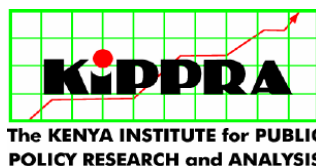


Microstructure Elements of the Bonds Market in Kenya

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Abstract

The importance of market microstructure in determining the success of a bonds market in allocating financial resources depends on the degree to which the microstructure elements have been designed to determine the proper price at which matching of demand and supply in an efficient and effective manner is done. This discussion paper analyzes some of the fundamental microstructure elements responsible for the current state of Kenya's bonds market. The study investigates the liquidity, efficiency and volatility in Kenya's bonds market and establishes that overall, treasury bonds' market is better designed in terms of microstructure elements, and has been performing relatively better than the corporate bonds market.

Abbreviations and Acronyms

APD	Average Per Deal
CBK	Central Bank of Kenya
CDS	Central Depository System
CMA	Capital Markets Authority
EADB	East African Development Bank
FISB	Fixed Income Securities Board
GDP	Gross Domestic Product
MRM	Mabati Rolling Mills
NSE	Nairobi Stock Exchange
REPO	Repurchase Orders

Table of Contents

Abstract	iii
Abbreviations and Acronyms	iv
1. Introduction	1
2. Bonds market in Kenya	2
2.1 Introduction	2
2.2 Importance of the Bonds Market to the Kenyan Economy	4
2.3 Trading System	5
2.4 Regulatory Framework	7
2.5 Policy Issue	8
3. Literature Review	9
3.1 Introduction	9
3.2 Liquidity	9
3.3 Efficiency	11
3.4 Volatility	12
4. Methodology	14
4.1 Empirical Framework	14
4.2 Variable Definition	15
4.3 Data and Sample	15
5. Empirical Results	17
5.1 Summary Statistics	17
5.2 Liquidity Analysis	18
5.3 Market Efficiency	20
5.4 Volatility Analysis	25
6. Conclusions	33
7. Policy Recommendations	34
References	36

1. Introduction

In the capital market reform process, emerging markets are focusing on the development of the debt market, which includes the bonds market. Effort is being put on institutional structure development, including modernizing the trading systems, putting in taxation incentives to lower the entry barriers and reduce the cost to investors, and tightening the regulatory framework. It is expected that with such institutional investment, the bonds market activities will heighten and competitiveness will be achieved.

In the Kenyan context, various changes have been instituted in the capital market, including establishment of a fixed income securities trading segment at the stock exchange; tax incentives and other factors that reduce transaction costs; diversification of the maturities; and modernization of the trading system especially for treasury bonds. It is also important to note the deliberate effort that the government took in boosting development of the bonds market in 2001. With all these developments the question is, has the bonds market microstructure been strengthened?

Institutional development is a major factor that determines development of the market under the microstructure theory. Policy makers and market administrators can influence investment strategies of the investors through their choice of institutional set up. Market microstructure determines the type of information available to the market, the manner in which incoming orders to buy and/or sell are matched and surveillance of the market. As such, institutional set up defines the microstructure characteristics of the market, including liquidity, efficiency, trading costs and volatility.

This study attempts to analyze the microstructure characteristics of the bonds market in Kenya, to see the implications of the various efforts being put on development of the market.

2. Bonds Market in Kenya

2.1 Introduction

Kenya's bonds market traces its origin back to the 1980s when the Government of Kenya first launched a bid to use treasury bonds to finance government deficit. Similarly, the first corporate bond was issued on 8 November, 1996 by the East African Development Bank (EADB), which issued a multi-lateral bond. However, the Kenyan bonds market experienced a turnaround in 2001 when the government re-launched treasury bonds. In both cases, the rates applicable were floating rates pegged to the 91-day treasury bill rates. The latest listing was by Faulu Kenya on 11 April, 2005. The bonds market has been relatively more active after 2001 and an increased number of bonds issues has been made. As at 3 May, 2005 there were 65 treasury bonds (Floating Rate, Special and Fixed Rate Bonds) and five corporate bonds listed on the Nairobi Stock Exchange (NSE). There has been a tremendous market gain in terms of the size of the bonds market as indicated in Table 2.1. Total bond value has increased from Ksh 0.8 billion in 1996 to over Ksh 186 billion in 2003, with the coupon rate in the market ranging between 8 per cent and 14 per cent.

2.1.1 Treasury bonds

In Kenya, the objective of government has been to maintain stability in treasury securities interest rates, lengthen the average maturity of the domestic debt through sustained efforts to restructure the debt away from the short tenor treasury bills to longer tenor treasury bonds, and develop a yield curve to provide a basis for pricing corporate bonds. Following the introduction of long tenor treasury bonds (7, 8, 9 and 10 years) in March 2003 by the government, the average maturity of domestic debt lengthened to 2 years and 2 months at the end of June 2004 from 1 year and 7 months in June 2003. Consequently, the stock

Table 2.1: The value (in Ksh billions) of Kenya's bonds market (1996-2003)

Year	1996	1997	1998	1999	2000	2001	2002	2003
Government	0.0	10.6	37.8	28.4	34.1	80.3	130.5	178.4
Corporate	0.82	0.54	0.27	1.05	1.1	6.8	8.55	7.65
Total	0.82	11.14	38.07	29.45	35.2	87.1	139.05	186.05

Source: Nairobi Stock Exchange files

of treasury bills (including repos) declined as a percentage of domestic debt to 32.6 per cent in June 2004 from 36.5 per cent in June 2003, while the stock of treasury bonds increased to 61.6 per cent in June 2004 from 55.8 per cent in June 2003 (Table 2.2), reflecting the continued interest by the Government of Kenya in domestic debt restructuring with a bias towards treasury bonds.

The share of treasury bonds of 5 years tenor and above in the total outstanding bonds increased to 42.2 per cent at the end of June 2004 from 25.7 per cent at the end of June 2003, while that of the 10-year bonds increased from 1.7 per cent of the outstanding bonds in June 2003 to 4.6 per cent in June 2004 (NSE information desk). The Government, however, faces a challenge of sustaining this achievement and extending the maturity profile further in order to diversify its fixed income portfolio away from short-term to long-term instruments. The significant role played by the banking sector as the leading investors in holding outstanding stock of treasury bonds should be recognized; so should that played by other parties such as insurance companies, parastatals and building societies. These investors indirectly help the government achieve its fiscal objectives, hence the need to protect their interest.

2.1.2 Corporate bonds

Kenya's corporate bonds market has always had a lower trading activity compared to the treasury bonds market.¹ Since the inception of this market in 1996, only five corporate organizations have listed their bonds. The growth of this market has been hindered by a number factors, among them information asymmetry among potential issuers, a high and

Table 2.2: Composition of treasury bonds in Kenya's total domestic debt (June 2000-June 2004)

	June 2000		June 2001		June 2002		June 2003		June 2004	
	Ksh bn	%	Ksh bn	%	Ksh bn	%	Ksh bn	%	Ksh bn	%
A. Government securities	190.9	92.6	199.3	94.1	226.8	96.1	278.2	96.2	289.5	94.5
Of which, Treasury Bills*	114.1	55.4	116.4	55.0	82.1	34.8	78.7	36.5	62.9	32.6
Treasury bonds	36.9	17.9	44.5	21.0	106.3	45.0	161.5	55.8	188.6	61.6
Government stock	3.0	1.5	1.5	0.7	1.5	0.6	1.1	0.4	1.1	0.4
Non-interest bearing debt	36.9	17.9	36.9	17.4	36.9	15.6	36.9	3.5	36.9	2.4
B. Others**	15.2	7.4	12.5	5.9	9.2	3.9	11.1	3.8	16.7	5.5
Total Domestic Debt (A+B)	206.1	100.0	211.8	100.0	236.0	100.0	289.3	100.0	306.2	100.0

Source: CBK monthly economic reviews, relevant months.

*Excluding Treasury bill REPOs; **Others include: overdrafts, items in transit, commercial banks advances and tax reserve certificates.

¹ See Table 2.1 for details.

unstable interest rates regime, lack of a yield curve to price long term instruments, and the crowding out effect of the government's domestic debt.

Added to the foregoing is the characteristic of the dominance of institutional investors in this market as shown in Table 2.3, who prefer a strategy to buy and hold the issued bonds. These investors, who include banks, insurance companies, fund managers and investment companies account for approximately 97 per cent of the total bondholding, whereas individuals account for about 3 per cent of the total corporate bondholding in Kenya.

