EFFECTS OF AUTOMATION OF BOND TRADING ON BOND MARKET PERFORMANCE IN THE NAIROBI SECURITIES EXCHANGE

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DECLARATION AND RECOMMENDATIONS

I, the undersigned, declare that this is my original work and has not been submitted to any other University, college or institution of higher learning other than Egerton University for academic credit.

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Signature…………………………………… Date……………………………

RECOMMENDATIONS

This research Project has been submitted for examination with my approval as the University supervisor.

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Signature……………………………………. Date………………………………..

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DEDICATION

I dedicate this research Project to my family for their support during this process. I will remain forever grateful.

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ABSTRACT

Nairobi Securities Exchange (NSE) is considered as developing securities market and for many years has faced many challenges due to its low liquidity. NSE has continued to grow and implement reforms and innovations in order to raise their levels of efficiency. Between 2002 and 2009 a series of reforms were undertaken through the market regulator-Capital Markets Authority (CMA) and the exchange itself. Whether these reforms have improved the performance of bond market still remains unknown. The aim of this study was to investigate the effect of automation of bond trading on the performance of bond market at Nairobi Securities Exchange (NSE). Specifically the study sought; to determine the effect of automated bond trading on transactions cost, trading volumes, liquidity and growth of market size at the NSE. Data collection sheet was used to collect data from the NSE database spanning from January 2005 to December 2012. The data was divided into two sub periods corresponding to the pre-automation (January 2005-December 2008) and post automation period (January 2009-December 2012). The study adopted a comparative research design. The population comprised of all firms trading on bond market at the NSE from 2005 to 2012. This study used secondary data. Secondary data that targeted bond trading between the period 1 January 2005 and 31 December 2012 was identified from the NSE bulletins. The data collected was analyzed using descriptive statistics, correlations, and linear regression analysis. The influence of bond automation trading on the transaction cost is high and significantly affects its changes. The study findings indicated that; there is significant influence of bond market automation to the performance of the listed companies at NSE. Specifically, the effect of automation on bond trading determines the changes in the cost shift; the bond trading volume and market size changes are determined by the influence of the automation effect and the changes (shifts) in the bond trading liquidity are due to the influence of bond trading automation. In reaction to the current situation, policy should be imposed governing the bond trading which shall see efficiency in bond automation and consequently increasing the income of a nation through increased collection of revenue. Government securities market development must be viewed as a dynamic process in which continued macroeconomic and financial sector stability are essential to building an efficient market and establishing the credibility of the government as an issuer of debt securities.

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ACRONYMS AND ABBREVIATIONS

ATS	-	Automated Trading system
BATS	-	Bond Automated Trading Systems
CAPM	-	Capital Asset Pricing Model
CDS	-	Central Depository System
CMA	-	Capital Markets Authority
GAAP	-	Generally Accepted Accounting Principles
IASB	-	International Accounting Standards Board
IBIS	-	Integriertes Boersenhandels-und Informations system
IFRS	-	International Financial Reporting Standards
KNBS	-	Kenya National Bureau of Statistics
NSE	-	Nairobi Stock Exchange
ROA	-	Return on Assets
ROE	-	Return on Equity
ROI	-	Return on Investment
ROS	-	Return on Sales
SEC	-	Securities and Exchange Commission
SPSS	-	Statistical Package of Social Sciences
USA	-	United States of America
WAN	-	Wide Area Net work

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The vital role played by capital markets all over the globe cannot be overemphasized. A capital market is a major barometer for measuring the aggregate performance in Kenya (Nzotta, 2002). Available evidence shows that there is a direct correlation between the level of development of a nation's capital market and her overall social and economic development (Okereke-Onyiuke, 2000). There is therefore, the need for a fast growing capital market, through technological innovation so as to facilitate the speedy growth and development of an economy. Computer networks have altered the modus operandi of global stock markets. This is characterized by modern innovation and accompanying liberalization of global markets, which have influenced such markets. Older trading systems, which rely on personal contact between traders, are being replaced by computer networks in which traders throughout the world communicate and trade over microwaves and optical fibres (Wriston, 1999). Today it is strange to hear that a Stock Exchange is operating based on the call over system.

Computerization of the order flow in financial markets began in the early 1970s, with some landmarks being the introduction of the New York Stock Exchange`s designated order turnaround system, which routed orders electronically to the proper trading post, which executed them manually (Alexander et al, 2000). Financial markets with fully electronic execution and similar electronic communication networks developed in the late 1980s and 1990s. In the U.S., for example decimalization, which changed the minimum tick size from 1/16 of a dollar (US$0.0625) to US$0.01 per share, may have encouraged algorithmic trading as it changed the market microstructure by permitting smaller differences between the bid and offer prices, decreasing the market-makers' trading advantage, thus increasing market liquidity (Kalimipalli and Warga, 2002). This increased market liquidity led to institutional traders splitting up orders according to computer algorithms so they could execute orders at a better average price. These average price benchmarks are measured and calculated by computers by applying the time-weighted average price or more usually by the volume weighted average price (Glosten, 2004).

According to Chau and Gray (2002), the use of bond automated trading in some developed countries such as German took over according to market share and since their introduction they have continued to increase their importance for the bond market. One could have expected that once a supposedly superior electronic trading system had been introduced, floor trading would run out relatively near-term automatically due to market participants´ choice or by securities exchange decision. This however has not been the case (Frame and White, 2004).

In 2006 a long desired implementation of automation of trading at the exchange was actualized. Live trading on the automated trading systems of the Nairobi Securities Exchange was implemented. As envisioned, the Automated Trading system delivered the promise of much more efficient trading and transaction processing, and shone the path for a modernized exchange ready for even greater growth. The system allowed for many changes and improvements that were not possible before, not least being longer trading hours per day and more options for transactions and trades. Besides trading equities, the ATS is also fully capable of trading immobilized corporate bonds and treasury bonds (NSE, 2013).

Eng and Mak (2003) state that automated trading is the use of electronic platforms for entering trading orders with an algorithm which executes pre-programmed trading instructions whose variables may include timing, price, or quantity of the order, or in many cases initiating the order by a robot, without human intervention. Anthon (2002) adds that algorithmic trading is widely used by investment banks, pension funds, mutual funds, and other buy-side, investor-driven institutional traders, to divide large trades into several smaller trades to manage market impact and risk. Sell side traders, such as market makers and some hedge funds, provide liquidity to the market, generating and executing orders automatically.

The introduction of the Central Depository System (CDS) in 2004, the Automated Trading System (ATS) in (2006) and the implementation of Wide Area Network (WAN) in 2007, was the onset for Automation to revolutionize security trading in Kenya. In Kenya as a result of bond automated trading systems in 2009, the NSE liquidity was up, while the number of days for settlement and cases of fraud were down in bond trading as fixed-income traders and investors flock to the Automated Trading System (ATS) of the Nairobi Stock Exchange. Citing data provided by NSE, the value of bonds traded by the end of May was KSh 177.5

billion ($2.2 billion), up 60% on the KSh 110.6 billion traded in the same period in 2009. The report says that 90% of bonds traded are transacted by banks and institutions, such as fund managers. High-net-worth individuals are also active (Kariuki, 2012). What is not clear is whether the automation has lowered the transaction cost, price discovery process, improved the transparency levels, trading volumes, increased the market size volatility of returns and growth of clientele base.

Kariuki (2012) the increased liquidity is attributed to ATS. There is also a better match between inflation and bond yields. According to the Central Bank of Kenya (2013), annual inflation was 3.9% in May 2012, compared to 26.6% in 2008 and 12.4% per cent in 2009. Last October 2011 the Kenya National Bureau of Statistics started using the geometric mean method to calculate inflation, which gives lower figures than the arithmetic mean method used previously. In April 2011 KNBS adjusted the basket of goods and services used to calculate the consumer price index. The central bank reflects changed consumer tastes and makes the inflation rate comparable with that in other countries. Investors are now seeing a positive real return on their investments. Cases of fraud have also reduced, increasing investor confidence.

1.2 The statement of the problem

The Nairobi Securities Exchange's secondary bond market automation of trade in government paper started in the 2009, and there after the automation of other bonds. Studies done on market performance focus on stock automated trading but not the bond market. The market performance can be measured by several variables these being among them, transaction cost, levels of disclosure and transparency and efficiency of operations, liquidity, efficiency levels, volatility of returns, price discovery, market returns, stock market size, trading volumes, foreign currency risks, refinancing risks and credit risk. Studies have been carried on the impact of automated systems on efficiency and effectiveness of firms listed. Kariuki (2012) carried out a study on the impact of automated trading systems (ATS) on Share trading in the Nairobi Stock Exchange while Mailafia (2011), did a study to determine the effect of automation of the trading system in the Nigerian Stock Exchange. While these studies shade some light on the impact of automated system but they did not specifically deal with bond automated trading. Before the automation of bond trading, the Nairobi Securities exchange faced several challenges. There was low liquidity, lack of transparency, short trading hours, high transaction costs, low trading volumes, block trades board and high volatility. As envisioned, the bond automated trading delivered the promise of much more efficient trading and transaction processing, and shone the path for a modernized exchange ready for even greater growth. Whether the bond automated trading affected changes and improvements that were not possible before, by providing the necessary liquidity, trading hours per day and more options for transactions and trades. This study therefore established whether trading volumes, transactions cost, liquidity and market size had an effect on the bond trading. These variables are performance measures of automated bond trading, therefore it's necessary to look at them since they are part of the bond market performance and they should not be neglected. This is the knowledge gap that this study fills.

1.3 Purpose of the study

To determine the effects of automation of bond trading on bond market performance at NSE.

1.4 Objectives of the Study

The specific objectives of this study were:

i. To determine the effect of automation of bond trading on transactions cost at the NSE.

ii. To determine the effect of automation of bond trading on trading volumes at the NSE.

iii. To determine the effect of automation of bond trading on market size at the NSE.

iv. To determine the effect of automation of bond trading on liquidity at the NSE.

1.5 Hypothesis of the study

H_{O1}: Automation of bond trading has no significant effect on transaction costs at the NSE.

H_{O2}: Automation of bond trading has no significant effect on trading volumes at the NSE.

H_{O3}: Automation of bond trading has no significant effect on growth of market size at the NSE.

$H_{O4:}$ Automation of bond trading has no significant effect on liquidity at NSE.

1.6 Significance of the Study

The findings and recommendations of this study will highlight areas for regulatory framework enhancement which will be of utmost importance to the CMA and NSE management in relation to bond automated trading. For investment banks the findings will shade some light on whether the automation of bond trading had reduced the transaction cost, increases liquidity, market size and trading volumes at NSE. Identification of key effects of automation of bond trading will help NSE make decisions on how they can improve on their performance on bonds trading. On the other hand the study findings will help to balance divergent interests of investors and firms thus enhance investor sentiment, firm reputation and integrity of the bonds market. This research project will be undertaken to contribute to existing literature on the automated trading on the bond market performance at NSE and thus important for academicians. Therefore, analysts and researchers with an interest in the Kenyan bond market will benefit from the results this study.

