EFFECTS OF MARKET MICRO-STRUCTURE ON PERFORMANCE OF NAIROBI SECURITIES EXCHANGE

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN FINANCE, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

NOVEMBER, 2017

DECLARATION

This research project is my original work and has not been presented for award in any other University.

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D63/82083/2015

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

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ACKNOWLEDGEMENTS

This project has greatly benefited from the guidance of my supervisor Dr. Elly Ochieng'. I'm very thankful for your comments and dedication in ensuring that I accomplish my research. I wish to extend my appreciation to the University of Nairobi, School of Business who played a great role in teaching us the course work which culminated to this dissertation.

I wish to acknowledge the support of my friends, colleagues and my entire family; you have been very helpful to me and inspiring in this academic journey.

To all my classmates, School was fun because of the support, the humor and the teamwork we shared. Special thanks to Paul for your company and support.

DEDICATION

To my wife Jane Kanina for your support and to my sons: Lavi and Lonn for making my world beautiful.

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LIST OF ABREVIATIONS AND ACRONYMS

ASE	Amman Stock Exchange
ATS	Automated Trading System
BBO	Broker Back Office
BI	Borsa Italia
CBK	Central Bank of Kenya
CDS	Central Depository System
CDSC	Central Depository Settlement Corporation
CMA	Capital Markets Authority
EMH	Efficient Market Hypothesis
ETF	Exchange Traded Fund
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GSE	Ghana Stock Exchange
IFE	International Fisher Effect
JSE	Johannesburg Stock Exchange
KNBS	Kenya National Bureau of Statistics
LSE	London Stock Exchange
NASI	NSE All Share Index
NSE	Nairobi Securities Exchange
RWH	Random Walk Hypothesis
SPSS	Statistical Package for Social Sciences
SRO	Self-Regulatory Organization
WAN	Wide Area Network

ABSTRACT

Market microstructure changes have received considerable attention in the recent past with concentration being on their perceived impact on stock market performance. Automation and demutualization are among the major microstructure changes that have been discussed greatly in literature. Automation of trading and settlement has been touted as one of the key initiatives critical in developing of stock markets in African. Many studies point out demutualization as a precursor to the establishment of suitable governance structures that ensures resilience and growth of the stock exchanges in the current dynamic and competitive environment. Demutualized stock exchanges are flexible in decision making and therefore able to engage in numerous investment activities. This study sought to determine the effect of demutualization and automation on stock market performance of Nairobi Securities Exchange Limited as measured by stock market returns, equity trade volumes and liquidity using monthly secondary data collected from NSE, CBK and KNBS for the period 2001-2016. The independent variables for the study were automation and demutualization of the stock exchange and they were represented by dummies that took a value of zero before the event and a value of one after the event. The control variables were average monthly inflation rate as measured by CPI, average monthly interest rates as measured by bank rates and average monthly exchange rates as measured by KSH/USD. Multivariate linear regression was employed using the Statistical Package for Social Sciences (SPSS) version 21 computer software. Results show that introduction of Automated Trading System (ATS) at the NSE led to an increase in volumes traded and improved market liquidity. This finding implies that automation improved market performance of the NSE while the impact of automation on market returns could not be established. Results on demutualization were not significant across the three regression equations and had mixed signs. Demutualization is therefore more of a governance tool and may not directly impact on market performance. The study recommends that NSE should upgrade the ATS, introduce the on-line discount trading services and ensure that intraday data on bid-ask spreads and stock prices and volumes is a priority. This study considered three aspects of the stock performance namely: stock return, trade volumes and market liquidity. Further studies could compute returns from NSE All Share Index or NSE FTSE 15 Share index and have other aspects of market performance such as volatility as the dependent variables. The study was not exhaustive of the independent variables that affect stock market performance at NSE and therefore this study recommends that future research could focus on other variables like diaspora remittances, foreign direct investments, political stability and other macro-economic variables.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Securities markets enable firms to easily raise finance while ensuring efficient capital allocation in an economy. They play a key role in price discovery, provide liquidity, assist in risk transfer, facilitate corporate governance, and act as a measure of company performance. The ability of these markets to perform their critical functions highly depends on their level of efficiency. Financial economists, investment managers and market regulatory authorities are therefore concerned with the efficiency of securities markets. To this end, the development of technology has over the last decade changed how security markets operate as firms have put their trust in computer algorithms that receive, analyze and automate the trading process (Beunza, 2013). Beunza (2013) posits that automated trading improves liquidity and makes markets more efficient. Globally Stock exchanges have been undertaking demutualization to counter international competition and technological challenges. Demutualization is meant to improve efficiency in the management of the markets. Further, equitization of an exchange allows distribution of the equity ownership to a larger pool of investors thereby reducing market participants' control and influence of stock exchanges (Menkveld, 2011).