2.2 Importance of the Bonds Market to the Kenyan Economy

There exists a direct relationship between fiscal deficit and significant issuances of government debt securities; the development of the bonds market is inextricably linked to the direction and management of fiscal

Table 2.3: Outstanding stock of corporate bonds by holder (%)

Corporate bondholding as at 31 December, 2001					
Issuer	Banks	Ins. Com.	F/ man.	Inv. Co	Individuals
Shelter Afrique	23.10	15.90	0.00	61.00	0.00
*EADB	59.60	14.70	0.00	25.20	0.50
*EADB	19.10	26.40	8.60	44.10	1.80
Safaricom	58.00	4.00	31.00	3.50	0.50
Corporate bondholding as at 31 December, 2002					
Issuer	Banks	Ins. Com.	F/ man.	Inv. Co.	Individuals
Shelter Afrique	19.14	10.86	0.00	70.00	0.00
*EADB	46.40	6.05	5.00	40.25	2.30
*EADB	41.17	25.33	0.00	31.58	1.92
Safaricom	43.85	2.80	27.35	25.60	0.40
Corporate bondholding as at 31 December, 2003					
Issuer	Banks	Ins. Com.	F/ man.	Inv. Com.	Individuals
Shelter Afrique	16.50	9.00	74.50	0.00	0.00
EADB	21.50	11.05	42.95	24.50	0.00
MRM	36.42	3.00	59.95	0.63	0.00
Safaricom	45.48	2.78	51.13	0.25	0.37
Corporate bondholding as at 31 December, 2004					
Issuer	Banks	Ins. Com.	F/ man.	Inv. Com.	Individuals
*EADB	46.00	11.05	42.95	0.00	0.00
MRM	36.42	3.00	59.95	0.63	0.00
Safaricom	45.48	2.78	50.88	0.50	0.38
*EADB	36.25	17.50	46.25	0.00	0.00

Source: CMA annual reports and files

* Issued in two tranches, Ins. Com-Insurance companies, F/man-Fund managers, Inv. Com-Investment companies.

policy. The extent to which fiscal spending is financed through the sale of government bonds in open competitive markets, and the degree to which this sustains a critical level of supply of government debt securities has important implications to the development of a country's economy.

Similarly, a domestic corporate bonds market helps corporations reduce their financing costs in two ways. First, through disintermediation, by allowing corporations—through bond issuance—to borrow directly from investors, thus bypassing the major intermediary role of a commercial bank and, second, by structuring their asset and liability profiles in such a way as to reduce maturity risk and currency mismatch in their books of accounts. Although corporations still go through underwriters, brokers and dealers to raise debt finance, competition among these intermediaries is more intense compared to that between commercial banks, thus pushing down their intermediation costs. As a result, borrowing firms enjoy a lower cost of debt financing.

The bonds market belongs to the larger financial services sector, which in 2003 contributed at least 10 per cent to total GDP. The Kenya government issues bonds mainly to finance domestic debt borrowing, which is part of a general objective of financing public debt. Kenya's public debt stood at Ksh 709.7 billion at the end of June 2004. Out of the outstanding public debt, Ksh 306.2 billion or 43.2 per cent was domestic. The share of domestic debt in GDP stood at 26.4 per cent in June 2004. Overall, total public debt to GDP was at 61.2 per cent in June 2004. Domestic debt was mainly financed through sale of treasury bonds to commercial banks and the non-banks (61.6%), and, utilization of the overdraft facility at the Central Bank of Kenya.

In addition to trading in bonds, they may also be used as collateral (through lien creation) against borrowings before maturity date, or be transferred to others. The corporate bonds market statistics show a positive contribution to GDP, albeit at a lower level. As at June 2003, for instance, corporate bonds worth Ksh 7.35 billion were outstanding. Institutional investors who have a tendency to buy and hold to maturity dominate the corporate bonds market.

2.3 Trading System

Bonds trading at the NSE follow a call auction system to determine the bond price. In a call auction, the orders are accumulated periodically and matched at a specific time and price, which in most cases is an average price between ask and bid price. Additionally, NSE's bonds market does not have market makers; it is order-driven. This, according

to Madhavan (2001), reduces efficiency compared to if it were a quote-driven market. The main order type used at the NSE in trading in bonds is the limit order. In this type of order, the broker is instructed to buy or sell a security at a specific price (or better).

The secondary market for treasury and corporate bonds in Kenya is trading at the NSE, which takes place through licensed stockbrokers who act as intermediaries playing the agent role. For a transaction to take place in the case of treasury bonds, a prospective investor must have a Central Depository System (CDS) account, which is a central facility at Central Bank of Kenya for holding securities by book entry without the necessity of certificates. It is a requirement of Central Bank that all investors have a CDS account for them to purchase Government bonds. New investors are required to complete CDS account opening cards before making their accounts fully operational. No fee is charged to open this account. Additionally, an investor requires only one CDS account, which can be used for all investment in Government securities. When applying to hold or sell bonds, investors apply on a prescribed application form, which requires information on the issue number, face value, offer payment for every Ksh 100, desired rate to maturity (% rate), duration, name of the prospective investor and CDS account number.

Bonds in Kenya's market are traded on a separate board known as the Fixed Income Securities Board (FISB). Specific rules that govern trading in bonds on the board are followed to ensure an orderly trading process at the NSE. To start with, bids and offers of bonds are displayed on the FISB in the order in which they are called. Also, bids and offers are first matched on the basis of best price and, second, on a first come first served basis.

To trade, bids and offers must be equal, and for at least 50 per cent of the value on offer, for the matching to take place. No bidding spreads or forced transactions are allowed at the exchange. Also, it is a requirement that board lots be at par and that prices be expressed as a percentage of Ksh 100 par rounded to four decimal places. The minimum board lot is according to the rules defined as the outstanding minimum nominal value of the bond. Additionally, bonds with periodic partial principal repayments are traded at the subsequent minimum nominal value following the partial principal repayments.

In a case where the bonds bear a floating rate of interest, the daily applicable reference interest is displayed on the Fixed Income Securities Board at the start of the trading session. All bonds are, according to these rules, traded cum coupon up to the closure of books as

communicated by the issuer for determination of entitlements. Lastly, the rules stipulate that no bond should be traded within 3 working days of the principal redemption.

A major issue of concern that would constrain the operations of the treasury bonds market is the entry requirement. The minimum face value required before one invests in bonds is Ksh 50,000 and any additional to be invested must be in multiples of Ksh 50,000, according to the National Debt Department of the Central Bank of Kenya. Although those eligible to invest include individuals, individual participation is highly constrained.

Aside from trading in the organized exchange, off-market trading in bonds (also known as over-the counter trading) takes place at the NSE. This market has fewer participants than the organized exchange. It, however, helps institutional investors to do cross border trading and execute large blocks of trade.

2.4 Regulatory Framework

Trading in bonds is governed by specific eligibility, listing rules and regulations set up by both the Nairobi Stock Exchange (NSE) and the Capital Markets Authority (CMA). In the pre-reform period (before February 2001), NSE used to have only one listing market segment with stringent eligibility and listing requirements. According to the market participants, these requirements failed not only to address the needs of small and medium-sized organizations but also the special needs of institutional investors. In the post-reform era, however, the NSE regulatory framework has changed, bringing with it a sub-division of the market into three distinct market segments (main investment, alternative investment and fixed income investment), each with its own eligibility and listing requirements. In addition to defining the various categories of investors and addressing their needs, the post-reform NSE has defined trading lots, a feature which did not exist before the reforms were introduced.

To list at the NSE and issue bonds, a corporate organization needs to be registered under the Companies Act and be limited by shares with a minimum share capital of Ksh 50 million and net assets of Ksh. 100 million or a guarantee. The bonds to be issued must be freely transferable to other parties. Additionally, at the time of issuing the bonds, the issuer must have published on a going concern basis, audited and unqualified financial statements, which must comply with International Accounting Standards (IAS). Furthermore, the issuer should not be in breach of

any loan covenant in regard to maximum debt capacity and should have made profit in two of the last three years preceding the issue.

The organization must also be solvent and have a gearing ratio of 4:1 or less.² At the date of its intention to issue bonds, the organization's three years' ratio of funds generated from operations to total debt should, not be less than 40 per cent. The corporate organization should, in addition to disclosing the suitability of directors and management to the exchange, present a clean certificate from the relevant regulatory authority for banking and insurance companies.

Despite all the efforts that have been made to boost trading in the bonds market and protect investors, more effort needs to be put in to attract more investors. Both the exchange and its controlling authority need to develop a reform agenda in the regulatory framework to make the market more competitive in attracting investors and boosting the bonds market activity.

2.5 Policy Issue

The question that comes to mind about Kenya's bonds market is whether enough is being done to improve the bonds' market institutional structure, reduce the cost of trading, reduce excess volatility and improve both efficiency and liquidity through tax incentive provision. Taxation, being an added cost to trade, may have been discouraging some potential investors from venturing into investment in bond markets, given that these same investors pay other fees and charges. However, a reduction in tax charged may drastically reduce the capacity of government to introduce necessary institutional reforms aimed at boosting bonds market activity. Therefore, a balance needs to be struck in provision of tax incentives in the bonds market to ensure that market activity is boosted while at the same time improving the institutional framework in bonds market in Kenya.