1.7 Scope of the study

The targeted bonds of firms were all those listed and trading corporate bonds. Publicly quoted at present 9 corporate bonds are listed bonds at the Nairobi Securities Exchange (NSE) and 60 treasury bonds as at 31/12/2012. There are two fixed income securities segments at NSE namely; normal and infrastructure bonds and there is only three listees at the NSE that is government of Kenya bonds, corporate bonds/notes and preference shares. Kenya's corporate bond turnover is dominated by the Kenya Electricity Generating Company (KenGen) bonds, which account for over 80 per cent of the turnover. The following firms are listed at Nairobi securities exchange and trade on corporate bonds; Centum bond senior unsecured fixed rate and equity linked notes, Consolidated bank of Kenya ltd medium term note programme, Shelter Afrique medium term note, PTA bank Ltd floating rate bond, MRM, CFC Stanbic bank senior & subordinated bond issue, Kengen public infrustracture bond offer 2019, Safaricom ltd domestic medium term note ,Barclays bank medium term floating rate note and Housing finance medium term note. The study shall cover a period between 2005 to 2012.

1.8 Assumptions of the Study

I. The data collected from the NSE bulletin is assumed to be error free.

II. It's assumed that all relevant information concerning the study shall be readily available at NSE archive.

1.9 Operational definition of terms

Market liquidity: the ease and speed with which economic agents can buy and sell securities.

Electronic trading: An auto mated trading system, in which all transaction takes place through using screen for each stock broker, so that each stock broker place buy and sell orders into the trading system, which in turn match those orders to generate \ trade.

Automated market: A market which uses an electronic platform as opposed to manual platform in carrying out trading activities.

Efficient market: A market in which security prices rapidly reflected information about securities.

Emerging Markets: A term used to describe the financial markets of developing countries. Definitions vary on which countries are emerging and which are not. However, the emerging market indices compiled by International Financial Corporation and Morgan Stanley are often as bench marks.

Market reforms: In the context of this study, market reforms refers to the major changes introduced by market authorities as covered in chapter two.

Market transparency: the possibility to observe the size and the direction of order flow.

Capital Market: A market in which individuals and institutions trade financial securities.

Securities exchange: organized market for buying and selling financial instruments known as securities, which include stocks, bonds, options, futures, forward rate agreements, REITS.

Asset volatility: refers to changeably or randomness of asset prices

Bond Automated Trading Systems- is the electronic system that records bids and offers for inactively traded bonds until they are canceled or executed.

Clientele Base- is the group of customers and/or consumers that a business serves.

Efficiency of Operations- A market condition that exists when participants can execute transactions and receive services at a price that equates fairly to the actual costs required to provide them.

Volatility -is a measure for variation of price of a financial instrument over time. Historic volatility is derived from time series of past market prices

Liquidity- a high level of trading activity, allowing buying and selling with minimum price disturbance. Also, a market characterized by the ability to buy and sell with relative ease.

Market size- The normal market size is a set number determined by the stock's market capitalization.

Market capitalization- is calculated by multiplying the shares outstanding by the price per bond. Market capitalization is one of the basic measures of a publicly-traded company; it is a way of determining the rough value of a company.

Bond- a security representing the debt of the company or government issuing it. When a company or government issues a bond, it borrows money from the bondholders; it then uses the money to invest in its operations.

Transaction costs- The expense incurred in buying or selling a security. Transaction costs include commissions, markups, markdowns, fees, and any direct taxes.

Trading volume- The measure how many trades take place for a security or on an exchange on a given trading day. A high trading volume is an indicator of a high level of interest in a security at its current price.

CHAPTER TWO
LITERATURE REVIEW

2.1 Overview of Nairobi Securities Exchange

According to Ngugi (2000), Nairobi Securities Exchange facilitates the mobilization of capital for development and provides savers in Kenya with an alternative saving tool. The introduction of the Central Depository System (CDS) in 2004, the Automated Trading System (ATS) in 2006 and the implementation of Wide Area Network (WAN) in 2007, was the onset for Automation to revolutionize security trading in Kenya. In 2009, the Nairobi Stock Exchange's secondary bond market came live with the automation of trade in government paper. On the Nairobi Securities Exchange, there are currently 68 government bonds issued by the Government of Kenya and 10 corporate bonds issued by 7 companies. Of the corporate bonds, there is none whose issued value is more than Kshs. 2 billion. The combined value of all listed government bonds is approximately Kshs.350 billion, while that of the listed corporate bonds is approximately Kshs.10 billion, bringing the NSE debt market’s capitalization to about Kshs. 360 billion.

To buy a corporate bond, one must open an account with the arrangers of the issue who will facilitate the purchase of the bond and communicate the same to the registrar who will then print a ‘bond certificate’ with the details of the bond showing the bond holder, face value, maturity and coupon among other details. Treasury Bonds, however, are paperless securities i.e. no paper certificate is issued. (Ngugi, 2003)

Share trading was initiated in the 1920s when Kenya was a British colony. This period is mainly characterized by informal share trading with no formal rules or regulations to govern trading activities (IFC/CBK, 1984). Trading in shares was based on a gentleman’s agreement where standard commissions were charged and clients were obliged to honor their contractual commitment of making good delivery and settling of relevant costs. There was no physical trading floor or specialized stockbrokers. Share trading was a part time job for accountants, auctioneers, estate agents and lawyers who met to exchange prices over a cup of coffee (Parkinson, 1984; Munga, 1974). The first stock brokerage firm was established in 1951 by Francis Drummond. Foreign investors dominated share trading mainly because they had the knowhow of operating organized capital markets and also because their high income sufficiently permitted them to accumulate savings and investment in securities (Ngugi and Njiru, 2005).

In December 2009, NSE marked a milestone by uploading all government bonds on the Automated trading System (ATS). Also in 2009, NSE launched the Complaints Handling Unit (CHU) SMS System to make it easier for investors and the general public to forward any queries or complaints to NSE. The evolutionary process is also characterized by a shift in trading system from a periodic auction system to a continuous trading system. Trading system defines the price discovery process or the transformation of latent demand of investors into realized transactions (Kakiya, 2010). The evolutionary process of trading system also indicates a shift from manual to electronic and centralized settlement clearing. It is argued that a trading system that enhances efficiency in the price discovery process, provides liquidity at low costs, and has no excess volatility is more desirable for the development of the stock market. High liquidity, it is observed, enhances long-term investment by reducing the required rate of return and by lowering the cost of capital to the issuers of securities. An efficient price discovery process enhances the role of the market in aggregating and conveying information through price signals, therefore making prices more informative (Amihud, et al 1990; Bessembinder and Kaufman, 1997)

2.2 Theoretical Literature

Edwards, Harris and Piwowar (2000) contends that the efficient market hypothesis states that asset prices in financial markets should reflect all available information; as a consequence, prices should always be consistent with ‘fundamentals’. Efficient Stock Markets provide the vehicle for mobilizing savings and investment resources for developmental purposes. They afford opportunities to investors to diversify their portfolios across a variety of assets. In general, ideal market is the one in which prices provide accurate signals for resource allocation so that firms can make productive investment decision and investors can choose among the securities under the assumption that securities prices at any time fully reflect all available information. A market in which prices fully reflect all available information is called efficient (Osaze, 2003).

The Efficient market Hypothesis, a concept that says security prices fully reflect available relevant information identifies three forms of efficiency: weak-form efficiency, semi-strong efficiency and strong-form efficiency. The works of Fama (1970), Samuel and Wilkes (1980), Weston and Copeland 1988), Osaze (2003), Horne (1997) and Scott-Quinn and Deyber (2009) all affirm this position. One medium through which information could be effectively disseminated is the use of computer. Modern technological innovations coupled with globalisation have altered the modus operandi of global stock markets in our contemporary society. Alile and Anao (1986) recalled that a Stock Exchange market flourishes in an environment where the telephone, fax and telex work efficiently. In our contemporary society, a stock exchange will attain a desirable level of efficiency in a highly automated and conducive environment. For the Nigerian Capital Market, however, the introduction of computers into its operation did not come until 1997 (Brown, 2002).

The capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) marks the birth of asset pricing theory. The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor enough to invalidate the way it is used in applications. The CAPM's empirical problems may reflect theoretical failings, the result of many simplifying assumptions. But they may also be caused by difficulties in implementing valid tests of the model. For example, the CAPM indicates that the risk of a stock should be measured relative to a comprehensive "market portfolio" that in principle can include not just traded financial assets, but also consumer durables, real estate and human capital. The CAPM builds on the model of portfolio choice developed by Harry Markowitz (1959).

The model assumes investors are risk averse and, when choosing among portfolios, they care only about the mean and variance of their one-period investment return. As a result, investors choose mean variance- efficient portfolios, in the sense that the portfolios minimize the variance of portfolio return, given expected return, and maximize expected return, given variance. Thus, the Markowitz approach is often called a "mean variance model." The portfolio model provides an algebraic condition on asset weights in mean variance- efficient portfolios. The CAPM turns this algebraic statement into a testable prediction about the relation between risk and expected return by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets (Markowitz, 1959).

Several factors can determine corporate bond trading. Following the inventory paradigm argument, we hypothesize that size should have a significant positive impact on bond liquidity, as dealers can more easily manage their inventory of larger issues. While studies using yield spreads to proxy for liquidity find little support for this hypothesis. Hong and Warga (2000) show that larger issues have significantly tighter bid-ask spreads. For the 55 FIPS-traded bonds, Alexander, Edwards, and Ferri (2000) find that larger issues do have higher trading volume.

Alexander, Edwards, and Ferri (2000) and Warga (1992) argue that as a bond becomes more seasoned it becomes less liquid, as inactive portfolios absorb progressively more of the original issue and less is available to trade. Prior evidence shows that yield spreads increase as the bond ages Sarig and Warga (1989), Warga (1992)), bid-ask spreads increase (Chakravarty and Sarkar (2003), Hong and Warga (2000), Schultz (2001)), and trading volume decreases (Alexander, Edwards, and Ferri (2000)).

Alexander et al (2000), test whether bonds with higher interest-rate risk have a stronger speculative trading component. The theoretical literature by Harris and Raviv (1993), Kandel and Pearson (1995)) suggests that differences in investors' forecasts should lead to more speculative trading in the highest duration issues. Credit risk, uncertainty concerning value is likely to be higher for lower credit quality issues. Further, speculation about changes in the bond's credit quality, which are more likely for lower grade bonds, should induce more trading. Hotchkiss and Ronen (2002) show that lower grade bonds are more likely to reflect firm specific information. Alexander et al (2000) document more trading in high-yield bonds with higher credit risk.

Harris and Raviv (1993) theorize that trading volume is positively affected by return shocks, because price volatility reflects differences in investors' opinions. This in turn induces more speculative trading. Consistent with this hypothesis, Alexander, Edwards, and Ferri (2000) find that trading increases with bond return volatility.

Publicly vs. privately traded equity, more information is available on public equity firms, hence reducing the cost of adverse selection for market makers in those bonds and increasing their liquidity. Fenn (2000) finds that private firms pay a yield premium over firms with public equity. We expect more information induced trading for public than for private equity firms. For the 55 FIPS-listed bonds, Alexander at el (2000) find the opposite result. Equity trading volume and return. Firm-specific news should affect trading in both the equity and debt of a firm. Hotchkiss and Ronen (2002) find support for the hypothesis that bond and stock returns react jointly to common factors. In contrast, Kwan (1996) finds that only past stock returns are correlated with current bond yield changes. For bonds of companies with publicly traded equity, we expect stock activity and bond liquidity to be positively related.