This study is founded on the theory of Efficient Market Hypothesis (EMH), Behavioral Finance Theory and Agency Theory. The EMH holds that prices of stock trading on an exchange reflect all relevant information and therefore trade at fair value (Fama, 1970). While EMH assumes rationality in decision making, behavioral finance recognizes heuristics in the thought processes that people apply in decision making. Further EMH maintains that markets are efficient, though on different levels, implying that stock prices

are unbiased estimates of the stocks' intrinsic value, while behavioral finance holds that stock prices are affected by heuristic errors and biases, emotions, frame dependence, and social influence hence may not be the true fundamental value (Chandra, 2008). Further, the study is also anchored to the agency theory which explains the agency relationship, in which the principal delegates work to an agent. Usually the principal empowers the agent with some of the decision making authority (Jensen & Meckling, 1976).

In 2006, Nairobi Stock Exchange (NSE) implemented automated trading system which replaced the manual trading conducted through an open outcry at the trading floor. The shift enabled NSE to expand the trading session from two hours before automation to six hours in Feb 2008. In 2014, NSE was demutualized, followed by additional capital raising through an Initial Public Offer (IPO) and listed the issued shares on the Main Investment Market Segment (MIMS) (NSE, 2017). The NSE Limited is considered a more dynamic exchange compared to its counterparts in Eastern Africa and sub-Saharan Africa in general (Kibuthu, 2005). However, NSE is trailing developed and emerging markets in terms of liquidity and volatility of price and returns.

1.1.1 Market Micro-structure

According to O'Hara (1995), market micro-structure refers to the ecosystem of the trading mechanisms adopted for financial securities. It examines how working mechanism of a securities market influence the costs of transaction, volume, quotes, prices, and trading behaviour. Further, Market microstructure evaluates the impact of transaction costs on the behavior of stock prices in the short run. Such costs are as manifested in quote spread and levies. Automated trading relies on computer commands in execution of market orders. The process is characterized by a robust IT infrastructure

which operates a centralized limit order book that updates order entries on real-time basis. High-frequency trading is a form of automated trading utilizes computer algorithms to identify and execute arbitrage trading opportunities. These processes rely on robust trading systems that are interfaced with high-speed communications platforms that support rapid submission of orders remotely (Jain, 2005).

Demutualization is the conversion of an entity from a mutual ownership structure to an equity (share) ownership structure. The process begins by obtaining the appropriate regulatory approvals after which membership rights are converted into equity shares. Upon demutualization an exchange may elect to raise capital through public offer followed by listing, (Hughes & Zargar, 2006). Aggarwal (2002) argues that demutualized exchanges are limited companies owned by shareholders/outside investors, where the separation of trading rights and ownership has taken place in order to diminish the agency problem. The trading operations are therefore managed by an elected board of directors as opposed to the members. Stock exchanges demutualize when existing mutual ownership structures fall short of providing adaptability and financial support needed to thrive in current competitive environment.

1.1.2 Stock Market Performance

Stock market performance refers to how securities behave in their respective markets given the risks and returns of the markets (Wasseja et al., 2015). Stock market performance gives an indication of how the entire stock market, or a given stock, is fairing. Fluctuations in stock prices and indices predict stock trends, as well as that of the whole economy or a specific sector, in the foreseeable future. This enables investors to

make informed decisions on their investments and expenditure. In any economy, stock market performance serves as a barometer of the health of the economy given the importance of the financial sector contribution (Sandler, 2016).

Usually, the market index is taken as a measure of performance within a specific period in the stock market. The index measures a certain section of the market deemed to represent the entire market performance (Shaharudin, Samad & Bhat, 2009). The index is used to compare returns from various assets for decision-making purposes by both investors and managers (Aurangzeb, 2012). Stock price indices are usually weighted averages of the component price relatives (Clements, Izan, & Lan, 2011). In Kenya, NSE-20 share index is considered as an indicator for overall stock market performance (Aroni, 2011). The construction of the index does not include dividends, but it is adjusted to cater for firm's corporate actions such as splits and capitalization changes over time. In Kenya, the NSE All Share Index (NASI) is also used as a measurement of market performance. The introduction of NASI was as a result of numerous criticism on the 20 share index which only listed 20 blue cheap companies. Total market capitalization can also be used to gauge the performance of the market. This involves summing up the entire volume of shares traded in the totality to determine how active the market is (Daferighe & Sunday, 2012).

1.1.3 Market Micro-structure and Stock Market Performance

Many studies point out demutualization as a key factor to a radical growth of stock exchanges in the current dynamic and competitive environment. The process shifts an exchange focus from fulfilling the interest of intermediaries to that of a wide array of

stakeholders. Demutualized stock exchanges are flexible in decision making and therefore able to undertake numerous investment activities. Further, demutualized stock exchanges are able to embrace technology, adopt a management style that is more proactive to market dynamics and gain easier access to cheaper capital. Improved corporate governance structures optimize financial decisions by assigning resources to investment opportunities that maximize the shareholders' wealth (Lee, 2002).