² A gearing ratio shows the extent of indebtedness of a corporate organization, the lower the ratio the more solvent an organization is.

3. Literature Review

3.1 Introduction

The viability of bonds markets depends on its level of liquidity, efficiency, volatility and trading costs. Market rules and practices governing the trading process, such as how trading orders are submitted and what trading information must be disclosed, affect the market microstructure elements. This raises the question of whether changes in institutional structure can enhance market performance by improving the microstructure elements.

3.2 Liquidity

Liquidity, or the ability to buy or sell quickly and without substantially moving prices, is the key to market success. As a market becomes more liquid, it encourages more trading which, in turn, attracts more market participants, resulting in a virtuous circle where markets become more liquid and more efficient over time.³ By reducing the riskiness of buying and selling bonds, liquidity makes market participation more attractive, which has a bearing both on prices and ability of the market to process information efficiently. Ultimately, liquidity can dictate the success of a market. Liquidity goes beyond the physical ability to trade and also includes market depth, which refers to the ability to transact at the current market price. In a deep market, even large orders can be transacted at the current price. In contrast, when market depth is lacking, the larger an order, the more prices will have to be adjusted to fill the order.

Linking the institutional structure to liquidity, some studies have looked at the implications of trading system on liquidity. For example, Madhavan (1993) develops a theoretical framework that permits one to compare different trading structures and shows that there are differences between the equilibrium behaviour of continuous and periodic auctions, and between dealer and quote-driven systems. Periodic auctions provide better price efficiency in his model, but at the expense of continuity and higher information costs. Amihud and Mendelson (1991) examine the effect of liquidity on fixed income instruments. Their results show that liquidity has an economically and statistically significant impact on required returns. As liquidity increases, required return declines.

Domowitz (2001) conducted a study to find out whether electronic trading can offer much more than just the reduction of transaction costs through the automation of trade execution and dissemination of quote information. Results showed that electronic trading systems offer strategic liquidity management. Another study looked at the relationship between market transparency and liquidity. Using empirical studies,

³ See Madhavan (1993); and Amihud and Mendelson (1991).

Bloomfield and O'Hara (1999) show that low-transparency dealers are more likely to provide liquidity because of the information content of their actions in the market. However, Madhavan and Porter's (2001) case study of Toronto Stock Exchange indicates that increased transparency had "detrimental effects" on liquidity. Gravelle (2001) found that fixed income markets tend to be characterized by pre-trade transparency (by requiring quotes from dealers) and from stock exchanges by post-trade transparency (by immediately reporting transactions).

Other studies have related liquidity to other elements of microstructure. For example, it is shown that illiquidity can itself create trading cost especially because of its interaction with fundamental risk. As a result, the "trading cost view" postulates that illiquid securities must provide investors with a higher return to compensate them for their larger transaction costs, controlling for their fundamental risk (Amihud and Mendelson, 1986). Studies testing this hypothesis confirm a significant cross-sectional relationship between liquidity (as measured by the tightness of the bid-ask spread or trading volume) and asset returns, controlling for risk (Brennan and Subrahmanyam, 1996; Chordia, Roll and Subrahmanyam, 2000; Datar, Naik and Radcliffe, 1998; Elwaswapu, 1997; Warga, 1992; Daves and Ehrhardt, 1993; Kamara, 1994; and, Krishnamurthy, 2000).

The "liquidity view" postulates that liquidity is itself a source of risk as it changes unpredictably over time. Since investors care about returns net of trading costs, the variability of trading costs affects the trading cost of a security. Acharya and Pedersen (2004) showed that liquidity risk should be priced to the extent that it is correlated across assets with asset fundamentals. Similarly, Hasbrouck and Seppi (2004) proposed a model of liquidity risk where traders have asymmetric knowledge about future liquidity so that less informed investors try to learn from current trading volume how much liquidity there may be in the future. They showed that current liquidity is a predictor of future liquidity risk and is therefore priced.

More recent literature puts forward the "risk-liquidity interaction view," which opines that both current and future liquidity alter the impact on the changes in risk on current prices and yields. This view does not emphasize on liquidity risk but rather on the interaction of liquidity and fundamental risk. Proponents of this argument, including Pagano and Ernst-Ludwig (2004) contend that changes in fundamental risk affect less the price of bonds that are currently less liquid but more the prices of bonds that are more liquid. Similarly, Vayanos (2004) argues that fund managers are subject to withdrawals when their performance falls below the minimum threshold, and are therefore likely to liquidate at times of high volatility. This increases the liquidity premium at times of high volatility.

3.3 Efficiency

Markets are said to be efficient if they quickly and correctly incorporate information into prices. This is important because many traders are unable to devote time and resources to gathering information given the cost this portends for them, preferring instead to depend on the market itself to properly reflect all available information in prices. For these uninformed traders, a market that is inefficient is also unattractive because it means that trade may be made at unfavourable prices and if they realize that later, they may be discouraged from trading. For that reason, markets that are more efficient will attract investors and this translates into increased market liquidity.

The importance of efficiency as a market microstructure element was identified by Jack Treynor in his short article, *Only Game in Town*⁴ (written under the pseudonym of Bagehot, 1971). In this article, Treynor explained why investors lose from trading, and why informed investors win. According to him, the key is to understand the role of the dealer or market maker, who loses when trading with informed investors, but aims to recoup these losses through trading with uninformed investors.

Grossman and Stiglitz (1980) observed that in a world with costly information, it is impossible for markets to be information efficient. They resolved this paradox by drawing on Treynor's idea of assuming that the market also entertains transactions from uninformed noise traders. This focus on the way that markets function has led to extensive literature on the microstructure of financial markets. The Bagehot (1971) article provided an early insight into the way information is incorporated into security prices through the activities of investors, and how market structure can have an impact on the efficiency of the bonds market.

The intuitive story presented by Bagehot was formalized in the price formation model presented by Kyle (1985). Kyle developed a model in which multiple orders of variable size are processed at a single price. His model had three types of traders: a single informed trader, several competing market makers, and uninformed noise traders who transact randomly. Noise traders camouflage the activities of the informed trader, whose transactions are organized in such a way that his private information is reflected gradually in market prices. The market makers compete and, therefore, break even while informed transactors achieve a profit at the expense of noise traders.

⁴ Investors' confusion between market gains and trading gains helps explain why they continue trading even though it rarely improves their performance. Then, too, some investors reason that if trading based on random selection is as likely to prove profitable as not, trading based on any information whatever will result in performance better than neutral. The key to the fallacy in their reasoning is the market maker, who must impose a spread in order to survive.

Glosten and Milgrom (1985) showed that the very possibility of trading on information could be sufficient to induce a positive bid-ask spread. Building on earlier work by Copeland and Galai, Glosten and Milgrom (1985) identified the element of the spread that is attributable to adverse selection. Taken together with Demsetz's (1968) order processing costs, and Ho and Stoll's (1981) measure of inventory control costs, this has provided a framework to an extent that it is now used widely for analyzing the bid-ask spread confronted by investors.

3.4 Volatility

Volatility refers to the frequency and magnitude of price movements in the market. While prices are expected to vary over time to reflect changes in relative and absolute value, the concern over volatility is that short-term price movements do not correctly reflect changes in equilibrium value. Furthermore, the concern is over excess volatility, which has the potential of destabilizing the market and in the process making it less attractive to potential investors. Volatility and the other microstructure elements have a strong linkage. For instance, if markets are liquid, transaction costs will be lower, especially bid/ask spreads and, as a result, the observed sequence of trading prices will be less volatile as the natural bouncing of transactions between the bid and ask occurs over time.

The generally accepted view is that asset price volatility is caused by the arrival of new information, which results in investors wishing to adjust their portfolios (Clark, 1973). Epps and Epps (1976), in an attempt to explain volatility clustering, postulate that because information arrives at an uneven rate, volatility is also variable. They argue that if one could replace clock time with event time, so that the time measure is stretched during periods of high information arrival and is contracted in periods of low arrival (weekends, nights, lunch-times), volatility would be much smoother.

A further observation is that the information arrival process impacts additionally on trading volume (Karpoff, 1987). With new information, investors adjust their portfolios, hence the need to trade. The consequence is that volume and volatility will be jointly determined and positively correlated (Tauchen and Pitts, 1983). Volume will also tend to cluster (Lamoureux and Lastrapes, 1990). In explaining persistence in volatility, Gilbert (1987) uses a fundamental characteristic of financial asset trades that they must all at some future date be reversed. One cannot consume a share or a bond in the way that one consumes an apple or an orange. Positions established today will be unwound at some future date. Shocks to trading volume today will generate echoes in the future. On this view, volatility persistence is the outcome of unwinding positions resulting from information arrival at an earlier date.