Equity market condition, financial market conditions influence bond trading as investors optimize and rebalance their portfolios in light of new information. The literature on the relationship between market volatility and liquidity is divided. Gallant, Rossi, and Tauchen (1992) observe a positive correlation between market volatility and trading volume of NYSE-traded stocks. Chordia et al (2000) and Engle and Lange (1997) find the opposite result.

Changes in long-term interest rates- the price of fixed-income instruments is directly affected by changes in riskless interest rates. We expect more active trading when interest rate changes are larger. The interest-rate effect should be stronger for higher-duration bonds as their price is more responsive to interest-rate changes.

Embedded options, some corporate bonds have attached call option features, which protect the issuer from adverse movements in interest rates. This implied insurance is expected to reduce the interest-rate effect on bond prices, and hence reduce price induced trading. Industry of the issuer, trading activity may be different across industry groups due to differences in industry transparency, regulation, or market outlook.

2.3 Performance of Market

In the business policy literature there are two major streams of research on the determinants of firm performance. One is based primarily upon an economic tradition, emphasizing the importance of external market factors in determining firm success (Das, 2007). The other line of research builds on the behavioral and sociological paradigm and sees organizational factors and their fit with the environment as the major determinants of success. Within this school of thought, little direct attention is given to the firm's competitive position (Foster and Viswannathan, 1993). Similarly, economics traditionally has disregarded factors internal to the firm Theory or empirical evidence of linkages to performance abounds within each paradigm. But surprisingly little has been done to integrate the two and evaluate the relative effect of each on firm profitability. Notable exceptions are recent works by Hong and Warga (2000), Miller (1986), White (1986), Litzenberger at el (2012), and Lesmond, at el(1999) who discussed and or evaluated a limited number of contingent relationships between economic and administrative factors. No work has been done, however, to assess the relative importance of these two sets of explanatory factors.

Management researchers prefer accounting variables as performance measures such as return on equity (ROE), return on investment (ROI), and return on assets (ROA), along with their variability as measures of risk (Holden and Subrahmanyam, 1992). Earlier studies typically measure accounting rates of return. These include: Return on Investment (ROI), return on capital (ROC), return on assets (ROA) and return on sales (ROS). The idea behind these measures is perhaps to evaluate managerial performance-how well is a firm's management using the assets to generate accounting returns per unit of investment, assets or sales (Kyle, 2005). The problems with these measures are well known. Accounting returns include depreciation and inventory costs and affect the accurate reporting of earnings. Asset values are also recorded historically (Brown and Caylor, 2006).

Return on equity (ROE) is a frequently used variable in judging top management performance, and for making executive compensation decisions (Brown, 2002). ROE is defined as net income (income available to common stockholders) divided by stockholders equity (Holden and Subrahmanyam, 1992). On the other hand, ROA is the most frequently used performance measure in previous studies. It is defined as net income (income available to common stockholders), divided by the book value of total assets. (Wallis, 2000).

Bond automated trading system affects the performance of market in several ways. There are several measures of firm’s performance such as the measure of liquidity of firms, securities volatility, stock market size, trading volumes, price discovery process, market size, the level of clientele base, the level of transparency and disclosure, efficiency in operations, and transaction costs, (Brown and Caylor, 2006). Some of the impacts of BAT are as discussed below:

2.3.1Transactions Cost

At a first glance, it is counter-intuitive that investors with private information about a company will trade in its debt securities (Alexander et al, 2000). Even though the value of a company's debt, equity and its derivatives will all be affected by information related to the issuing company's underlying assets, investors who posses such undisclosed information will presumably trade in the equity security and/or its derivatives, rather than in the debt securities (Glosten, 1994). According to a recent study released by the Securities and Exchange Commission (SEC) (Edwards et al, 2004), average transaction costs for trades in corporate bonds are higher than in stocks. Furthermore, unlike options, corporate bonds do not provide higher leverage than stocks.

Several explanations stand out when looking into the transaction costs argument and the market structure for high-yield corporate bonds. First of all, as it has been documented in several previous studies, the value of high-yield corporate debt is very sensitive to firm-specific information, especially extreme information regarding the state of the company. Therefore, the high-yield corporate bond market offers potential profitable opportunities for trading on nonpublic information (Frame and White, 2004). More importantly, these opportunities provide an additional venue for an informed trader to strategically exploit his private information (Kalimipalli and Warga, 2002). Conventionally, an informed trader employs optimal trading strategies in the stock and the options markets to make the most out of his information. These trading strategies typically include certain trading intensity over multiple trading periods, as well as an optimal order size for each individual period (Kyle, 2005).

Trading too aggressively on the private information in stocks and options makes it harder for the informed trader to hide from the marker maker and the regulators, and hence increases his transaction costs (Samuel and Wilkes, 1980). As the informed trader becomes more aggressive, trading in stocks and options gets more and more expensive. At some point, the marginal cost from trading an additional amount of stocks and options exceed that for a first trade in high-yield bonds (Holden and Subrahmanyam, 1992).

As a result, substituting a certain amount of excess trading in stocks and options with a trade in the issuer's high-yield debt might better serve the informed trader's goal in maximizing his total profits (Osaze, 2003).. Furthermore, given the fact that the debt securities market has been subject to much less scrutiny for insider trading compared to the markets for equity securities and derivative securities, informed traders have much lower perceived probability of being detected and prosecuted (Alexander et al, 2000). Consequently, to take full advantage of his private information, the informed trader will choose to trade a certain amount of high-yield bonds, in addition to some quantity of stocks and options of the issuer (Kyle, 2005).

In addition to higher transaction costs from more aggressive trading in stocks and options, there are other important factors that play a role in encouraging an informed trader's decision to trade in the junk bond (Fama, 1970). These factors include some common practices within the bond industry, and the trader's degree of risk aversion. First, differing from the equity market, the high-yield corporate debt market is largely institutional. Institutional investors who trade high-yield corporate bonds sometimes buy syndicated loans for the same company issuing high-yield bonds (Frame and White, 2004). In addition, these investors in syndicated loans are often also traders, who trade bank loans next to high-yield bonds. In fact, it is quite often that a single trader at a hedge fund deals in all of a company's debt instruments. Under such porous circumstances, keeping private information private and avoiding improper use of this information is a challenge (Foster and Viswannathan, 2003). Our results have implications for investors, issuers, and regulators. Investors incorporate transactions costs into their portfolio decisions. Their investments decisions depend on the costs of investing in bonds as well as the costs of divesting from them should they require liquidity before their bonds mature. Issuers consider secondary market transactions costs when deciding how to structure their bonds. Bond features that reduce liquidity are unattractive to investors and therefore costly to issuers. Regulators study transaction costs to determine how they depend on market structure, and in particular, on price transparency. Understanding such relations allows them to adopt regulatory polices to better promote competition and efficiency.

2.3.2 Level of Disclosure and Transparency

Samuel and Wilkes (1990) writes that in accounting, Voluntary disclosure and transparency of information is seen as the furnishing of information by a firm`s leadership that is beyond the requirements for example the information that is a requirement by generally acceptable accounting principles and as well as the rules set by exchange commission whereby the reports are believed to be only relevant to the management or the internal users of the firm`s annual reports. The disclosure of voluntary information and transparency is carried out mostly by many organizations. This is in addition to the same being considered as an important aspect in financial reporting research (Holden and Subrahmanyam, 1992). Some of these information includes: information that is strategic to the firms such as a firm`s characteristics including size and strategies that are adopted, information that is not financial in any nature for example their socially responsible behaviours, and information dealing with finances of a firm such as a firms stock price information (Eng & Mak, 2003).

Voluntary disclosure and transparency has several benefits. Some of the main beneficiaries of voluntary disclosed information are the investors, organizations and the economy of a country. A good aspect of this is that it aids investors to decide profitable capital allocation decisions and lowers firms' cost of capital, the latter of which also benefits the general economy and countries can make use of this information to plan and make strategies for the future (Kyle, 2005; Alile and Anao (1986). Chau and Gray (2002) in their study are in agreement with the approaches of voluntary disclosure. In that voluntary disclosure aids in the reduction of conflicts of interest in widely held organizations among various groups of stakeholders. Normally organizations are able to balance any of the benefits that come out of voluntary disclosure against any of the costs arising. This may include the cost of procuring the information to be disclosed and decreased competitive advantage which is as a result of the information disclosed (Horne, 1997). The extent and what determines the type of voluntary disclosures and transparency of organizations have been explored in the financial reporting literature by many authors. For example Meek, Roberts and Gray (1995) in their study they found out that the extent and type of voluntary disclosure differs company size, the industry of the firm as well as the geographic region of the firms. Others researchers also found out that the extent of voluntary disclosed information is affected by the companies` corporate governance structure and ownership structure.

There are various financial based principles for example the International Financial Reporting Standards (IFRS) used by organizations for reporting requirement which have been adhered to by most countries globally whereas in some nations they are underway. These are international interpretations and accounting standards which have been proposed to be adopted by the International Accounting Standards Board (IASB). These principles are notably principles-based approaches rather than rules- based methods which have been forwarded in other generally accepted accounting principles (GAAP). These principles are formulated as a shared business affairs system of communication so that organizations` financial accounts are understandable and can be compared across boundaries globally (IABS, 2007).

This global standard which is as a result of an ever increasing global shareholding and trade, dictates that firms are able to have business and transactions in different countries. This being the case these rules governs accountants to have financial books of account which can be compared, are understandable universally, are reliable and are relevant to the users of this information and more specifically the external and internal users. IFRS came into being to ensure that organizations and business entities financial accounts and statements both the first and the interim reports for the period covered by those statements contain information with high quality and that it ensures there is transparency for all users and can be compared over all periods they have been prepared and presented. Apart from this they should provide a purpose for accounting in accordance with the International Financial Reporting Standards (IFRSs). This should also be generated if the benefits outweighs the costs that are involved (International Accounting Standards Board, 2007). Bond trading costs are not well known because corporate bond markets are not nearly as transparent as are equity markets. Dealers provide public quotes for few bonds on a continuous basis, and until recently, most bond transaction prices have never been published. Does lack of price transparency contributes to bond transaction costs, which is assumed to be substantially higher than equity transaction costs.

2.3.3 Growth of Clientele Base

The clientele base is the group of customers and/or consumers that a business serves. In the most situations, a large part of this group is made up of repeat customers with a high ratio of purchase over time (Das, 2007). These customers are the main source of consumer spending. In many cases, the customer base is considered the business's target market, where customer behaviors are well understood through market research or past experience. All actions the company takes would be through consideration of its customer base. Companies with a customer base consisting mainly of large companies may increase their customer base by pursuing small and mid-size companies (Anthon, 2002).