Domowitz and Steil (2001) observed that automated trading processes are more efficient compared to the traditional manual systems. Amihud et al., (1997) found that introduction of iterated continuous trading lead to improved market efficiency. The stock prices adjusted rapidly to reflect to newly released information while noise trading declined. Similarly, Anderson and Vahid (2001), and Taylor et al., (2000) investigated the effect of automation on efficiency of the Australian and London stock exchanges respectively and affirmed improved market efficiency. They noted that market performance indicators such as capitalization, turnover, liquidity and number of shares traded had increased significantly.

Jain (2003) noted that automation of trading mechanism helps the listed companies to reduce the cost of equity following improved liquidity and market efficiency in the secondary market and reduces investor's costs of trading. The study concluded that technological advancement has contributed in transforming the business model of stock exchanges around the globe. Madhavan (2000) found that transparency affects market liquidity, securities transaction costs and the lead time in price discovery process. Similarly, Pagano and Roell (1996) observed that enhanced transparency in a stock exchange trading mechanisms boost market liquidity by curtailing exploitation of less

informed market participants. Improved market efficiency reduces quote spread, volatility and pricing errors.

1.1.4 Nairobi Securities Exchange

NSE was registered in 1954 under the Societies Act (1954) as an association of member stockbrokers responsible for developing the securities market and regulation of trading activities. Over the years, NSE has seen tremendous changes due to regional political dynamics and legal frameworks. These developments include: ownership structure (legal status), the number trading participants and listed companies (NSE, 2017).

The deployment of the Automated Trading System (ATS) in September 2006 at NSE was a milestone in achieving operational efficiency, transparency and reduced cost of transactions. Implementation of automation has enhanced market integrity and spurred investor confidence (Capital Markets Authority, 2007). The ATS has module that hosts trading corporate bonds and treasury bonds. Automated trading phased out human intervention in conducting end of day processes such as computing closing prices and share indices among other statistical reports. Automation enabled the Exchange to extend the trading session from two hours (10:00 am – 12:00 pm) to three hours (10:00 am – 1:00 pm). In February 2008, NSE announced a further extension of trading session by two hours (9.00am to 3.00pm). In addition, settlement and clearing cycle was reduced from T+7 to T+3 days (NSE, 2017).

The ATS has a real time surveillance module which generates market abuse alerts that prompt investigations against market intermediaries and listed companies. The ATS provides an email enabled portal for disseminating to the market all the corporate

announcements submitted by listed firms. The same information is relayed to all Central Depository System (CDS) accounts holders who have subscribed for market alerts from NSE. Prior to automation, corporate announcements were delivered physically or via fax to trading participants, a process that was characterised by delays leading to information asymmetry in the market. In October 2011, NSE in conjunction with Central Depository Settlement Corporation (CDSC) and trading participants implemented Broker Back Office (BBO) system which was interfaced to the ATS and CDS. The BBO automated orders entry, contracting, settlement and accounting. The system has an audit log function that tracks of all order data entries and maintains a record of all changes made thereto. In September 2016, NSE commissioned an upgrade of the ATS to boost its performance and accommodate the new services and products which include Exchange Traded Fund (ETF) and derivatives (NSE, 2017).

In 2012, Capital Market Authority (CMA) through a legal notice No. 87 passed the Capita Markets (Demutualization of the NSE Limited) Regulations, 2012 which paved the way for demutualization process for NSE. Having met the set requirements, NSE was demutualized in June 2014 and self-listed in September 2014 (NSE, 2011). Among the conditions set out by the demutualization regulations was self-listing and setting up self-regulatory organization structures within one year. Further, NSE was required to undertake public education to help the investment community appreciates the changes in the organization in order to remove any previous negative perceptions (CMA Master Plan, 2013-2014). Demutualization and self-listing enabled NSE to raise additional capital, through initial public offer (IPO). NSE raised Kshs.627 million through subscription of 66 million shares by retail and institutional investors at a price of Kshs.

9.50 per share. Following an official recognition by CMA as an SRO in September 2016, NSE is in the process of establishing regulatory structures. The status mandates NSE to act as the first line regulator to oversee CMA's licensees admitted at exchange as market intermediaries, derivatives market operations and listed companies (NSE, 2017).