4. Methodology

4.1 Empirical Framework

The purpose of this study was to analyze the microstructure characteristics of the bonds market. The main elements considered include: liquidity, efficiency and volatility. Although literature provides more sophisticated models of carrying out the analysis, the study carried out a simple but informative analysis about the state of the market microstructure in the bonds market in Kenya, due to data constraints.

a) Liquidity

To capture liquidity, the study used the traded value (which is what was available) and number of deals. If all the statistics of the outstanding value of bonds were available, the study would have used the turnover ratio. Similarly, it would have been more preferable to use the traded volumes rather than values because of the impact of price changes. The number of deals shows participation in the market while the traded volume/values show the size of transactions. Thus, we expect that the higher the number of deals, the higher the level of participation and, the higher the value traded the larger the size of transactions. However, it is possible that small deals could be associated with higher traded values so that large transactions fail to capture the participation rate. In this regard, the study used the average traded value per deal to analyze the average size of each transaction.

b) Efficiency

The study looked at various aspects that have implications on the efficiency of the market. The first aspect considered was thinness of the market, measured by the trading days in an ideal situation (this excludes weekends and holidays and includes all the days that the market is open for trading in the week). A thin market is said to be inefficient because of information asymmetry. Second, it is hypothesized that when information assimilation is not an issue for the market, then the difference between the closing prices and the highest prices quoted during the day should not be significantly different. In this study, we compare the closing prices with the highest quoted prices. Inefficiency is inferred when the dispersion between the two is high. An assumption is also made that the closing price that captures information in the course of trading should be between the high and low quotations of the day. It would have been interesting to capture efficiency by looking at how the market adheres to administrative directives. For example, there are defined limits within which the current price should not exceed. With

daily data, it would be possible to trace the magnitude of the daily prices and calculate their dispersions. However, the study did not get access to this type of data.

c) *Volatility*

The study used the standard deviation and variance of bonds return to capture the volatility in the market. The standard deviation captures the direction of fluctuations while the variance captures the magnitude. The volatility is defined as:

$$\text{Volatility} = \text{std}_{t-1} \left\{ \log \left(\frac{Q_t}{Q_{t-1}} \right) \right\} = X_i - \bar{X}$$

Where, std is the standard deviation, \log is the natural logarithm, Q represents price, current yield or any other variable whose volatility is being measured. X_i is the monthly observation and \bar{X} is the mean value of 12 months. Subscript $t-1$ indicates that the standard deviation is conditional on information available at time $t-1$. The variance is defined as the square of the standard deviation. Bonds return is a sum of the current yield and capital gain or loss. Thus, the study divided the bonds returns into the two components and analyzed them separately. The idea was to capture the size of the two components in the total volatility. Further, the study captured the dispersion between the lowest and highest prices to give an indication of price dispersions.

4.2 Variable Definition

Bond return = current yield + capital gain/loss; Current yield = coupon/bond prices; Capital gain/loss = $\log(\text{bond price})_t - \log(\text{bond price})_{t-1}$; Value = traded value of bonds; Deal = number of deals struck in the period; APD = ratio of value to deal; Day = the number of days traded; Day* = the ratio of number of days traded to total ideal number of days; Closing = closing price in the day of trading; High = the highest price quoted in the day of trading and; Low = the lowest price traded in the day of trading.

4.3 Data and Sample

The study covers the period 2000 to 2004 when comprehensive monthly data is available as observed from the NSE's monthly bulletins. In total,

the study uses 1,279 treasury bonds traded value observations; 45 corporate bonds traded value observations; 60 bonds deals; 1,266 bonds prices; 1,093 current yield observations for treasury bonds; and, 45 bonds prices and current yield observations for the corporate bonds. The variation in sample sizes is as a result of the way bonds data is entered at NSE; the style keeps changing over time and there are variations in frequency of trading.

5. Empirical Results

5.1 Summary Statistics

Table 5.1 provides summary statistics for the various measures of microstructure characteristics of the bonds market. Corporate bonds have on average a lower price (102.33) than the treasury bonds (104.75). Whereas corporate bond prices range between 99 per cent and 109 per cent, indicating a price dispersion of 10 per cent, treasury bonds prices range between 65 per cent and 148.5 per cent, indicating a price dispersion of 84 per cent. The relatively higher price dispersion in treasury bonds is indicative of higher price volatility in this market. The distribution of prices does not follow a normal distribution as both types of bonds have positive skew coefficients and fat tails relative to normal distribution.

Table 5.1: Summary Statistics of observations influencing liquidity

	Mean	Median	Max	Min	Std. Dev.	Skew	Kurtosis	J-B	Prob.
Prices and yields									
Corporate Bonds									
Bond Price	102.33	101.74	109.2	99.08	2.27	0.88	3.66	5.07	0.08
Capital gain/loss	-0.0022	7.66E-05	0.0589	-0.088	0.031	-0.804	4.22	5.76	0.00
Current yield	10.61	10.66	19.58	2.97	2.65	0.48	6.62	19.91	0.00
Treasury Bonds									
Bond Price	104.75	102.3	148.5	65	9.13	1.61	7.15	1,451.6	0.00
Capital gain/loss	-0.0004	0.0002	0.4	-0.43	0.09	-0.14	6.5	644.81	0.00
Current yield	11.09	11.78	19	1.47	2.94	-1.12	4.39	320.85	0.00
Liquidity measures									
C/bonds turnover	55.52	21	381	0.000077	86.1	2.28	7.67	80.23	0.00
T/ bonds turnover	91.65	10.98	1,800	0.005	170	3.36	19.38	16,686	0.00
Deals*	73.00	71.00	172.00	18.00	36.72	0.35	2.44	1.61	0.37
Value per deal*	26.38	30.15	55.60	0.01	15.05	0.01	2.14	1.84	0.40
Capital gain/loss volatility									
Corporate bonds									
Standard deviation	-7.99E-05	0.0004	0.4	-0.429	0.095	-0.12	6.49	643.24	0.00
Variance	0.009	0.0093	0.1847	5.28E-10	0.021	3.75	21	19,893.9	0.00
Treasury bonds									
Standard deviation	5.88E-11	0.003	0.066	-0.088	0.031	-0.71	4.30	5.23	0.073
Variance	0.0009	0.0002	0.0073	0.00	0.0017	2.33	7.95	61.65	0.00
Current yield volatility									
Corporate bonds									
Std deviation	2.44E-11	0.00498	1.421	-1.29	0.479	0.312	6.29	19.17	0.00
Variance	0.225	0.009	2.02	0.00	0.52	2.26	6.65	57.58	0.00
Treasury bonds									
Std deviation	1.93E-05	0.003	2.213	-1.999	0.442	0.576	9.91	2210.5	0.00
Variance	0.195	0.0056	4.528	6.30E-08	0.583	4.68	27.11	30,170	0.00

Note: The bonds' traded value is in terms of millions of Kenya Shillings; *Total number of deals struck and average value per deal is for both corporate and treasury bonds combined.

The average value of treasury bonds traded is generally higher than the corporate bonds as can be observed from Table 5.2. Theoretically, on average, Ksh 91 million worth of treasury bonds and Ksh 55 million worth of corporate bonds are turned over per day, an indication that there is more participation in the treasury bonds market. For both the corporate and treasury bonds, an average of 73 deals are struck per day, with a minimum of 18 deals and a maximum of 172 deals. Treasury bonds capital gains/losses are generally more volatile than corporate bonds, with a maximum and minimum of 0.40 and -0.429 , and 0.066 and -0.088 , respectively. For the current yield, volatility for corporate bonds fluctuates between a maximum and minimum of 1.42 and -1.29 , whereas that of treasury bonds is between 2.21 and -1.999 , indicating that the trend has been the same, with total volatility in the treasury bonds market being higher.