Scott-Quinn and Deyber (2009) contend that all businesses begin with no customers. These start-ups begin with an abstract idea that slowly evolves into something someone will buy. As these products evolve from abstract ideas into primitive objects that are then further refined, the business that created the product begins to gain customers. Edwards et al (2004) adds that the satisfied customers become the repeat buyers and core customer of the company. This is the process that creates the customer base. The main buyers of a company are rarely set in stone. Most often, successful start-ups begin with low-end or downmarket customers with low income and low costs. As the products or services that are being bought are polished and remade, a company gains higher-end customers who gain interest in the product as it reaches higher levels of functionality, use, and/or value of some kind. Eng and Mak (2003) further state that as the shift to these higher priority customers continue, they begin to be a larger source of income for the company, and slowly become the main base whom the business lends the most importance. This process, of moving from low-end customers to more expensive and more profitable customers, is known as upstreaming, and is an integral part of the theory of disruptive innovation (Das, 2007).

Businesses work very competitively to keep their core market intact. The sellers will research their buyers to increase customer awareness (Holden and Subrahmanyam, 1992). Keeping products customer oriented has become so huge a priority, in fact, that it has become a large focus of business schools to teach all types of business administrators, from manager to marketer, to keeping the customer in mind for the improvement and creation of sellable products (Brown, 2002). It is very rare for an established company to lose its core customers to incumbents, and it has been stated that when an established company loses their consumer base via sudden and straightforward methods, it was not an ingenious move of the incumbent that allowed this to happen, but rather a result of the established company dropping the ball (Kalimipalli and Warga, 2002).

2.3.4 Efficiency of Operations

A market condition that exists when participants can execute transactions and receive services at a price that equates fairly to the actual costs required to provide them (Frame and White, 2004). An operationally-efficient market allows investors to make transactions that move the market further toward the overall goal of prudent capital allocation, without being chiseled down by excessive frictional costs, which would reduce the risk/reward profile of the transaction (Coelli et al, 2005).

In a business context, operational efficiency can be defined as the ratio between the input to run a business operation and the output gained from the business. When improving operational efficiency, the output to input ratio improves (Osaze, 2003). Inputs would typically be money (cost), people (headcount) or time/effort. Outputs would typically be money (revenue, margin, cash), new customers, customer loyalty, market differentiation, headcount productivity, innovation, quality, speed & agility, complexity or opportunities (Rao, 2006).

In order to improve operational efficiency, one has to start by measuring it. Since operational efficiency is about the output to input ratio, it should be measured both on the input and the output side (Kalimipalli and Warga, 2002). Quite often, company management is measuring primarily on the input side, e.g. the unit production cost or the man hours required to produce one unit (Samuel and Wilkes, 1980). Even though important, input indicators like the unit production cost should not be seen as sole indicators of operational efficiency. When measuring operational efficiency, a company should define measure and track a number of performance indicators on both the input and output side (Battese, 2009).

2.3.5 Liquidity

Liquidity is defined as the ability to trade quickly at a low cost (O'Hara, 1995). Previous literature suggests three ways of measuring liquidity: through the bid-ask spread, the price impact of large trades, and trading volume. A study largely uses yield spreads or issue size as proxies for bond liquidity. Further, yield spreads reflect compensation for credit risk in addition to liquidity risk. Chakravarty and Sarkar (2003) and Hong and Warga (2000) estimate bid-ask spreads based on price differences between transactions identified as buys versus sells for the most actively traded bonds in the National Association of Insurance Commissioners (NAIC) dataset. Calculating price impact as a liquidity measure remains problematic because of infrequent trading in corporate bonds.

Using trading volume as a proxy for liquidity is supported by two theoretical arguments. First, the 'inventory paradigm' of Demsetz (1968). Ho and Stoll (1981), and Stoll (1989) suggest that liquidity depends on the cost of financing dealer inventories. Based on this paradigm, inventory costs for low-trading bonds are likely to be higher and are passed on to the investor in the form of higher bid-ask spreads. Low trading volume and high bid-ask spreads both indicate low liquidity, but realized bid-ask spreads also reflect compensation for risk factors in addition to liquidity. Moreover, Grossman and Miller (1988) theorize that realized spreads provide compensation to dealers to cover the execution cost of the trade rather than compensation for providing liquidity. Second, Kamara (1994) develops a measure of 'immediacy risk' which incorporates trading volume directly. Immediacy risk is the risk of adverse price moves by the time the transaction is executed. This risk is directly related to the price volatility of the bond and the time needed to execute a trade, and is reduced with higher trading volume.

At the same time, there are two critiques of using trading volume as a liquidity proxy. First, some critics argue that the volume of large trades, rather than total volume, is a better measure of liquidity. Second, trading volume does not explicitly incorporate trading costs, falling short of fully satisfying O'Hara's definition of liquidity. While Chakravarty and Sarkar (2003) find a significant negative correlation between trading volume and realized bid-ask spreads, there are important exceptions. Bamber (1986) and Krinsky and Lee (1996) observe that around earning announcements both volume and bid-ask spreads are high, raising questions about the use of either as a proxy for liquidity. The theoretical literature argues that increased trading in this situation is not liquidity driven, but rather 'speculation driven', and results from investors' differences in interpreting economic news.

2.3.6 Credit risk

Previous studies have examined the effect of credit risk on volume, yield, volatility, and spread but the results are mixed. For investment grade corporate bonds, Chakravarty and

Sarkar (2003) and Hong and Warga (2000) find that same-bond-same-day spreads increase with credit risk, but Schultz (2001) finds no liquidity pattern associated with credit risk. Alexander, Edwards, and Ferri (2000) finds that high-yield bonds with more credit risk have higher trading volume than high-yield bonds with lower credit risk. Chen at el (2002) examined credit risk across both high-yield and investment grade corporate bonds, but their results are mixed at best. For municipal bonds, Downing and Zhang (2004) find increases in volatility with more credit risk and Harris and Piwowar (2005) find that bonds with higher credit risk are more expensive to trade.

2.4 Bond Automation System

The need to improve the market infrastructure was brought about by the pitfalls in the manual system that was in place. For instance, it would take about a week or two between the actual sale and confirmation (Ngugi, 2003). This manual system of clearing and settlement had a serious impact on the liquidity and efficiency of the stock market. This led to the proposal to adopt the central depository system (CDS). The adoption of the CDS would shorten the registration process, boost liquidity in the market, increase market activity, reduce settlement risk and elevate the market to international standards.

Although the idea to implement the CDS had been floated in 1995, the central depository and settlement corporation limited CDSC was established on 23rd march 1999 under the company act (Cap 486) and the CDS act was gazetted on 25th August 2000 (CMA, 2000).On 1st August 2000, a delivery versus payment system (DvP) was introduced as the initial step towards moving to the electronic system of settlement. Some of the reasons for setting up the DvP system were; to move the market closer to the T+3 settlements period as envisaged in the CDS environment, enhance investor confidence and liquidity by making the settlement period shorter and safer ad enable brokers to concentrate on their core business . however the DvP system was faced with the challenge of settling transactions within 5days of trading (T+5) and providing shareholders with their shares within seven days of trading (Ngigi, 2003). The CDS was implemented by the launch of the ATS on 11th September 2006. Trading hours were increased from 10.00 am to 1 pm and settlement period reduced to T+5.

A wide Area Network (WAN) platform was implemented in 2007 and this eradicated the need for brokers to send their staff(dealers) to the trading floor to conduct business .Trading is now mainly conducted from the broker's office through the WAN .The WAN platform was boosted by the Broker Back office system which connected operations In October 2011 .The BBO system automates the entire process of transacting In shares with minimal manual intervention and is interfaced with the automated Trading System (ATS) and central Depository System (CDS).The system has the capacity to facilitate internet trading which improved the integrity of the exchange trading systems and facilitates greater access to the securities market. However brokers under certain circumstances can still contact trading from the floor of the NSE .The automation of the back office operations o the trading participants of the NSE is a joint investment banks, the capital markets authority (CMA) and the central Depository and settlement Corporation (CDSC) .Now the entire process of trading in securities listed on the NSE is supported by IT, from inputting an order ,to processing the order, to making payment and transferring the securities to the new owners (Ngigi, 2003).

2.5 Empirical Review

Regardless of the level of automation, a financial market has always been, and will be, a place where traders gather to trade instruments like common stocks, bonds, options, futures, among others (Harris, 2003). The way in which these markets exchanges operate plays an essential role in the allocation of risk and capital, as the prices that traders negotiate ultimately determine how market-based economies allocate their scarce resources (Ngugi, 2003). In recent years, designing a well-functioning exchange has become more dependent on technology, which warrants the consideration of the following main principles of automation: the human and the machine, when working together, should be viewed and evaluated as a system and not as separate parts for example human-automation system, and in this human-automation system the human carries the ultimate responsibility regardless of the level of automation and is the \supervisor" of the system in its broadest sense (Ngugi 2005).

Meek et al (1995) contend that the trading floor changed considerably during the more than 400 years of its existence. In trading floor securities were traded with open-outcry, via phone or computer systems. Prices on the floor were fixed by brokers using computer systems. In the recent past, to keep up with speed in trading, brokers used quote machines that issued quotes and were able to fix prices automatically. The development of an electronic market started in the 1990s for example in Germany with the introduction of Integriertes Boersenhandels-und Informations system (IBIS) was launched with a reduced range of shares. Following IBIS was Xetra (Exchange Electronic Trading) in 1997, a computerized trading platform that works purely order driven bid and ask limits determine the price when they correspond, without an intermediary who steps in between. The basic targets for these developments were: high liquidity, transparency, location independent market access and frictionless trading (Franke and Hess, 2000).

The interaction between humans and automation in performing a common task should be viewed as a system (Sheridan, 2002). In the exchange industry, humans and automation interact to perform a common task, for example, to complete a transaction. That is, when a task is at hand, the question is not whether to allocate it to a human or a machine, exclusive of the other, but rather how the task will be performed by the human-automation system as whole. A fully automated task and a task fully implemented by a human are the two extremes on the continuum of different automation levels of the system. Technology has advanced greatly in the last couple of decades and as a result, the question is no longer whether a function can be automated, but rather, whether it should be (Weiner and Curry, 1980). Standard statistical decision theory of failure response tasks provides the tools for evaluating whether or not a task or a function should be automated (Sheridan and Parasuraman, 2000). Theoretical studies suggest that a pure electronic limit order book, or a combination or dealer market elements and pure electronic limit order market elements, can be supported as dominant markets over a pure dealer market (Glosten, 1994; Seppi, 1997; Parlour and Seppi, 2003).

Theissen (2002), sites that the electronic trading offers low spreads for liquid stocks while the floor is more competitive for less liquid stocks. This result provides evidence that an electronic trading system design is better suited for liquid stocks and the floor system design is better suited for less liquid stocks and not that the automation per se or the human has some operational advantages. Generally, Goldstein et al (2009) show that electronic markets offer lower execution costs even after controlling for selection biases. However, findings that execution costs are higher in electronic trading than in floor-based trading (Handa et al, 2004;

Venkataraman, 2001) could be because the human failed to design the optimal system and not that automation is inefficient.

Computerized market was both more liquid and deeper than the open outcry market (Pirrong, 1996). Spreads on the computerized trading were the same and sometimes lower than spreads on the open outcry trading (Pirrong, 1996; Kofman and Moser, 1997; Frino at el, 1998). It should be noted that comparison of open outcry and computerized system in the general case is a joint hypothesis test of the microstructure of the market, as well as the level of automation. That is, finding the same or lower spreads on the computerized system may be attributed either to a change in microstructure associated with the move from open outcry to a computerized system or to a change in the interaction between the human and the machine.

