market and therefore available for trade, leads to more participants thus improving liquidity of bonds as more people are involved in trade. Since increased trade opens the market to other players including those from the international market, foreign participation is explained by the foreign exchange rate, and the test results have confirmed that it is a significant factor for consideration.

#### 5.2 Conclusions

The bonds market liquidity is essential for the smooth functioning of any financial system and the existence of deeper and more liquid bonds market makes it easier for financial investors to adjust their portfolios in a cost-effective way. The study finds that bank lending interest rate, domestic debt, foreign exchange rate and savings rate are generally significant factors influencing the liquidity of the bonds.

The changing bank lending rates influence the expectation of investors and decisions on the investment options. The inverse relationship between the turnover and the bank lending rate implies that a decline in bank lending rates entices investors to substitute investment with

savings in bonds while a decline in interest rates means that investors tend to invest more in the bonds to preserve their capital.

The increased savings and foreign participations increases capital available for onward lending to the users of funds. The changes in saving interest and foreign exchange rates have an effect on the final result on liquidity. For instance, a decrease in the rates reduces the available resources for investment in bonds. An increase in the rate, which implies increase in returns on savings and depreciation of currency entices more savings and foreign participation leading to increased capital, hence increase in investment in bonds. The volatility in the rates is explains the buy and hold strategy employed currently by investors in the bonds.

Since the variables analysed are affected by government policies, the government needs to put in place appropriate monetary and fiscal policies to manage the domestic debt and volatility of the interest rate and foreign exchange.

### **5.3 Policy Recommendations**

From the foregoing discussion and test results, and based on the research findings, the following are the policy recommendations:

First, government through central bank should put in place policies on interest rate, more so on savings interest rates that will entice people to increase savings so that resources are availed for investment in bonds. To increase foreign participation, the government should put in place measures to manage volatility of exchange rate. This will not only improve liquidity of the bonds but also encourage borrowing using debt instruments that spur growth of the productive sectors through investment.

Second, the government should employ appropriate fiscal and monetary policies to help manage stability of interest rates by reducing volatility, and borrowing domestically without crowding out private investors, so as to create an enabling environment for trade and to build the investor base for the secondary market.

Third, the government should put in place mechanisms and incentives to encourage trading in secondary bonds market to spur secondary market liquidity.

### **5.4 Areas for Further Research**

The scope of the research was broad and did not cover the corporate bonds in details as its capitalization is minimal in the market as compared to the government bonds. Therefore

liquidity of the corporate bonds is an area that may need in-depth review to shed light on its performance and use by the private institutions in sourcing for long term funding.

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## APPENDICES

### Appendix 1: Performance of Primary Bond Treasury Issues Market

Year	Offer	Bids	Allotment	Performance (%)
2007	87	143.74	84.98	165%
2008	85	94.385	61.532	111%
2009	42.5	214.03	40.384	504%
2010	176.1	287.03	179.855	163%

**Appendix 2: Treasury Bond Issues in the Primary Market**

Year	2001		2002		2003		2004		2005		2006		2007	
	No of	Kshs	No of	Kshs	No of	Kshs	No of	Kshs	No of	Kshs	No of	Kshs	No of	Kshs
	Issues	Mn	Issues	Mn	Issues	Mn	Issues	Mn	Issues	Mn	Issues	Mn	Issues	Mn
1	17	30,020	5	17,070	4	10,360	3	10,000	8	26,970			2	8,080
2	15	14,300	5	22,910	6	14,640	4	14,910	3	12,330	4	18,960	3	11,680
3	9	2,800	6	22,860	4	16,320	5	17,140	3	10,810	2	12,800	2	6,870
4			2	10,000	3	12,000	2	6,490	1	3,630	3	9,550	1	3,380
5			1	7,000	4	14,310	1	3,560	1	6,090	2	7,910	2	5,390
6			1	3,000	3	15,000	3	10,950	1	4,740	2	14,000	2	11,700
7					1	3,000	2	4,870	1	3,880	1	3,180	1	2,260
8					1	4,000	1	1,520			1	3,200	1	2,620
9					1	4,000		7,190			1	2,950		
10					1	2,700	1	5,930			1	5,090		
11													1	3,910
12													2	8,820
15													2	11,070
<b>TOTAL</b>	<b>41</b>	<b>47,120</b>	<b>20</b>	<b>82,840</b>	<b>28</b>	<b>96,330</b>	<b>22</b>	<b>82,560</b>	<b>18</b>	<b>68,450</b>	<b>17</b>	<b>77,640</b>	<b>19</b>	<b>75,780</b>