Table 5.2: Total bond traded values (Ksh millions) across maturities

	2000	2001	2002	2003	2004	Total for the period
Corporate bonds in Ksh millions						
3-year	173.37	71.00	30.25	33.2	0.50	308.32
4-year		708.30	770.90	5.5		1,484.7
5-year		20.00	612.20	65.2	2.91	700.31
7-year					11.00	11.00
Treasury bonds in Ksh millions						
1-year	1,900	5,400	6,780	1,160	400	15,640
1.5-year		0.2	848	5.2		853.4
2-year	2,300	4,130	7,050	13,410	6,870	29,630
3-year	1,030	3,080	7,450	12,880	6,140	30,570
4-year			1,470	2,740	4,960	9,170
5-year		3	477	3,820	6,320	10,620
6-year		800	158	3,670	2,260	6,888
7-year				1,070	2,530	3,600
8-year				2,170	1,500	3,670
9-year				670	1,500	2,170
10-year				1,200		1,200

Source: CBK and CMA bond market reviews

5.2 Liquidity Analysis

The liquidity of the market has been analyzed using various measures, with all of them showing that participation in the corporate bonds market is much lower relative to the treasury bonds market.

a) Traded value

Table 5.2 summarizes the traded values between 2000 and 2004. There is an increase of traded values with a drop in 2004 for both the treasury and corporate bonds. There are also notable differences across maturities for the various types of bonds. Corporate bonds show more traded value for the 4-year than any other active tenor. The 5-year tenor seconds 4-year tenor in market activity, followed by the 3-year tenor, with the 7-year tenor being the relatively least active. Over time, all the bonds indicate a higher level of trading immediately they are listed and then a drastic general decline thereafter.

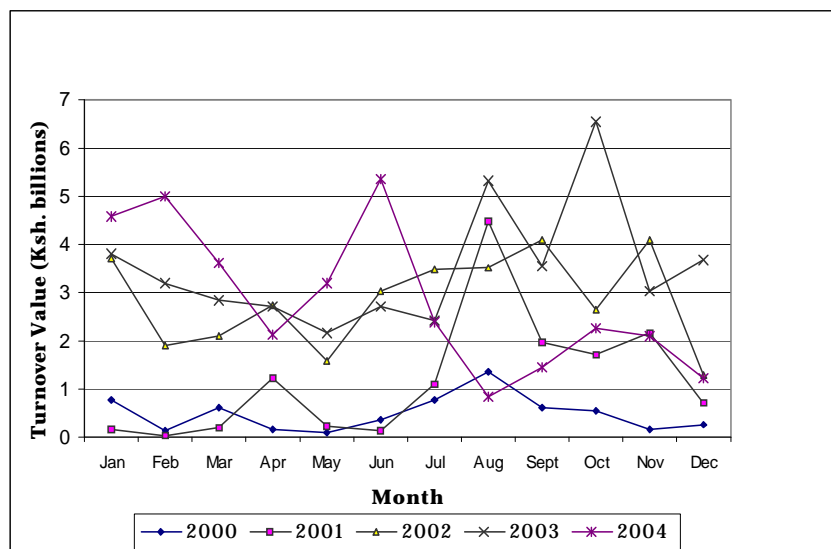
In traded value terms, the treasury bonds market is dominated by the 2 and 3-year tenors, indicating a preference for short-term securities by treasury bonds investors. Another indicated pattern is that when a new treasury bond tenor is introduced in the market, it is generally not very popular as measured by the low traded value. However, over time, it is able to pick up as investors gain confidence in it. In the short-run, investors appear to be substituting one-maturity with another, as an increasing trading in one sees trading in the other decline.

Considering the monthly levels of trading, Figure 5.1 indicates that there is a general tendency for the value traded to decline in the first half of the year. A peak is generally achieved in the third quarter of the year while a declining tendency is experienced by the end of the fourth quarter of the calendar year. This indicates seasonality effects in bonds market trading.

Comparing the corporate and treasury bonds traded values, results show that participation in the corporate bonds market is relatively far lower (40%), implying that treasury bonds (96%) dominate Kenya's bonds market. A possible explanation for this is the relatively higher prices that treasury bonds fetch in the bonds market.

b) Trading deals

Table 5.3 shows that there has been an increasing number of deals in the market, an indication that participation in the market has increased over time. It also shows that the average size of deals has increased over time from 47 in 2000 to 90 in 2004. Similarly, on average, turnover values and the average number of deals struck have increased, an

Figure 5.1: Monthly liquidity levels

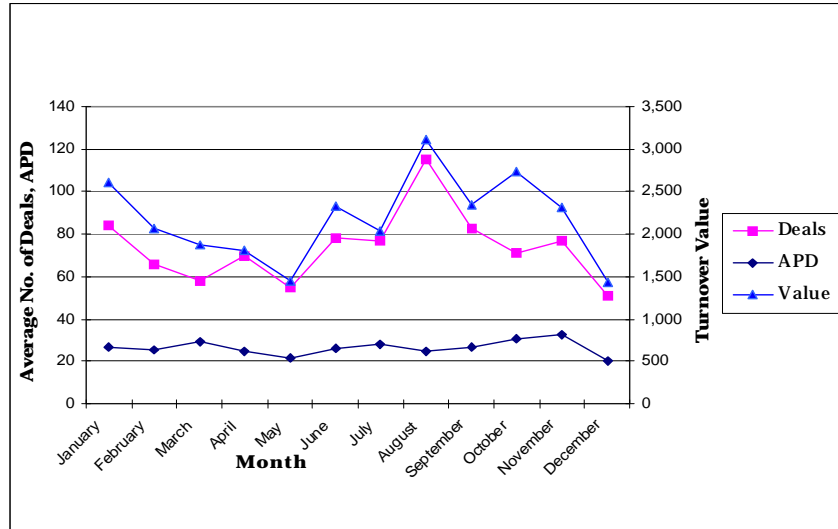
indication of market deepening. This can be attributed to the increasing number of bonds listed in the market and awareness among the investors.

Figure 5.2 summarizes the relationship between the turnover value, number of deals struck and the average turnover value per deal. A notable observation is that participation in the bonds market is accompanied by an increasing size of the market turn over value and vice versa. There is a general increasing trend in turnover value; average turn over per deal and the number of deals as can be observed by the increase at a decreasing rate of the curves representing the trend of the three variables. There is, however, a drop in the turnover value, the number of deals struck and the average turnover value per deal in 2004, signaling a decline in bonds market activity.

5.3 Market Efficiency

Although both the treasury and corporate bonds share the same floor in the secondary market, their clearing and settlement systems and procedures are different. For instance, an investor in the treasury bonds market is required to have a Central Depository System (CDS) account to facilitate the immobilization of bonds, given that bonds are held in electronic accounts. It also facilitates faster and easier processing of transactions. The market defines the spreads within which daily prices move, which helps in controlling volatility of prices. Conversely, one is

Figure 5.2: Relationship between average number of deals, APD and turnover value across 2000-2005



not required to hold a CDS account to trade in corporate bonds and this lowers the relative efficiency in trading in corporate bonds.

The first panel of Table 5.4 shows the average price, yield and return for the corporate bonds. Generally, the 3-year bond price is higher than the rest of the active bond tenors. Similarly, the 4-year bond has a generally declining yield trend that is lower than the 3-year tenor bond. The converse is true for the 5-year bond whose yield has been generally higher than the 3-year bond. A notable feature for the 3-year bond is that it has a declining yield even as the price declines, implying that the coupon rate for this bond has gone down drastically over time. Therefore, in real terms, the 3-year bond is relatively more rewarding to investors.

The second panel of the same table gives the average price, yield and return for treasury bonds. It can be observed that, generally, as the tenor of the bond increases, so does its average price. On the other hand, the yield falls as the tenor of the bond increases. This could be the reason why trading activity is concentrated on lower tenor bonds. Additionally, in general, corporate bonds of the same maturity as treasury bonds are more expensive and, on average, have a higher yield hence lower trading activity in corporate bonds, owing to the lower risk faced in trading in treasury bonds.

Table 5.3: Average value per deal of bonds in Kenya in Ksh millions (2000-2004)

Month	2000			2001			2002			2003			2004		
	Value	Deals	APD	Value	Deals	APD	Value	Deals	APD	Value	Deals	APD	Value	Deals	APD
January	770	85	9.06	140	27	5.52	3,710	112	33.1	3,800	98	38.8	4,580	97	47.2
February	130	62	2.09	150	28	0.54	1,920	48	39.9	3,180	93	34.2	4,990	99	50.4
March	610	33	18.5	180	28	6.46	2,110	41	51.6	2,830	76	37.2	3,620	112	32.3
April	160	22	7.27	1,240	84	14.8	2,740	57	48.1	2,720	91	29.9	2,140	95	22.5
May	110	38	2.89	210	18	12	1,560	52	30.1	2,150	71	30.2	3,180	97	32.7
June	370	21	17.62	130	28	4.96	3,040	60	50.6	2,720	111	24.5	5,340	172	31
July	750	83	9.04	1,100	60	18.4	3,500	63	55.6	2,420	111	21.8	2,400	68	35.2
August	1,350	93	14.5	4,480	136	32.9	3,530	116	30.5	5,320	149	35.7	840	82	10.3
September	620	39	16	1,980	63	31.4	4,100	123	33.3	3,550	88	40.3	1,440	102	14.1
October	550	30	15.9	1,710	54	31.6	2,630	100	26.3	6,540	128	51.1	2,250	41	29
November	170	35	4.86	2,160	71	30.5	4,080	130	31.3	3,030	76	39.9	2,110	72	55
December	270	25	10.08	700	20	35	1,300	51	25.5	3,680	120	31.7	1,210	39	0.01
Average	488	47	10.65	1,181	51	18.67	2,851	79	38.0	3,495	101	34.6	2,842	90	29.97
Total	5,860	566	10.35	14,180	617	23	34,220	953	36.0	41,940	1,212	35.0	34,100	1,076	32

Value – Refers to the bond turnover value in millions of Kenya shillings; APD – Average value per deal in millions of Kenya shillings.