Changes in trading systems provided a unique natural experiment setting to assess the relative liquidity of open outcry and electronic markets. The consensus is that trade execution costs generally decrease when automation is introduced (Tse and Zabotina, 2001; Aitken et al, 2004; Bortoli et al, 2005). Trading has since migrated to electronic exchanges which are developing a competitive advantage relative to the traditional manual markets. Volume growth rates of the largest contracts traded in automated (screen-based) exchanges in futures and options exchanges worldwide from 1990-1994 have experienced faster growth than those traded in manual markets (Levecq and Weber, 1995).

Madhavan and Panchapagesan (2000) show that the presence of designated dealers facilitates price discovery relative to a fully automated call auction market. Evidence from empirical studies that analyze upstairs/downstairs markets, where downstairs markets are electronic, also show that both markets contribute to price discovery (Booth et al, 2002). The evidence from studies using futures data also supports the idea that both automated and floor systems operated in parallel contribute to the price discovery process (Martens, 1998; Franke and Hess, 2000). However, these studies also document that the computerized system provides better liquidity in relatively quiet periods and that the open outcry trading provides better price discovery in volatile and high-information intensity periods. Schwartz (1994) concludes that the automated market absorbs information much more quickly than the floor, for example screen trading accelerates the price discovery process. However, humans still maintain the supervisory role in the automated markets and their contribution to the documented information absorption is largely unexplored.

Maghereh (2005) examines the effect of the automation of Amman stock Exchange (ASE)on the market efficiency using the daily closing price index for a period of 10years .The sample included those stock of the largest and most liquid .he found that the shift to electronic trading system increased volatility ,and had no significant effect on market efficiency .Similarly ,Iskandrani and haddad (2012) investigated the impact of applying Electronic Trading System(ETS) on the market liquidity and stock prices behavior In Amman Stock Exchange before and after its implementation .using data consisting of closing prices and trading volumes for 38 companies for the period of 8 years conducted an event study for the monthly relative means of 'trading volumes' as a proxy for liquidity and stock price behavior is examined through conducting an event study for the stock return .They find that market liquidity is significant influenced by the electronic trading and the impact of trading shows a negative abnormal return. In addition ,Al-khouri and Al –Gwazawi (2008) investigates the impact of the electronic trading system (ATS) on the market volatility and liquidity on the Amman stock Exchange (ASE) before and after its implementation .They find a reduction in volatility after the adoption of electronic trading and improved liquidity level of ASE.

Marinde (2006) conducted a study on micro structure theory of the African capital markets in 1999 and discovered that with institutional changes market efficiency improved in NSE (Nigerian stock Exchange) ,NSE (Nairobi stock Exchange) ,JSE(Johannesburg stock Exchange) and market liquidity also improved ,while volatility reduced. Mailafia (2011) examined the effect of automation of the trading System in the Nigerian stock Exchange and using the key capital market indicators, the market capitalization, turnover by volume, and capitalization and noted highly significant improvement in the performance of these indicators with introduction of the ATS in 1999. Similarly, Suday et al (2012) evaluated the effect of the microstructure change.(from manual trading system to the automated trading system)on the trading effectiveness in the Nigerian stock market from 1999 to 2011 .It was revealed that the ATS was an effective trading system and it brought about an efficient settlement system and fostered new trading opportunities .However, Benouda and Mezzez (2003) finds that automation of the Tunisian stock Exchange (TSE) results in the improvement in the liquidity of shares ,decreased returns but did not have significant effect on the volatility or efficiency.

The efficient price discovery process is traditionally associated with lower fundamental volatility which promotes stock market effectiveness in allocating resources .highly volatility can distort resource allocating by making investors more reluctant to hold stocks .Risk-averse investors will demand a high risk premium which increases the cost of capital and reduces market liquidity (Kim and Sangal, 2000)

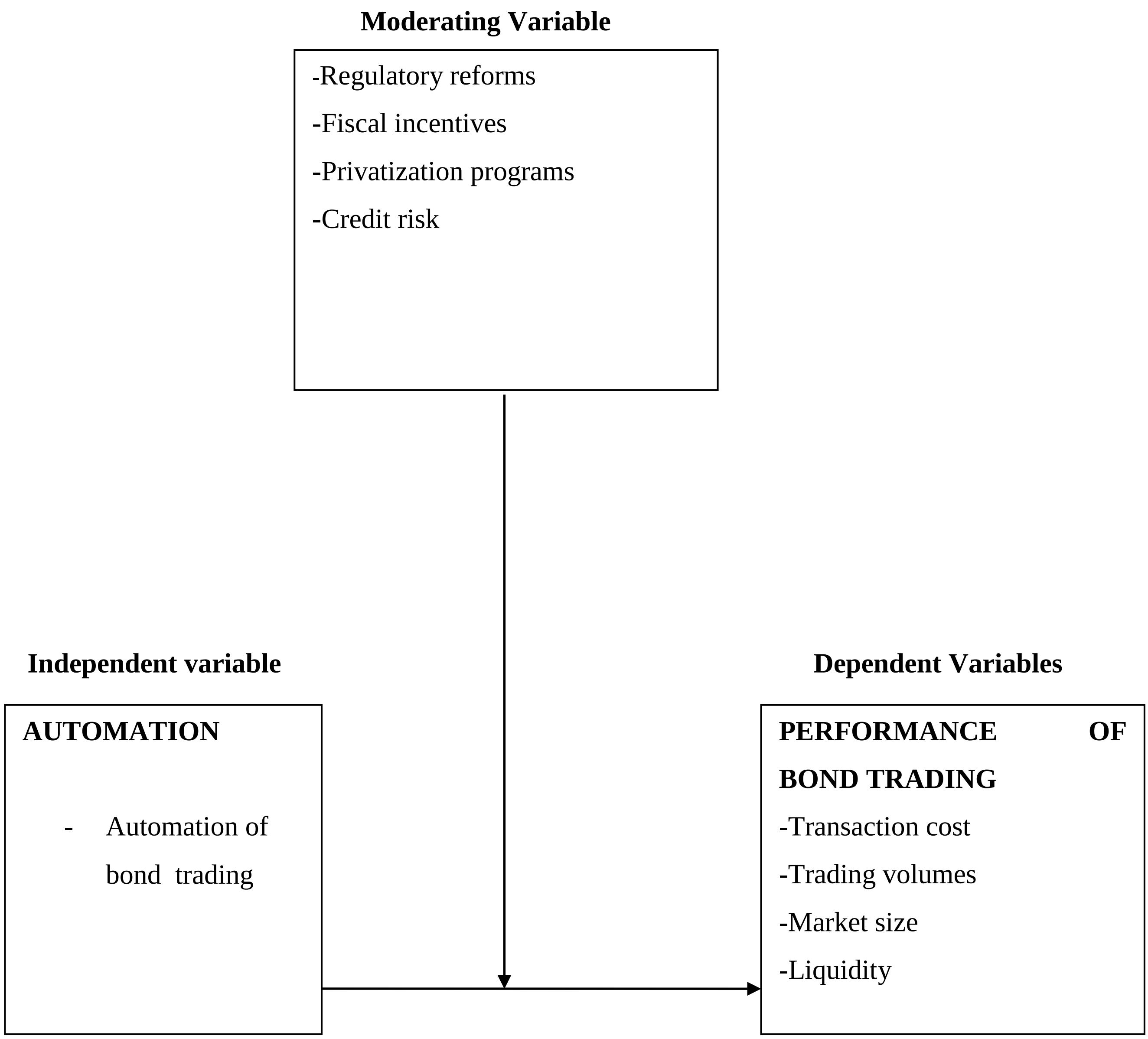
According to Mensah (2004), the liquidity of a market and the behavior of security prices are affected by a myriad of factors which can be classified as macrostructure and microstructure factors. Macro structural factors are those factors are those factors beyond the control of the market authorities. They affect the number and types of the market participants and their expectations equally. They include macroeconomic risk (public debt, capital control), monetary policy (design of monetary instruments, central bank day to day management of liquidity) and legislative framework (bankruptcy legislation, cross border transactions).

The trading system plays an important role in the price discovery process of the market. Recently, many stock exchanges across the world are moving from physical trading platforms to computer based systems. The bulk of the evidence points towards improved efficiency after introduction the introducing of computer based trading. For example, Sinnakkannu and Nassir (2006) found that micro-structural changes (introduction of computerized trading, central depository system and clearing and settlement) implemented by Bursa Malaysia reduced the time to equilibrium i.e. speed for information adjustment from 14 days to 9 days in 2001. Majoni and massa (2001) found evidence of increased efficiency at the Italian stock exchange after micro structure reforms. Amihud et al (1997) using an event study method observed that Tel Aviv stock exchange greatly benefited from the change in trading system. Stocks that were selected for transfer from the call auction system to the continuous trading system posted positive gains due to liquidity improvements. Furthermore, Olujide (2000) found evidence that the automation of the Nigeria stoke exchange in 1997 through the introduction of central securities clearing system and ATS had a positive impact on the liquidity of the market, transparency, investor confidence and foreign investment. On the contrary, Dedysigh and Watson (2007) found that the Jamaican, Trinidad and Tobago stock markets were informational inefficient both before and after automation.

2.6 Conceptual framework

To measure the performance of bond listed firms the study considers bond automation as the key input. According to this framework, NSE Automation of bond trading constitutes the independent variable whereas the bond market performance (trading volumes, transaction cost, liquidity and market size) the dependent variables which is the output. In conceptualizing, NSE automation will be examined through its effect on bond listed firms performance. De la Torre,Gozzi and Schmukler (2006) find that the market interest rates, bond market liberalization, privatization programs via securities markets and institutional reforms can potentially contribute to performance of bond market. In Kenya the implementation dates of the above variables were in the 1990s (Maehle,Teferra, and Khachatryan, 2013). Privatization/divestiture via the bond is an ongoing process. The conceptual framework for this study is shown in Figure 2.1**.**

Figure 2.1: Conceptual framework



(Source; Adopted from reviewed studies)

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a comparative research design. This design was appropriate for the study as it enabled data collection for the pre and post automation period. A study was conducted on all firms trading in the bond market. This corresponds to the aim of this study which was to investigate the effects of automation of bond trading on bond market performance at the Nairobi Securities Exchange (NSE) in the two sub periods. This design was suitable in analyzing and comparing the behavior of the market in the two periods of the study.

3.2 Target Population

The targeted bonds of firms were all those listed and traded between 2005 and 2012. Publicly quoted are 9 corporate bonds are listed bonds at the Nairobi Securities Exchange (NSE) and 60 treasury bonds as at 31/12/2012. See appendix II for details. Due to the small number of the Kenyan-based bond listed firms in the targeted period, a study was carried out covering all the bonds of the companies that have been listed in entire period since the year 2005. This ensured all bonds of the firms trading on the bond market were evaluated on whether automation of bond trading had an effect on the various variables such as trading volumes, liquidity, and transaction cost and market size. The activities of the 9 companies captured the effect of automation and any other changes thereof on the NSE

3.3 Data Instrumentation

Using a data capture sheet (appendix II), to differentiate between the performance in the pre and post automation periods, estimations were done for the pre automation and post automation periods. Since the automation process took some time before it was finally implemented as a result of some institutional and implementation challenges at the exchange, the periods of implantation were excluded.