Year	2008		2009		2010		2011	
	No of	Kshs	No of	Kshs	No of	Amounts	No of	Amounts
	Issues	Mn	Issues	Mn	Issues	Kshs Mn	Issues	Kshs Mn
1	1	3,000	2	10,000				
2	3	16,000	1	6,000	3		6	
5	4	24,090	2	15,000	4	46,000	4	
7	1	8,000						
8					1	14,500		
9							1	31,600
10	2	14,270	4	36,000	2	24,000	3	
12			1	18,500	1	18,500		
15	2	14,400			2	28,500	2	
18								
20					1	10,000	2	
25	1	7,500	1	13,000	1	7,500	1	15,000
30							2	
<b>TOTAL</b>	<b>14</b>	<b>87,260</b>	<b>11</b>	<b>98,500</b>	<b>15</b>	<b>149,000</b>	<b>21</b>	<b>207,000</b>

Source: CMA (Various Years)

### Appendix 3: Granger Causality Tests

(a). F Tests probability results

	Asset Level	Bank Lending Interest Rate	Inflation	Credit Rating	Deposit Interest Rate	Foreign Exchange Rate	External Debt	GDP Growth Rate	Domestic Debt	Stock Market Index	Savings Interest Rate	Short term Interest Rate	Turnover
Asset Level		91%	32%	69%	72%	2%	6%	93%	1%	43%	19%	18%	1%
Bank Lending Interest Rate	31%		74%	45%	10%	61%	12%	93%	0%	0%	40%	0%	3%
Inflation	39%	29%		13%	4%	75%	30%	12%	29%	27%	41%	14%	51%
Credit Rating	2%	76%	59%		90%	92%	74%	85%	24%	64%	70%	89%	86%
Deposit Interest Rate	24%	4%	0%	49%		51%	32%	10%	3%	11%	29%	0%	68%
Foreign Exchange Rate	98%	75%	51%	74%	86%		3%	25%	78%	58%	60%	99%	55%
External Debt	7%	97%	91%	25%	81%	20%		76%	1%	91%	76%	25%	3%
GDP Growth Rate	76%	33%	39%	79%	44%	58%	74%		77%	10%	7%	40%	79%
Domestic Debt	10%	24%	8%	33%	1%	88%	7%	46%		62%	22%	6%	90%
Stock Market Index	11%	7%	95%	57%	4%	33%	83%	80%	95%		18%	30%	93%
Savings Interest Rate	97%	74%	91%	98%	12%	18%	23%	16%	56%	3%		0%	23%
Short term Interest Rate	38%	60%	61%	32%	59%	63%	4%	46%	2%	3%	7%		10%
Turnover (Y)	1%	97%	97%	0%	48%	58%	86%	49%	0%	71%	66%	94%	

(b). F Test Statistics results (F critical 2.00)

	Asset Level	Bank Lending Interest Rate	Inflation	Credit Rating	Deposit Interest Rate	Foreign Exchange Rate	External Debt	GDP Growth Rate	Domestic Debt	Stock Market Index	Savings Interest Rate	Short term Interest Rate	Turnover
Asset Level		0.10	1.17	0.38	0.33	4.53	3.01	0.08	5.59	0.86	1.74	1.80	5.64
Bank Lending Interest Rate	1.20		0.31	0.82	2.44	0.50	2.21	0.07	6.61	6.41	0.95	9.49	3.83
Inflation	0.97	1.28		2.12	3.63	0.28	1.24	2.28	1.27	1.37	0.91	2.07	0.68
Credit Rating	4.51	0.28	0.54		0.10	0.09	0.30	0.16	1.49	0.44	0.37	0.12	0.15
Deposit Interest Rate	1.50	3.40	6.94	0.73		0.69	1.16	2.47	4.00	2.30	1.28	12.70	0.39
Foreign Exchange Rate	0.03	0.29	0.68	0.31	0.15		3.93	1.43	0.25	0.55	0.52	0.01	0.61
External Debt	2.88	0.03	0.09	1.45	0.22	1.68		0.27	5.38	0.09	0.28	1.43	3.70
GDP Growth Rate	0.28	1.15	0.97	0.23	0.84	0.55	0.31		0.27	2.43	2.86	0.94	0.24
Domestic Debt	2.46	1.47	2.74	1.13	5.16	0.13	2.85	0.80		0.48	1.57	3.11	0.11
Stock Market Index	2.34	2.82	0.05	0.56	3.64	1.13	0.18	0.22	0.05		1.81	1.24	0.07
Savings Interest Rate	0.03	0.30	0.09	0.03	2.24	1.78	1.53	1.92	0.59	3.99		6.84	1.54
Short term Interest Rate	1.00	0.51	0.49	1.18	0.54	0.47	3.49	0.79	4.67	3.86	2.90		2.44
Turnover	4.87	0.03	0.03	9.94	0.74	0.55	0.16	0.72	7.56	0.34	0.42	0.06	