Source: Computed from NSE monthly bulletins and stock market files.

Table 5.4. Average price, current yield and return for government and corporate bonds

	2000				2001				2002				2003				2004			
	P00	Y00	R00	%	P01	Y01	R01	%	P02	Y02	R02	%	P03	Y03	R03	%	P04	Y04	R04	%
	Corporate Bonds																			
3	103.7	12.90	.0058		104.9	11.5	-0.011		101.2	11.35	-0.0424		102.07	5.6	0.0178		103.37	2.25		
4					100.8	12.12	-.0223		102.65	9.27	-.0024		100.26	2.22			100.30	8.76	2.03E-03	
5					100.4	12.92	0.025		100.65	9.18	-.0029		100.57	5.8	-.00067		100.64	7.50	0.007	
7																				
	Treasury bonds																			
1	101.3	12.0	-.0005		100.6	12.7			102.6	10.9	0.0007		101.6	11.3	0.0001		98.5	3.8	0.0041	
1.5					102.0	11.3			102.9	14.2			105.0	13.8			101.5	8.2	0.0001	
2	101.3	12.1	-.0002		103.2	13.0	0.0006		103.3	11.3	-.0003		104.0	11.6	-.000235		101.7	10.0	0.0001	
3	101.3	11.5	-.0001		99.3	13.2	0.0006		102.1	10.9	0.0002		105.7	10.0	-0.0000		105.2	13.0	-.0030	
4									102.5	11.1	0.0033		106.5	10.7	-0.0009		109.6	11.2	0.0011	
5									100.3	11.4	-.0201		111.9	11.4	0.0052		108.7	10.2	-.0072	
6					101.9	11.8			102.0	10.6	-.0005		116.6	11.4	-0.0030		103.5	10.19	-.0152	
7													115.0	12.0	-0.0099		108.9	8.7	0.0036	
8													118.4	10.9	-0.0041		110.6	10.9		
9													123.8	10.3	-0.0287					
10													115.5	10.4	-0.0127					

Note: In a case of a mean price and average yield reporting with no corresponding return, it means there was only one observation for that tenor and return could therefore not be calculated.

a) Number of days of trading

The number of days the bond is traded in the market is indicative of the thinness of the market. Treasury bonds have recorded an increasing number of times of trading relative to the corporate bonds (Table 5.5). As a proportion of the total number of days of trading, it increased from 68 per cent in 2000 to 87 per cent in 2004. This means that comparatively, corporate bonds thinly trade in the market, an indication that on the overall, treasury bonds are more efficiently traded than corporate bonds.

b) Information trading

In an efficient market, new information should be incorporated quickly and correctly in the price of a bond. It therefore follows that at the close of trading, the closing price should reflect all the information available to the market until the last minute of trading before the market closes. Similarly, in an efficient market, the dispersion between the highest price attained and the closing price should be small to reflect the fact that most of the information available to the market was impounded in prices just before the market closed. The dispersion between the highest price attained and the closing price has been computed and is summarized in Table 5.6 (a), whereas the lowest price attained and closing price dispersion is reported in Table 5.6(b). Figure 5.3 summarizes the relationship between the closing price and the high and low prices.

Results from the tables show that the total average dispersion of the closing price from the highest price is higher (9.02%), than the dispersion of the closing from the lowest price (6.05%). In efficiency terms, it means that information that could lead to an increase in bond price is relatively more efficiently relayed to the market than information likely to lead to the eventual reduction in bond price. Also, a high dispersion between the highest and closing price could be signaling information trading because, depending on the nature of the information, as the information is assimilated in the market, then the price at the end of the trading day may be lower or higher. For the low/close price dispersion, we find an indication of relatively lower information trading.

5.4 Volatility Analysis

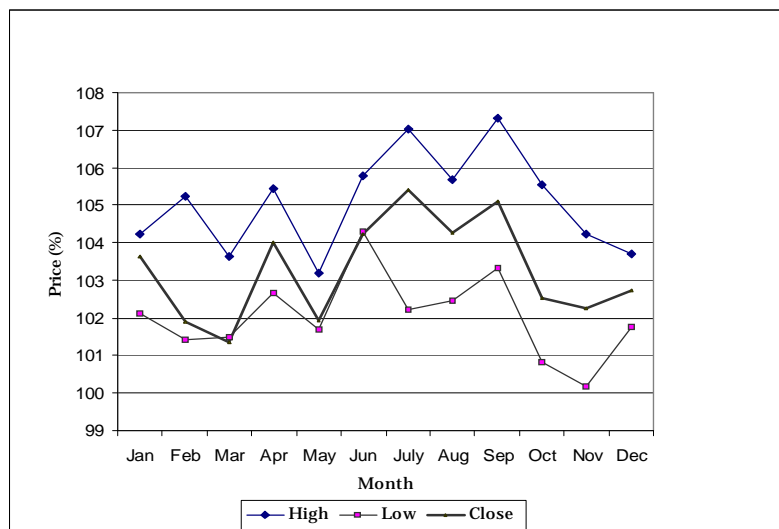
The bonds return volatility, which captures the capital gain/loss and current yield volatility, have been separately computed to find out the contribution of the two to the total bonds market volatility.

Table 5.5: Number of days of trading for Kenya's corporate and government bonds (2000-2004)

	2000		2001		2002		2003		2004	
	Days Traded	Ideal Total	Days Traded	Ideal Total	Days Traded	Ideal Total	Days Traded	Ideal Total	Days Traded	Ideal Total
January	18	21	10	23	18	22	20	21	19	22
February	13	21	11	20	18	20	19	20	18	20
March	14	23	8	22	15	20	19	20	21	23
April	13	18	12	19	19	21	20	21	19	20
May	16	22	9	19	1	23	20	21	20	21
June	15	18	9	21	1	20	19	21	19	22
July	15	21	15	22	4	23	19	23	21	22
August	19	23	16	23	2	22	20	21	20	22
September	11	21	14	20	3	21	20	22	21	22
October	10	20	15	22	2	22	21	22	15	21
November	16	20	21	22	3	21	18	19	19	21
December	7	17	7	18	1	18	19	20	13	23
Total	167	245	147	251	210	253	234	251	225	259
Day 2 (%)	68.2	2.0	58.6	83.0	9.9	2.4	93.2	86.9	5	1.2
% of Total	96	4	90	89	11	97	3	98	2	

C.B.—Corporate Bonds; T.B.—Treasury Bonds

Figure 5.3: Average dispersion as measured by high, low and closing price across 2000-2004



a) *Treasury bonds*

Figure 5.4 traces the volatility of treasury bonds' capital gain/loss across the various maturities. The figure shows that short tenor bonds have lower volatility compared to the long tenor bonds in terms of both the direction and magnitude of volatility. This could explain why there is preference for the short tenor bonds relative to long tenor bonds in Kenya's bonds market, given the minimal risk exposure.

Considering the current yield volatility, Figure 5.5 shows that the short tenor bonds again have lower volatility, which is explained by the volatility in prices given that the coupon rate is almost constant over time. Comparing the two volatilities, we find that the current yield fluctuates between 2.21 and -1.99 as compared to the capital gain/loss volatility, which fluctuates between 0.4 and -0.429 . It means, therefore, that current yield volatility contributes a significantly higher proportion (83.55%) to the total bonds return volatility than capital gain/loss volatility (16.45), for treasury bonds.

Considering the difference between the highest and lowest price, over time the dispersion between the two has increased. A peak is recorded in October-2003 and a declining tendency thereafter. However, the values are generally higher than they were in 2000.