The data collection sheet contained nine companies listed in NSE to trade corporate bonds between January 2005 to December 2008 for the pre automation period and January 2009 to December 2012 for post automation period. The necessary data was collected to capture all the objectives of the study.

3.4 Data and Data Collection Procedure

The data collection sheet captured the data for traded volumes, transaction cost, and number of clients, markets returns and market capitalization for each corporate bond. The bid and ask price, the price impact of large trades and trading volumes were used to measure liquidity. Yield spread or issue size was used as proxies for bond liquidity, further, yields spreads reflect compensation for credit risk in addition to liquidity risk. The market returns for each corporate bond ware collected to calculate the riskiness of investing in bond market in pre and post automation periods; the standard deviation was calculated to measure risk of corporate bonds.

The pre-automation period was taken as the four years (January 2005-December 2008), while the post automation period was taken as four years (January 2009- December 2012). This study used secondary data which targeted bond trading between the period 1 January 2005 and 31 December 2012 identified from the NSE bulletins. In particular, issue price, issue size, market value of bonds, securities returns, transaction costs, market returns, liquidity and traded volumes were obtained from the NSE library in Nairobi. The daily bond and index closing prices were obtained from NSE. This data base enabled the researcher to obtain necessary information to evaluate whether the automation had significant effects on the following variables, trading volumes, liquidity, transaction cost and market size. The data was obtained from NSE. To ensure completeness and accuracy of data, a data collection guide was used to capture data on all the variables of the study.

3.5 Reliability and Validity of the research instrument

Reliability is concerned with the consistence of measures. The level of instruments reliability is dependent on its ability to produce the same results when used repeatedly. Validity refers to whether an instrument actually measures what it is supposed to measure, given the context in which it is applied. To achieve validity and reliability, data was checked for coding errors and omissions while coding into excel sheets. The database was also verified for accuracy and completeness of all the entries to ensure reliability of data is achieved. The researcher personally recorded data; this was done to ensure the accuracy and adequacy of the data. The data was checked against NSE, CMA statistical bulletins for consistencies.

3.6 Data Analysis and Presentation

The data collected was analyzed using descriptive statistics, correlations, and linear regression analysis. In addition to the comparative analysis of the performance, the study presented an analysis of the overall bond market performance with respect to identified variables over the period.

Secondary data was obtained from NSE fact sheet and statistical bulletins, NSE annual reports and statistical bulletins and periodical publications from the NSE, media publications on NSE and stock exchange websites and journals from 2005 to 2012. To differentiate between the performance in the pre and post automation periods, estimations were done for the pre automation and post automation periods. Statistical Package for Social Scientists (SPSS) version 21 software package was used as a tool to help analyze the data.

3.6.1 Test of Market size, Trading volume, Transaction costs and Liquidity.

To measure bond market size, Market Capitalization Ratio (MCR) was used. MCR refers to the value of listed corporate bond divided by Gross Domestic product (GDP). The size of the market depends on the activity of the primary market because it is only when more corporative bonds are sold in the market and therefore a more trading in the secondary market. Bond market capitalization will be computed using the market value of the total bonds. This measure has been applied by Yartey (2008) to measure the size of the Johannesburg Securities Exchange.

i. $MS_t = \beta_0 + \beta_1 ABT_t + \varepsilon$

ii. $TV_t = \beta_0 + \beta_1 ABT_t + \varepsilon$

iii. $TC_t = \beta_0 + \beta_1 ABT_t + \varepsilon$

iv. $Lt = \beta 0 + \beta 1 ABT_t + \varepsilon$

Where;

MS_t: Is the market size at time t

TV_t: Is Trading Volume at time t

TCt: Transaction cost at time t

Lt: Liquidity at time t

ABT_t: Automation of bond trading at NSE at time (t).

β_0 is the intercept; and reflects the constant of the equation.

β_1 β_2 is the sensitive coefficient of each independent variable.

ε is the error term. It represents the effects of the independent variables that will be omitted from the model.

$MS_t = \beta_0 + \beta_1 ABT_t + \varepsilon$, $TV_t = \beta_0 + \beta_1 ABT_t + \varepsilon$, $TC_t = \beta_0 + \beta_1 ABT_t + \varepsilon$ and $Lt = \beta 0 + \beta 1 ABT_t + \varepsilon$ are single regression equations which identifies the correlation between the market size and automation of bond trading and price of the bond, trading volumes and automation of bond trading, transaction cost and liquidity. The market size, transaction costs, trading volumes and liquidity are the dependent variable while the automation of bond trading and price of the bond are the independent variable. The Karl Pearson's coefficient correlation(r)/ product moment was used to determine the correlation between the dependent and independent variables that is testing the slope only (gradient). A coefficient correlation of r=1 perfect correlation, r>0.5high correlation, r<0.5 low correlation, between independent and dependent variables.

The equations were tested for reliability for correlation analysis and forecasting purpose. Goodness of fit test was applied through the use of coefficient of determination (r^2) as a method to determine the reliability of all independent variables together with gradient. A coefficient of determination of $r^2 = 1$ perfectly reliable, $r^2 > 0.5$ highly reliable, $r^2 < 0.5$ fairly reliable.

The T-test was used to test the significance of the difference in pre and post bond automated trading systems. T test was used to determine whether the introduction of automation bond trading had an effect on the dependent variables. The t test tested whether the null hypothesis are true or false. T statistics is highly used when the data is normally distributed and the data is discrete. Hypothesis were conducted at 95% level of confidence ($\alpha = 0.05$). The computed t and t value (from t-table) were compared. Where computed t was greater than the t value from the table, the null hypothesis was rejected. This test showed the significance of independent variable. The t-test assesses whether the means of two groups are statistically different from each other. This analysis is appropriate whenever you want to compare the means of two groups, and especially appropriate as the analysis for the pre and post bond automation.

3.6.2 Test of Liquidity

To measure market liquidity, two measures were used: 1) Value Traded Ratio, (2) Turnover Ratio. Value Traded Ratio (VTR) refers to the total value of traded bond in a securities market divided by GDP.VTR measures the organized trading of bonds as a share of national input and should therefore; positively reflect liquidity on an economy –wise basis. The turnover ratio (TR) the second measure for liquidity refers to the values of total bonds traded divided by the market capitalization. High turnover is often used as an indicator of low transactions cost.

Turnover ratio (TR) and the total Value Traded ratio (VTR) are complements. Levine and Zervos (1998) indicate that the value traded ratio measures the degree of trading relative to the size of the economy. VTR therefore, reflects bond market liquidity on an economy wide basis. The value traded ratio complements the market capitalization as although a market may be large, there may be little riding. Thus, taken, MCR and VTR together provide more information about a bond market than if only a single indicator is used. Although VTR captures trading compared with the size of the economy, turnover measures the trading relative to the size of the bond market. Thus the complete information on the total VTR and turnover ratio provides a more comprehensive picture of liquidity of a bond market. Similarly according to popover (2004), the growth effect of the automated trading system can be measured by the market liquidity and bond turnover where market liquidity measures the ease of trade and bond market turnover measures the speed and rate of trade.

CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION

4.1 Introduction

The chapter presents the analysis part of the study. The analysis is based on the research objectives where each objective is tackled according to the analysis techniques designed in the methodology. Specifically, Regression analysis is used for all the variables to develop the equations relating each dependent variable and the independent variable. Coefficient of determination (R^2), which explains the extent to which changes in the dependent variable can be explained by the changes in the independent variable or the percentage of variation in the dependent variable that is explained by the independent variable is used to explain further the reliability of the relationships. In this case the study studied four dependent variables (transaction costs, trading volume, market size and the liquidity) against one independent variable (Automation of bond trading). The influence of the independent variable to the four dependent variables is presented in simple regression equations and the association tested with the use of correlation analysis as presented in the following sub sections:

4.2 Effect of automation of bond trading on transactions cost

To evaluate the effect of bond trading automation on transaction cost, a simple linear regression model was developed through the aid of SPSS. The model summary results were as presented in table 4.1 which gives the correlation coefficient and the reliability values based on bond automation and transaction cost data collected.

Table 4.1 Regression Model Summary for Bond Automation and Transaction Cost

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.882[a]	.871	.852	20.38801

a. Predictors: (Constant), Automation

The independent variable (automation of bonds), explain 87.1% of the variation in the transaction costs for the listed firms as represented by the R Square. This therefore means that other factors not studied in this research contribute 12.9% of the variability in the transaction costs incurred by the listed firms.

Findings in the table also illustrate that, the study results are 85.2% reliable as indicated by the Adjusted R Square value. This shows that, had the study been conducted using a different period (number of years studied), the results would have been 14.8% different from the current findings which is not a significant difference that can result to disagreeing set of findings.

Table 4.2 Regression Analysis for Bond Automation and Transaction Costs

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	235.621	21.682		1.867	.010
	Automation	61.240	31.459	.622	1.947	.021

a. Dependent Variable: Transaction costs

The researcher conducted a simple regression analysis so as to determine the relationship between automation of bond trading and the transaction cost at NSE. As per the SPSS generated by table 4.2, the equation ($TC_t = \beta 0 + \beta 1 ABT + \varepsilon$) becomes:

TCt = 235.621 + 61.240 ABT

Where TC_t is the transaction dependent variable (Costs at a given time (t)), while ABT is the independent variable (Bond Automation)

According to the regression equation established, taking automation of bond constant at zero, the transaction cost will be 235.621. The data findings analyzed also show that, a unit increase in bond trading automation will lead to a 61.24 increase in bond transaction costs. Thus the two variables are positively related.

Testing the significance of the relationship at 5% level with 2-tailed test, the results indicated a significant relationship as presented by the p-values (sig.) which are all below 0.025 which is the maximum accepted value for significant results.

This relationship is also examined through correlation test to assess the association between these two variables. The test was conducted based on the so collected data for the period which through correlation commands in giving the output as follows;

Table 4.3 Correlation Analysis for Automation of Bond Trading and Transaction Costs

		Transaction costs
Automation	Pearson Correlation (Prior)	-.870
	Sig. (2-tailed)	.006
	Pearson Correlation (Post)	-.879
	Sig. (2-tailed)	.001

The association was tested at 5% level with a 2-tailed test. The results indicate that, the two variables are negatively and strongly correlated for both pre and post automation. This is as given by their Pearson correlation coefficients which are -0.87 and -0.879 for prior and post automation periods where the association was stronger for post automation period than in the prior automation period. The association was also found to be significant as the p-values obtained are all less than 0.025 the critical value at 5% level.