Appendix 4: Cointegration Tests results

Normalized Cointegrating Coefficients: 12 Cointegrating Equation(s)													
A	BLIR	CPI	CR	DR	FER	GD	GDPGR	PD	SMI	SR	TBR	Y	C
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-5.60
												0.00	
0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	-15.31
												-0.09	
0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	-12.51
												-0.14	
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05	-0.32
												-0.01	
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	-4.54
												-0.03	
0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.16	-76.39
												-0.05	
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	-0.52	-143.33
												-0.43	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	-0.25	-2.00
												-0.07	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	-2.36	-107.02
												-0.38	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	-0.01	-3.39
												-0.01	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.07	-2.61
												-0.04	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.03	-6.92
												-0.08	

Log Likelihood	-24.92												
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Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

A	BLIR	CPI	CR	DR	FER	GD	GDPGR	PD	SMI	SR	IBR	Y	C
1.000	0.053	0.007	0.069	-0.068	-0.012	-0.003	0.020	-0.006	-0.713	-0.113	0.003	0.004	-1.606
	(0.003)	(0.001)	(0.009)	(0.004)	(0.002)	(0.000)	(0.001)	(0.000)	(0.053)	(0.009)	(0.001)	(0.000)	

Log Likelihood -357.967



## Appendix 5: Correlation Analysis

	A	BLIR	CPI	CR	DR	FER	GD	GDPGR	PD	SMI	SR	TBR	Y
A	1.000	-0.360	0.291	0.943	-0.038	-0.075	0.377	0.127	0.969	0.610	-0.479	-0.142	0.817
BLIR	-0.360	1.000	-0.259	-0.267	0.775	0.218	0.129	-0.415	-0.304	-0.761	0.879	0.585	-0.146
CPI	0.291	-0.259	1.000	0.099	-0.144	0.029	0.331	-0.189	0.224	0.226	-0.322	0.135	0.017
CR	0.943	-0.267	0.099	1.000	0.049	-0.105	0.271	0.177	0.917	0.603	-0.390	-0.118	0.823
DR	-0.038	0.774	-0.143	0.049	1.000	-0.029	0.010	-0.202	-0.090	-0.375	0.723	0.758	0.014
FER	-0.075	0.218	0.029	-0.105	-0.029	1.000	0.587	0.063	0.056	-0.369	-0.071	0.078	0.132
GD	0.377	0.129	0.331	0.271	0.010	0.587	1.000	-0.116	0.490	-0.236	-0.032	-0.004	0.506
GDPGR	0.127	-0.415	-0.189	0.177	-0.202	0.063	-0.116	1.000	0.116	0.502	-0.468	-0.166	0.102
PD	0.969	-0.304	0.224	0.917	-0.090	0.056	0.490	0.116	1.000	0.516	-0.465	-0.237	0.879
SMI	0.610	-0.761	0.226	0.603	-0.375	-0.369	-0.236	0.502	0.516	1.000	-0.755	-0.292	0.339
SR	-0.479	0.879	-0.322	-0.390	0.723	-0.071	-0.032	-0.468	-0.465	-0.755	1.000	0.503	-0.246
TBR	-0.142	0.585	0.135	-0.118	0.758	0.078	-0.004	-0.166	-0.237	-0.292	0.503	1.000	-0.221
Y	0.817	-0.146	0.017	0.823	0.014	0.132	0.506	0.102	0.879	0.339	-0.246	-0.221	1.000

## Appendix 6: Augmented Dickey Fuller Tests

ADF Test Statistic	-1.790	1% Critical Value*	-3.593
		5% Critical Value	-2.932
		10% Critical Value	-2.604

\*MacKinnon critical values for rejection of hypothesis of a unit root.