Table 5.6(a) : The average close/high price dispersion for 2000-2004

	2000				2001				2002				2003				2004			
	High %	Close %	DSP %	High %	Close %	DSP %	High %	Close %	DSP %	High %	Close %	DSP %	High %	Close %	DSP %	High %	Close %	DSP %		
Jan	104.23	103.62	0.61	100.77	100.76	0.01	100.97	100.54	0.43	104.55	104.16	0.39	110.66	109.03	1.63					
Feb	109.33	97.09	12.24	101.00	100.73	0.27	102.96	100.90	2.06	104.48	104.32	0.16	108.45	106.44	2.01					
Mar	102.51	98.26	4.25	102.34	100.63	1.71	102.84	101.01	1.83	101.86	101.11	0.75	108.66	105.67	2.99					
Apr	101.91	101.9	0.01	100.85	100.44	0.41	103.13	101.03	2.1	109.15	107.27	1.88	112.21	109.31	2.9					
May	103.74	102.5	1.24	100.67	99.99	0.68	100.67	99.99	0.68	107.57	105.83	1.74	103.39	101.3	2.09					
Jun	103.65	102.72	0.93	99.77	99.88	-0.1	104.5	101.49	3.01	109.05	107.38	1.67	111.9	109.79	2.11					
Jul	99.57	98.6	0.97	99.74	99.71	0.03	103.74	101.55	2.19	124.09	121.47	2.62	108.07	105.81	2.26					
Aug	99.76	99.21	0.55	100.95	99.77	1.18	103.9	101.83	2.07	115.36	113.35	2.01	108.39	107.28	1.11					
Sep	100.95	101.29	-0.34	100.25	99.72	0.53	104.05	102.17	1.88	119.3	112.97	6.33	108.76	106.47	2.29					
Oct	101.85	100.39	1.46	101.51	99.98	1.53	103.08	101.89	1.19	116.8	112.1	4.7	104.5	98.28	6.22					
Nov	101.96	99.07	2.89	102.68	100.62	2.06	103.2	102.19	1.01	111.3	109.13	2.17	101.99	100.2	1.79					
Dec	99.83	100.91	-1.08	102.33	100.81	1.52	103.32	102.31	1.01	110.07	107.89	2.18	102.88	101.67	1.21					
Mean			1.98			0.82			1.62			2.22			2.38					

DSP-The highest price-closing price dispersion

Table 5.6(b): The average close/low price dispersion for 2000-2004

	2000			2001			2002			2003			2004		
	Close %	Low %	DSP %	Close %	Low %	DSP %	Close %	Low %	DSP %	Close %	Low %	DSP %	Close %	Low %	DSP %
Jan	103.62	102.12	1.5	100.76	99.45	1.31	100.54	99.73	0.81	104.16	102.54	1.62	109.03	106.78	2.25
Feb	97.09	100.69	-3.6	100.73	97.41	3.32	100.90	102.41	-1.51	104.32	101.74	2.58	106.44	104.86	1.58
Mar	98.26	101.85	-3.59	100.63	101.62	-0.99	101.01	102.47	-1.46	101.11	99.62	1.49	105.67	101.87	3.8
Apr	101.9	100.66	1.24	100.44	99.42	1.02	101.03	101.52	-0.49	107.27	104.97	2.3	109.31	106.65	2.66
May	102.5	101.97	0.53	99.99	100.22	-0.23	99.99	101.97	-1.98	105.83	104.29	1.54	101.3	100.01	1.29
Jun	102.72	102.84	-0.12	99.88	99.42	0.46	101.49	103.13	-1.64	107.38	104.47	2.91	109.79	111.73	-1.94
Jul	98.6	98.00	0.6	99.71	98.79	0.92	101.55	101.82	-0.27	121.47	106.73	14.74	105.81	105.81	0
Aug	99.21	97.03	2.18	99.77	99.58	0.19	101.83	102.30	-0.47	113.35	107.96	5.39	107.28	105.45	1.83
Sep	101.29	98.89	2.4	99.72	99.36	0.36	102.37	102.17	0.20	112.97	109.93	3.04	106.47	105.11	1.36
Oct	100.39	92.49	7.9	99.98	100.49	-0.51	101.89	101.74	0.15	112.1	107.30	4.8	98.28	102.11	-3.83
Nov	99.07	99.07	0	100.62	102.08	-1.46	102.19	94.47	7.72	109.13	107.44	1.69	100.2	97.77	2.43
Dec	100.91	99.40	1.51	100.81	102.07	-1.26	102.31	100.78	1.53	107.89	105.30	2.59	101.67	101.22	0.45
Mean			0.87			0.26			0.21			3.72			0.99

Figure 5.4: Volatility for government bond returns by maturity and across the years 2000 -2004

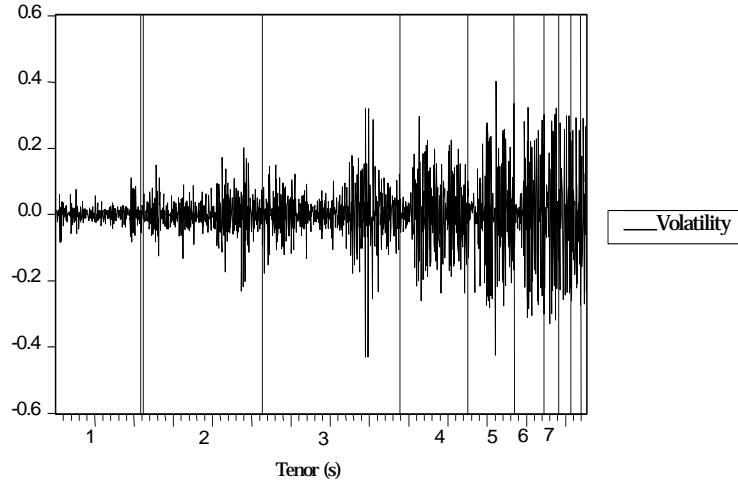


Figure 5.5: Volatility for government bond yield returns by maturity and across the years 2000-2004

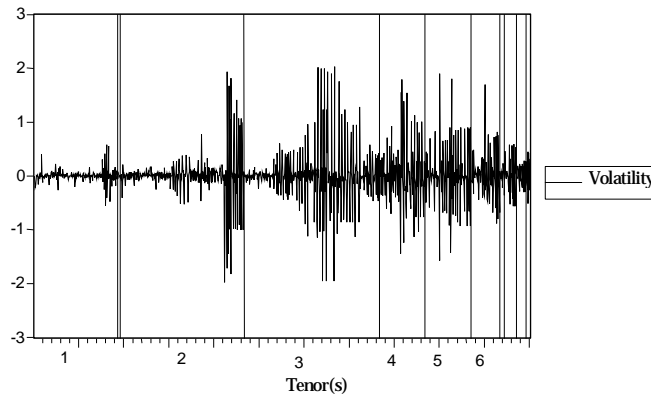


Figure 5.6: Direction of volatility for corporate bond capital gain /loss by tenor for years 2000-2004

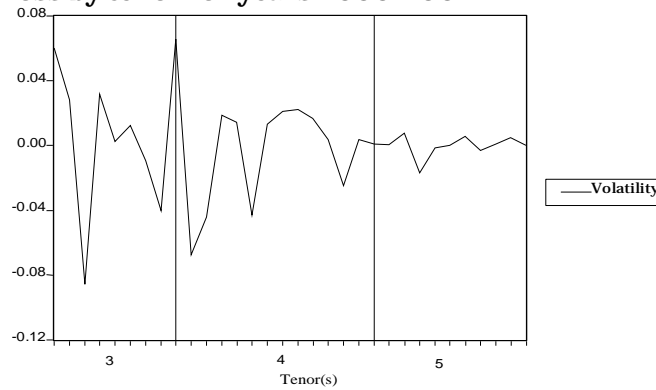
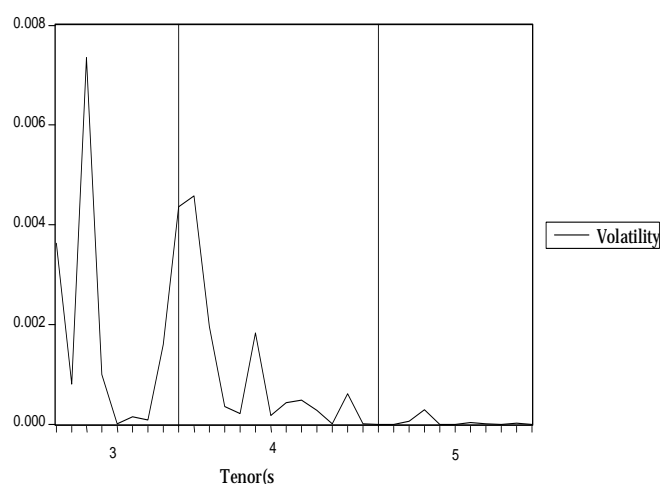