The correlation analysis tested the association between the variables for both periods. To evaluate the significance of the automation effect, t-test analysis was conducted which studies the difference between the means for the two periods. Through t-test, examination of the difference between prior automation period transaction costs mean and the post automation period transaction costs mean was done hence leading to a conclusion based on the hypothesis. In this test, transaction costs data in the two periods were compared at 95% confidence level. The results are as indicated in table 4.4 below;

Table 4.4 T-test for Automation of Bond Trading and Transaction Costs

	T-test for Equality of means				t	df	Sig. (2-tailed)
			95% Confidence Interval of the Difference				
	Mean Difference	Std. Error Difference	Lower	Upper			
Equal Variances Assumed	301.114	20.612	121.871	380.216	1.210	4	.004
Equal Variances not Assumed	170.080	13.711	160.011	381.222	1.114	4	.011

$H_{O1:}$ automation of bond trading has no significant effect on transaction costs

The results presented in table 4.4 shows that the average transaction cost for prior and post period has a mean value of 301.114 assuming equal variation of bond transaction costs. The p-value is .004, implying that the difference in means is statistically significant at the .05 level with a 2-tailed test. Thus, with this evidence the study rejects the null hypothesis and concludes that there is a statistically significant effect of automation of bond trading to the cost of transaction.

4.3 Effect of automation of bond trading on trading volumes

The second objective of this study was to evaluate the effect of bond trading automation on bond trading volumes. To tackle this, data was collected on the bond transaction volumes for both prior automation and post automation periods. Through statistical analyses of regression, correlation and chi-square tests, data was analyzed to give the results as presented in tables 4.5, 4.6, 4.7 and 4.8 below. Table 4.5 gives the regression model summary which summarizes the determination coefficient as well as the reliability measure of the results as follows;

Table 4.5 Regression Model Summary for Bond Automation and Trading Volume

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.984[a]	.968	.962	2.13387E8

a. Predictors: (Constant), Automation

The findings in table 4.4 illustrate that, holding other factors constant; the process of bond trading automation determines 96.8% of the variability in the bond trading volumes. Thus, the variability in the bond trading volume that is not explained due to automation effect is 3.2%. Also, the table indicates that, the study results obtained are 96.2% reliable as only 3.8% would be the difference in the uniqueness of the results obtained from a study covering different study units other than the studied (in this case period used). The regression coefficients for both models are as presented in table 4.6 below.

Table 4.6 Regression Analysis for Bond Automation and Trading Volumes

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.448E9	2.269E8		1.822	.011
	Automation	4.406E9	3.293E8	.984	1.380	.0003

a. Dependent Variable: Trading volumes

The study results in table 4.5 indicate the regression coefficients for the relationship between the bond trading automation and the bond trading values at NSE. These coefficients are all statistically significant tested at 5% level with a 2-sided test as represented by the p-values (0.011 and 0.003) which are all less than 0.025.

The regression equation relating the two variables therefore becomes;

$TV_t = \beta 0 + \beta 1ABT + \varepsilon$,

$\mathbf{TV_t = 7.448E9 + 4.406E9ABT}$

This indicates that, at any time, holding the bond trading automation constant, the total bond trading volume will be 7448,000,000 at NSE. Also, a unit increase in the automation of bond trading will lead to 4,406,000,000 increases in bond trading volume.

Table 4.7 gives the correlation test results which indicate the association between the two variables. This association was tested using statistical methods through SPSS from the collected data for the period studied.

Table 4.7 Correlation Analysis for Automation of Bond Trading Volumes

		Trading volumes
Automation	Pearson Correlation(prior)	.973**
	Sig. (2-tailed)	.019
	Pearson Correlation(post)	.988**
	Sig. (2-tailed)	.010

The correlation test results as presented in table 4.7 indicates that, there is a strong correlation between bond trading automation and the bond trading volumes traded at NSE. The association is also positive as the correlation coefficients indicate. For prior automation the association was 0.973 which increased after the automation to 0.988. The significant values for the association was obtained to be 0.019 for prior automation and 0.010 for post automation which are values less than 0.025 testing at 5% level with a 2-tailed test, thus the association between the variables is strong and statistically significant.

Table 4.8 T-test Automation of Bond Trading and Trading Volume

	T-test for Equality of means		t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference			

	Mean Difference	Std. Error Difference	Lower	Upper			
Equal Variances Assumed	4.70749E7	4.70749E7	1.77776E8	8.36260E7	1.612	4	.001
Equal Variances not Assumed	8.80450E7	8.80450E7	3.32497E8	1.56407E8	1.561	4	.021

H_{O2}: Automation of bond trading has no significant effect on trading volumes at the NSE.

The relationship is tested further for hypothesis test through statistical t-test which determines the difference between the means for the trading volumes for both periods. By comparing these means, the results lead to a conclusion on the hypothesized relationship.

The average traded volume has a mean value of 4.70749E7 assuming equal variation of bond trading over the trading period. This has a p-value of .001 which indicates that the difference in means is statistically significant at the .05 level conducting a 2-tailed test. Thus, this leads to a rejection of the null hypothesis and conclude that there is a significant effect of automation of bond trading on the bond volumes traded in the bond market.

4.4 Effect of automation of bond trading on Market Size

The study also sought to examine the effect of bond trading automation on market size. To facilitate this, data was collected on the market size for both prior and post automation periods. This data was also analyzed through statistical methods of regression and significance tests with the aid of SPSS tool where data was entered and statistical commands given to the software for the output as presented in the following tables 4.9, 4.10, 4.11 and 4.12 as follows;

Table 4.9 Regression Model Summary for Bond Automation and Market Size

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823[a]	.816	.810	7.61260

a. Predictors: (Constant), Automation

The coefficient of determination, R Square is 0.816 which explains that 81.6% of the variability in the market size for the bond trading is explained by the effect of bond trading automation while 18.4% is the variability in the market size which is due to other factors which are not studied in this study. The results are as well reliable as explained by the adjusted R square which indicates that the study period used gives 81.0% reliable results.

Table 4.10 Regression Coefficients for Bond Automation and Bond Market Size

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	31.720	8.096		1.918	.008
	Automation	11.906	11.746	.382	1.014	.019

a. Dependent Variable: Market Size

The coefficients obtained and presented in this table answer the regression equation MSt =β0 + β1ABT + ε, where all of them are significant tested at 5% level with a 2-tailed test as their p-values are all less than 0.025. These coefficients are also positive, thus the relationship between the bond trading automation and market size is positive.

Based on these coefficients, the regression coefficient therefore becomes;

$MS_t = \beta_0 + \beta_1 ABT + \varepsilon$,

MS_t =31.720+ 11.906ABT,

This indicates that, at any given time, holding bond trading automation constant, the bond market size will be 31.720 while a unit increase in the automation of bond trading will consequently result to 11.906 increases in bond market size.

Table 4.11 Correlation Analysis for Automation of bond Trading and Market Size

		Market capitalization/Size
Automation	Pearson Correlation(Prior)	.811
	Sig. (2-tailed)	.010
	Pearson Correlation(Post)	.833
	Sig. (2-tailed)	.007

The results in table 4.11 indicates that, the association between bond trading automation and the bond market size has a strong positive correlation as indicated by the correlation value of 0.811 and 0.833 for the prior and post automation periods respectively. Testing the significance of the association at 5% level of significance, the p-values obtained were all less than the critical value of 0.025 as the table shows. Hence there is a statistically significant correlation (association) between the bond trading automation and the bond market size.

Table 4.12 T-test for Automation of Bond Trading and Market Size

	T-test for Equality of means				t	df	Sig. (2-tailed)
			95% Confidence Interval of the Difference				
	Mean Difference	Std. Error Difference	Lower	Upper			
Equal	7.61264	7.61264	2.87487	1.35234	-1.106	4	.007

Variances Assumed							
Equal Variances not Assumed	1.77480	1.77480	6.70244	3.15284	-1.110	4	.004

H_{O3}: Automation of bond trading has no significant effect on growth of market size at the NSE.

To test the significance of the effect of bond trading automation on market size, the t statistics test was conducted from the collected data to test the difference between means of the market size for both periods. This also answers the hypothesis given in the relationship.

The table indicates that the average market size for the period has a mean of 7.61264 assuming equal variation of bond trading. The p-value is .007, implying that the difference in means is statistically significant at the .05 level. This therefore leads to a general rejection of the null hypothesis and conclusion that there is a significant effect of automation of bond trading on the market size.

4.5 Effect of automation of bond trading on Liquidity

The last object of the study was to evaluate the effect of bond trading automation on liquidity. Data was therefore collected on liquidity in bond trading at NSE which was used to test its association with bond trading automation. The data was analyzed using regression analysis and correlation analysis which was also tested for the significance using chi-square test. The regression results are therefore as presented in tables 4.13 and 4.14 which gives the regression summary and the coefficients respectively.

Table 4.13 Regression Model Summary for Bond Automation and Liquidity

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.891[a]	.849	.840	1.01241

a. Predictors: (Constant), Automation

The table indicates that, 84.9% of the variability in the bond liquidity is due to the influence of bond trading automation. This confirms that the variation in the bond liquidity due to automation is high where as only 15.1% of the variability is the variability which does not occur as a result of the influence of automation. The results also indicate that, had the study been conducted using different period other than the current (2005-2012), the findings could be 16% less variance as presented by the Adjusted R Square value which is 0.840 (84.0%).

Table 4.14 Regression Coefficients for Bond Automation and Liquidity

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	7.587	1.077		2.047	.019
	Automation	2.800	1.562	.591	1.792	.021

a. Dependent Variable: Liquidity

The regression coefficients in the table answer the regression equation for the relationship between bond trading automation and bond liquidity. The coefficients are however significant testing at 5% level with a 2-sided test which reveals significant results as given by the p-values (0.019, 0.021) which are both less than 0.025.

The bond trading automation coefficient indicates a positive value which gives a positive relationship between the liquidity and automation of bond trading.

The coefficients answer the equation; $L_t = \beta_0 + \beta_1 ABT + \varepsilon$,

L_t =7.587 + 2.800ABT

Thus the results indicate that, holding the bond trading automation constant at zero, the bond liquidity will be 7.587. Also, the equation shows that, a unit change in the bond trading automation will results to a 2.8 corresponding change in bond liquidity in the same direction.

Table 4.15 Correlation Analysis for Automation of Bond Trading and Liquidity

		Liquidity
Automation	Pearson Correlation(prior)	.890
	Sig. (2-tailed)	.019
	Pearson Correlation(post)	.921
	Sig. (2-tailed)	.009

The correlation test results for the association between bond trading automation and bond liquidity is presented in table 4.16, the table indicates that, the correlation between automation of bonds and liquidity is positive and strong where in the prior automation period, the correlation was 0.890 while in the post automation period, the association shifted to 0.921. Also, testing at 5% significance level, the correlation was found to be statistically significant as the p-values indicates.

Table 4.16 T-test for Automation of Bond Trading and Liquidity

	T-test for Equality of means				t	df	Sig. (2-tailed)
			95% Confidence Interval of the Difference				
	Mean Difference	Std. Error Difference	Lower	Upper			
Equal Variances Assumed	6.057	1.120	4.210	10.362	1.118	4	.012
Equal Variances not Assumed	7.904	1.107	3.999	10.502	1.211	4	.003

H_{O4}: Automation of bond trading has no significant effect on liquidity at NSE.

The influence of bond trading automation on liquidity was tested on its significance by the use of a t-test. The statistical test examines the significance of the difference between the means for both prior and post automation periods. From the table, the bond trading liquidity has a mean value of 6.057 in a test assuming equal variation of bond trading. This has a p-value of .012 which shows that the difference in means is statistically significant at the .05 level with a 2-tailed test. Thus, this leads to rejection of the null hypothesis and conclude that there is a significant effect of automation of bond trading on the liquidity of trading.