### Augmented Dickey-Fuller Test Equation

Dependent Variable: D(Y)

Method: Least Squares

Date: 10/01/12 Time: 09:55

Sample(adjusted): 2001:3 2011:4

Included observations: 42 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.144	0.080	-1.790	0.081
D(Y(-1))	0.185	0.165	1.127	0.267
C	1.677	1.090	1.539	0.132
R-squared	0.084	Mean dependent var		0.508
Adjusted R-squared	0.037	S.D. dependent var		5.537
S.E. of regression	5.434	Akaike info criterion		6.292
Sum squared resid	1151.599	Schwarz criterion		6.416
Log likelihood	-129.131	F-statistic		1.783
Durbin-Watson stat	1.872	Prob(F-statistic)		0.182

## Appendix 7: Phillip Perron Test

PP Test Statistic	-1.372	1% Critical Value*	-3.589
		5% Critical Value	-2.930
		10% Critical Value	-2.603

\*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	( Newey-West suggests: 3 )
Residual variance with no correction	27.678
Residual variance with correction	23.055

### Phillips-Perron Test Equation

Dependent Variable: D(Y)

Method: Least Squares

Date: 10/01/12 Time: 09:56

Sample(adjusted): 2001:2 2011:4

Included observations: 43 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.114	0.075	-1.516	0.137
C	1.509	1.054	1.431	0.160
R-squared	0.053	Mean dependent var		0.507
Adjusted R-squared	0.030	S.D. dependent var		5.470
S.E. of regression	5.388	Akaike info criterion		6.252
Sum squared resid	1190.163	Schwarz criterion		6.333
Log likelihood	-132.408	F-statistic		2.298
Durbin-Watson stat	1.682	Prob(F-statistic)		0.137

Appendix 8: Analysis of NSE Share Index from 1996 to 2011

NAIROBI STOCK EXCHANGE 20 SHARES INDEX 1996-2011													
Year	January	February	March	April	May	June	July	August	September	October	November	December	Average NSE Index
1996	3,409	3,230	3,047	3,019	3,031	3,144	3,150	3,074	3,090	3,056	3,047	3,114	3,117
1997	3,480	3,474	3,355	3,288	3,461	3,530	3,467	3,403	3,447	3,315	3,047	3,115	3,365
1998	3,348	3,362	3,213	3,015	3,016	2,908	2,853	2,863	2,810	2,784	2,584	2,962	2,977
1999	2,983	2,989	2,815	2,768	2,760	2,756	2,745	2,494	2,428	2,309	2,294	2,303	2,637
2000	2,308	2,277	2,211	2,162	2,053	2,003	1,967	1,958	2,001	2,043	1,927	1,913	2,070
2001	1,897	1,933	1,831	1,768	1,636	1,657	1,621	1,506	1,401	1,471	1,420	1,355	1,625
2002	1,343	1,334	1,183	1,129	1,071	1,087	1,098	1,043	1,027	1,116	1,162	1,363	1,161
2003	1,511	1,558	1,608	1,847	2,076	1,935	2,005	2,107	2,380	2,457	2,737	2,738	2,080
2004	3,158	3,175	2,771	2,708	2,689	2,370	2,708	2,709	2,671	2,830	2,918	2,946	2,804
2005	3,094	3,213	3,202	3,228	3,505	3,972	3,982	3,938	3,833	3,939	3,974	3,973	3,655
2006	4,177	4,057	4,102	4,025	4,150	4,260	4,259	4,486	4,880	5,114	5,615	5,646	4,587
2007	5,774	5,387	5,134	5,199	5,002	5,147	5,340	5,372	5,146	4,971	5,215	5,445	5,261
2008	4,713	5,072	4,843	5,336	5,176	5,186	4,868	4,649	4,180	3,387	3,341	3,521	4,523
2009	3,199	2,475	2,805	2,800	2,853	3,295	3,273	3,103	3,006	3,084	3,190	3,247	3,027
2010	3,765	3,629	4,073	4,233	4,242	4,139	4,439	4,455	4,630	4,660	4,395	4,433	4,758
2011	4,465	5,240	3,887	4,029	4,071	3,968	3,718	4,164	3,284	3,507	3,155	3,209	3,752