Table 5.7: The average high/low price dispersion for treasury bonds 2000-2004

	2000			2001			2002			2003			2004		
	High %	Low %	DSP %	High %	Low %	DSP %	High %	Low %	DSP %	High %	Low %	DSP %	High %	Low %	DSP %
Jan	104.23	102.12	2.11	100.77	99.45	1.32	100.97	99.73	1.24	104.55	102.54	2.01	110.66	106.78	3.88
Feb	109.33	100.69	8.64	101	97.41	3.59	102.96	102.41	0.55	104.48	101.74	2.74	108.45	104.86	3.59
Mar	102.51	101.85	0.66	102.34	101.62	0.72	102.84	102.47	0.37	101.86	99.62	2.24	108.66	101.87	6.79
Apr	101.91	100.66	1.25	100.85	99.42	1.43	103.13	101.52	1.61	109.15	104.97	4.18	112.21	106.65	5.56
May	103.74	101.97	1.77	100.67	100.22	0.45	100.67	101.97	-1.3	107.57	104.29	3.28	103.39	100.01	3.38
Jun	103.65	102.84	0.81	99.77	99.42	0.35	104.5	103.13	1.37	109.05	104.47	4.58	111.9	111.73	0.17
Jul	99.57	98.00	1.57	99.74	98.79	0.95	103.74	101.82	1.92	124.09	106.73	17.36	108.07	105.81	2.26
Aug	99.76	97.03	2.73	100.95	99.58	1.37	103.9	102.30	1.6	115.36	107.96	7.4	108.39	105.45	2.94
Sep	100.95	98.89	2.06	100.25	99.36	0.89	104.05	102.37	1.68	119.3	109.93	9.37	108.76	105.11	3.65
Oct	101.85	92.49	9.36	101.51	100.49	1.02	103.08	101.74	1.34	116.8	107.30	9.5	104.5	102.11	2.39
Nov	101.96	99.07	2.89	102.68	102.08	0.6	103.2	94.47	8.73	111.3	107.44	3.86	101.99	97.77	4.22
Dec	99.83	99.40	0.43	102.33	102.07	0.26	103.32	100.78	2.54	110.07	105.30	4.77	102.88	101.22	1.66
Mean			2.85			1.08			1.80			5.94			3.37

DSP - The highest price-closing price dispersion

Figure 5.7: Magnitude of corporate gain /loss volatility by tenor for the years 2000-2004



b) Corporate bonds

The corporate bonds market has relatively fewer observations, signaling the fact that trading it is not as active as the government bonds market. The 3-year, 4-year, 5-year and 7-year corporate bond are the only active bonds, with the 3-year trading in all the years between 2000 and 2004, the 4-year trading between 2001 and 2003, the 5-year trading in all the years under review except 2000, and the 7-year trading in 2004 only. For capital gain/loss, the short tenor bonds show larger spikes for both the rise and fall in bond return as compared to the longer tenor bond (Figures 5.6 and 5.7). These results are replicated by the variance, which shows higher magnitudes of fluctuations for the short-term bonds. These results are the exact opposite of the treasury bonds, which displayed higher volatility for longer tenor bonds. The higher volatility for shorter tenor bonds could be as a result of the higher competition with the 5-year tenor bonds, which are issued by three companies as compared to the 3 and 4-year, which have two companies, with higher competition leading to lower volatility.

For the current yield, Figures 5.8 and 5.9 indicate the short maturities to have relatively lower volatility than the longer maturities. Comparing the proportionate contributions of the yield and capital gain/loss volatility, we find that current yield fluctuates between 1.42 and -1.29, whereas capital gain/loss fluctuates between 0.066 and -0.088. Results, therefore, show that the current yield contributes 94.62 per cent of the

total proportion of volatility in this market, whereas capital gain/loss contributes 5.38 per cent of total volatility in the corporate bonds market.

In conclusion, we observe that current yield has a significantly higher volatility than capital gain/loss for both types of bonds. Over time, treasury bonds' volatility has increased, while across tenors, short-term bonds have had lower volatility than long-term bonds both in capitalgain/loss and current yield. For corporate bonds, relatively longer tenor bonds have had lower capital gain/loss volatility levels than short tenor bonds, whereas for yield, short tenor bonds have had lower volatility than longer tenor bonds. Overall, short tenor bonds have lower total volatility than long tenor bonds for both corporate bonds and government bonds.

Figure 5.8: Direction of volatility for corporate bond yield by tenor for the years 2000-2004

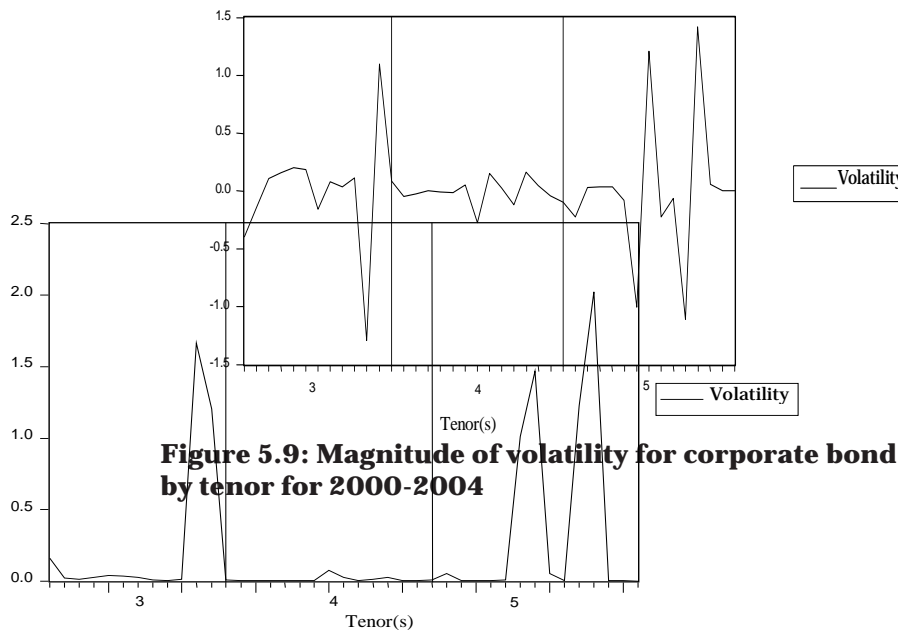


Figure 5.9: Magnitude of volatility for corporate bond yield by tenor for 2000-2004

6. Conclusions and Policy Recommendations

Bond market microstructure is an important area of research, going by the attention that this area has received hitherto. Our study analyzed the microstructure elements with the objective of seeking to understand how these elements influence bond price and, ultimately, the performance of the bonds market in Kenya.

On the basis of the analysis of the major microstructure elements, the study found that they differ across bond categories. Liquidity was found to be higher in the treasury bonds market than in the corporate bonds market. Efficiency was also found to be higher in the treasury bonds market as compared to the corporate bonds market. However, as concerns volatility, the reverse was the case. It was found to be higher in treasury bonds than in corporate bonds market.

Overall, the performance in treasury bonds market is better than in the corporate bonds market in terms of the analyzed microstructure elements. Concerted efforts should, therefore, be made to improve operations in the corporate bonds market so that it can operate optimally even as the government bonds market gets more vibrant.

Given the tumultuous times that Kenya's bonds market has been going through, urgent measures should be taken to reverse the evident negative trends so that this crucial market can take its legitimate position in spurring Kenya's financial sector to the course of rapid development. To achieve this, the study recommends the following:

Greater attention to longer tenor bonds

Although evidence from the analysis shows that short tenor bonds far outperformed long tenor bonds as measured by the microstructure elements, it is imperative that greater attention be focused on longer tenor bonds. We, therefore, recommend that government intensifies its efforts to diversify its fixed income securities portfolio to longer tenor bonds, given the relative success in using short-tenor bonds in financing its domestic debt. Corporate organizations should also be encouraged to launch longer tenor bonds with attractive premiums to improve bond market vibrancy.

More instruments in the market

Some corporate organizations defend their “buy and hold policy” by arguing that there are no alternative instruments in the stock market that they could invest in were they to sell the bonds they hold. Additional instruments in the market would spur market activity and encourage market participants to change their buy and hold behaviour. Such instruments are, for instance, REPOs and reverse REPOs, short selling, bond futures and options and interest rate swaps.

Automation

In this era of globalization, there is need to computerize operations in virtually all information and transaction processing operations in the stock market. The NSE is semi-automated and this has to some degree affected both the liquidity and efficiency of the market. Computerizing all operations in the market should have been done like “yesterday”. This would not only improve the rate at which information is impounded in bond price but also ease order processing and reduce the cost of trading. Trading online should also be facilitated to improve operations at the bonds market.

Information dissemination

Most of the Kenyan populace does not understand the operations of the stock market, let alone the bonds market. Therefore, a deliberate campaign should be set in motion to sensitize the public about the benefits of investing generally in the stock market and specifically in the bonds market.

Reduction of the minimum amount for investment in bonds

Retailing in bonds is an expensive undertaking that is out of reach to most potential investors. To invest in treasury bond, for instance, one requires at least Ksh 50,000 and this increases in multiples of Ksh 50,000 for those interested in investing more. The minimum amount should, therefore, be reduced to an “affordable” level if the objective of improving market performance is to be met.

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