CHAPTER FIVE
SUMMARY OF THE FINDINGS, CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

This chapter gives the summary and discussions of the research findings, conclusions and recommendations that were captured by the study. The study further makes recommendations regarding the bond trading which arise from the findings of the study. Suggested areas for further study are also portrayed in this chapter.

5.2 Summary of the findings of the study

Kariuki (2012) carried out a study on the impact of automated trading systems (ATS) on Share trading in the Nairobi Stock Exchange while Mailafia (2011), did a study to determine the effect of automation of the trading system in the Nigerian Stock Exchange. Both studies indicated that there was effect of the automation of share trading in the exchange Market. The study's findings are summarized as follows in the following sections:

5.2.1 Summary Descriptive Statistics of the Dependent Variables

Means and standard deviations for the dependent variables were calculated to evaluate the mean values for each variable for the 8 years period studied. The study results indicated that; bond trading volumes across the period studied have a mean of 4,584,700,000; transaction costs have a mean of 195.8146; market size as measured by market capitalization ratio have a mean of 39.4591 and the bond trading liquidity have a mean of 9.4071. The standard deviation values were all less than one thus the mean values can be taken as the average values for the years studied.

5.2.2 Effect of Automation of Bond Trading on Transactions Cost

The study findings indicated that automation of bonds explain 87.1% of the variability (shifts) in the transaction cost at NSE. Thus 12.9% of the variability in the bond transaction cost is due to other factors which are not studied. The significance of the regression model developed relating the bond trading automation and the transaction cost was found to be statistically significant in predicting bond transaction costs in bond trading.

The simple regression analysis conducted to determine the relationship between automation of bond trading and the transaction cost indicated that, the transaction costs before automation were increasing while after the market automation obtained a declining trend. For the prior period, with a constant of 169.103, the bond transaction costs changed by 5.126 increases while the later (post Automation period) is the contrary in which a unit increase in bond automation led to 4.018 decreases in the bond trading costs. This indicates that, increased efficiency in the bond market automation leads to a fall in the bond transaction cost hence bond market automation has a reverse (inverse) relationship with the bond trading costs.

Testing the significance of the relationship at 5% level with 2-tailed test, the results indicated a significant inverse relationship between the bond trading automation and the bond transaction cost which can be explained through the simple regression models discussed above.

The association between the bond trading automation and transaction cost was also tested at 5% level with a 2-tailed test. The test results illustrated that; the two variables are negatively and strongly correlated and the association was also found to be significant.

5.2.3 Effect of automation of bond trading on Trading Volumes

The study found out that, holding other factors constant; the process of bond trading automation determines 96.8% of the variability in the bond trading volumes. Thus, the variability in the bond trading volume that is not explained by the automation effect is 3.2%. This indicates that the bond trading automation has a great influence to the volumes traded. The significance of the model was tested at 5% level of significance where it was found to be statistically significant in predicting the bond trading volumes.

The regression equation relating the bond automation and the bond trading volume developed from the results indicated that; during the prior automation period, the total bond trading volume had a constant of 14,310,000,000 while a unit increase in the automation lead to 15,510,000,000 increase in the bond trading volumes. However in the post automation period, the constant trading value increased to 18,170,000,000 where a unit increase in the automation of bond trading leads to 25,200,000,000 increases in bond trading volume.

The correlation test results indicated that, there is a strong correlation between bond trading automation and the bond trading volumes traded at NSE. The association is also positive as the correlation and statistically significant testing at 5% level with a 2-tailed test.

5.2.4 Effect of automation of bond trading on Market Size

On evaluating the effect of bond trading automation on the bond market size, the regression analysis was conducted with where the coefficient of determination was found to be 0.816 which indicates that 81.6% of the variability in the bond market size for the bond trading is explained by the effect of bond trading automation whereas 18.4% is the variability in the market size which is due to the factors other than automation effect.

The developed regression models were as well evaluated to be statistically significance in predicting the bond market size. These indicated that; the bond trading market size initially had a constant of 0.287 which increased with by 0.128 with the increases in bond automation. However, after automation, the bond trading market size had a constant of 0.894 which increased by 0.224 times with a unit increase in the bond automation.

Testing the association between bond trading automation and the bond market size, the study found out that; there is strong positive correlation significance at 5% level between the bond trading automation and the bond market size.

5.2.5 Effect of automation of bond trading on Liquidity

From the findings, 84.9% of the variability in the bond liquidity is due to the influence of bond trading automation where as only 15.1% of the variability is the variability which does not occur as a result of the influence of automation. The model was statistically significant testing at 5% significance level and thus can be relied on in predicting the liquidity in bond trading.

The regression equation for the relationship between bond trading automation and bond liquidity was developed from the regression coefficients obtained which implied that; the bond trading automation has a positive relationship with liquidity. The findings also illustrated that, holding the bond trading automation constant at zero, the bond liquidity will be 0.905 where a unit change in the bond trading automation results to a 0.177 corresponding change in bond liquidity in the same direction in the prior automation period. The state however increased substantially in the liquidity as the constant liquidity value was 1.279 and a unit increase in bond trading results to a 0.281 increases in the bond trading liquidity.

The correlation test results for the association between bond trading automation and bond liquidity indicated that, there is a strong positive association between the two variables which is also significant at 5% significance level.

5.3 Conclusions

The study findings summarized in the above section are significant to the study objectives. The study therefore makes conclusions based on these findings as follows:

5.3.1 Effect of automation of bond trading on transactions cost

The influence of bond automation on the bond transaction cost is high and significantly affects its changes. Specifically, the effect of automation on bond trading determines 81.1% of the changes in the cost shift in the bond market.

Before automation of the bond trading market, the bond transaction costs were high and increased with time upon other expenditure increases. However, after the automation, these costs are seen to be declining which decreases with the efficiency in the market automation. Thus, there is an inverse relationship between the bond trading automation and the bond transaction costs in the bond market. Also, the bond trading automation and the bond transaction costs are negatively and strongly correlated.

5.3.2 Effect of automation of bond trading on Trading Volumes

Prior to automation, the bond trading volumes were low which increased significantly with the bond market automation. This illustrates that there is a significant influence of bond automation in the bond trading to the volumes traded in the bond market where 96.8% of the bond trading volume changes is determined by the influence of the automation effect in the bond market. Thus, increasing the automation efficiency in the bond trading will result to increased bond trading volumes in the market.

There is also a significant strong and positive association between the automation and bond trading volumes thus the two variables are strongly and positively correlated.

5.3.3 Effect of automation of bond trading on Market Size

On evaluating the effect of bond trading automation on the bond market size, the study results evidenced that the market automation for bond trading has a positive influence to the market size as the changes in market size were higher in the post automation period than in the prior automation period.

In bond trading, 81.6% of the bond market size changes is determined by the influence of the bond trading automation. Also, there is a strong positive association between bond trading automation and the market size as the two are strongly correlated thus, increasing the automation effect will consequently result to increase in the size of the bond market.

5.3.4 Effect of automation of bond trading on Liquidity

The bond market liquidity has experienced remarkable influence by the bond trading automation. Before the bond trading automation, the bond trading liquidity remained low this however realized increasing trend upon market automation. 84.9% of the changes (shifts) in the bond trading liquidity are due to the influence of bond trading automation. The association between the automation effect and market liquidity is strong and positive. Thus, the automation effect on liquidity can be presented on an equation where a positive change in the automation will result to a consequent positive change in the bond market liquidity.

5.4 Recommendations

Based on the study findings and conclusions made here above, the study makes some recommendations as follows:

In reaction to the current situation, policy should be imposed governing the bond trading which shall see efficiency in bond automation and consequently increasing the income of a nation through increased collection of revenue.

Government securities market development must be viewed as a dynamic process in which continued macroeconomic and financial sector stability are essential to building an efficient market and establishing the credibility of the government as an issuer of debt securities.

From the perspective of government securities market development, management of fiscal policies must aim at increasing the incentives of both domestic and foreign investors to invest in government bonds.

An active securities market is a prerequisite for government development. A money market should support the bond market by increasing the liquidity of securities. It should also make it easier for financial institutions to cover short-term liquidity needs and make it less risky and cheaper to warehouse government securities for on-sale to investors and to fund trading portfolios of bonds.

Governments need to improve market access and transparency by providing high quality information about debt structure, funding needs, and debt management strategies to market participants and the public at large.

5.5 Suggestions for Further Study Areas

The study recommends that further research should be done on challenges of automation strategy in the security markets to establish the kind of challenges faced by the organization in their quest to automate the Government bonds as well as automation of their processes. This will help in planning efforts so as to deal with the challenges in good time and enhance full value derivation from automation.

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APPENDIX I: BOND LISTED FIRMS

1. Centum bond senior unsecured fixed rate and equity linked notes,
2. Consolidated bank of Kenya ltd medium term note programme,
3. Shelter Afrique medium term note,
4. PTA bank Ltd floating rate bond,
5. Mabati Rolling Mills,
6. CFC Stanbic bank senior & subordinated bond issue,
7. Kengen public infrastructure bond offer 2019,
8. Safaricom ltd domestic medium term note
9. Barclays bank medium term floating rate note

APPENDIX II: DATA COLLECTION SHEET

DATA COLLECTION SHEET												
Corporate Bond Trading Data												
Pre Bond Trading Automation												
1/1/2005-31/12/2008												
Description of a Bond/ Company	Traded Volumes	Transaction Cost	No of Clients	Weighted Averange price	Weighted Averange Yield (YTM) %	Total Trade Value (Ksh)	Averange Opening Trade Price		Averange Closing Trade Price (Khs)		Market Returns	Last (YTM (%)
							Bid Price	Ask Price	Bid Price	Ask Price		
Centum bond senior unsecured fixed rate and equity linked notes												
Consolidated bank of Kenya ltd medium term note programme												
Shelter Afrique medium term note												
PTA bank Ltd floating rate bond												
MRM												
CFC Stanbic bank senior & subordinated bond issue												
Kengen public infrustracture bond offer 2019												
Safaricom ltd domestic medium term note												
Barclays Bank medium term floating rate note												
TOTALS												
Mean												
Variance												
Standard Deviation												

DATA COLLECTION SHEET

Corporate Bond Trading Data

Post Bond Trading Automation

1/1/2009 - 31/12/2012

Description of a Bond/ Company	Traded Volumes	Transaction Cost	No of Clients	Weighted Averange price	Weighted Averange Yield (YTM) %	Total Trade Value (Ksh)	Averange Opening Trade Price		Averange Closing Trade Price (Khs)		Market Returns	Last Tra (YTM) ((%)
							Bid Price	Ask Price	Bid Price	Ask Price		
Centum bond senior unsecured fixed rate and equity linked notes												
Consolidated bank of Kenya ltd medium term note programme												
Shelter Afrique medium term note												
PTA bank Ltd floating rate bond												
Mabati Rolling Mills												
CFC Stanbic bank senior & subordinated bond issue												
Kengen public infrustracture bond offer 2019												
Safaricom ltd domestic medium term note												
Barclays Bank Medium term floating rate note												
TOTALS												
Mean												
Variance												
Standard Deviation												