1.2 Research Problem

Market microstructure changes have received considerable attention in the recent past with concentration being on their perceived impact on stock market performance. Automation and demutualization are among the major microstructure changes that have been discussed greatly in literature. Automation of trading and settlement has been touted as one of key policies that trigger radical development of African stock markets. According to Taylor et al., (2000), automation is expected to minimize the costs and inefficiencies associated with manual trading platforms. Automation enhances market transparency and liquidity by speeding up operations. The impact of demutualization has been an area of great interest amongst academics, investment community and regulators. Akpesey (2008) argues that stock exchanges are increasingly appreciating that a versatile trading platform and contemporary corporate governance structures are critical in curtailing transaction costs, attracting investors and new firms to raise additional capital.

Reforms in security trading in Kenya particularly the introduction of the CDS in 2004, the implementation of ATS in 2006 and the implementation of Wide Area Network (WAN) platform in 2007 revolutionized trading at the NSE. As a result, NSE experienced increased liquidity while the numbers of days for settlement and cases of fraud also reduced. Other innovations that were achieved with the automation include abolishing of block trades board and introduction of trading of pre-emption rights in a similar way as

quoted stocks. Despite the efforts made to automate securities trading, there has been a controversy over whether the automation of a stock exchange market leads to better market performance or not. Domowitz and Steil (2001) demonstrated that electronic trading infrastructures are more efficient than traditional trading systems. Amihud et al., (1997) observed that introduction of continuous trading system improve efficiency in the price discovery process. Those with differing findings include Frino et al., (1998) and Pirrong (1996). There are also those that find no impact at all either positive or negative of the introduction of ATS on the market (Fung et al., 2003).

Global studies (Faina and Lopez, 2006; Akhtar, 2002; Hughes and Zargar, 2006) show that demutualization improves the performance of stock exchanges and consequently the listed firms. However, there also exist a host of studies (Mendiola and O'Hara, 2004; Worthington and Higgs, 2006) that find either a negative effect or no effect all arising from demutualization. This implies that at a global level, there exists differing opinions as to the effect of demutualization. This difference in research findings forms a research gap for this study.

Few attempts have been made to document the effect of market microstructure changes (and specifically automation, demutualization and self-listing) on performance in terms of returns, volume and liquidity at NSE by analyzing the trend of NSE 20 share index before and after market microstructure changes. The few studies that have been done in this area have either attempted to study either automation or demutualization as a market microstructure change but not both. This study sought to bridge this gap by answering the research question: what is the effect of market micro-structure changes on performance at the NSE?

1.3 Research Objectives

This study sought to determine the effect of market micro-structure on performance of the Nairobi Securities Limited.

1.4 Value of the Study

This study was conducted at the backdrop of the on-going ATS upgrade at the NSE as well the launch of the mobile traded government bond dubbed M-Akiba. It is therefore useful in giving investors information regarding automated trading at the NSE with a view of making the market more competitive and efficient.

Recommendations of this study inform the policy direction taken by the CMA and other stakeholders who play a role in developing of regulations, rules and guidelines that promote market micro-structures initiatives meant to ultimately improves the stock market performance in Kenya.

The study contributes to future references for researchers, scholars and students who aspire to undertake research on the topic or related field. Further, the study identifies areas of research by highlighting related topics and reviewing the empirical literature to establish study gaps.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses previous studies related to the topic of the study. It seeks to identify effects of automation, demutualization and self-listing of NSE on stock market performance. The chapter has five sections. The first focuses on various literatures attributed to the determination of market performance, while the second and third section covers the determinants of stock performance and the empirical literature respectively. The fourth section covers the conceptual framework while the last section concludes with the summary of literature review focusing on the gap to be filled.

2.2 Theoretical Review

The theoretical review focuses on the theories that explain the stock performance. These theories include Efficient Market Hypothesis, Behavioral Finance and Agency Theory which are discussed below.

2.2.1 Efficient Market Hypothesis

The EMH theory postulates that at any given time, stock prices of an efficient market reflect all the available information (Fama, 1965). The implication of this hypothesis is that no investors can "beat the market" and gain abnormal profits given that stocks are traded at their intrinsic value. Therefore, investors wanting higher returns can only do so by making riskier investment decisions as opposed to market timing and stock selection. This hypothesis assumes that traders are rational and that stock prices adjust quickly to assimilate any new information. Later in 1965, Fama affirmed the Random Walk Hypothesis (RWH), which is consistent with the EMH. RWH holds that stock prices are

independent of each other and follow a random pattern, and cannot therefore be forecasted using previous market data.

Fama (1965) classified EMH into three basic levels. These levels of market efficiency are Strong form efficiency, Semi-strong form efficiency, and Weak-form efficiency. In Strong-form, stock prices reflect all available information, both private and public; in Semi-strong form, stock prices reflect only publicly available information; whereas, in Weak-form efficiency, stock prices reflect all relevant historical data available. Despite all these, stock markets often exhibit certain patterns that could lead to abnormal returns; these are referred to as market anomalies, for example, the January effect, neglected firms effect, day-of-the-week effect and small firms effect.

Despite the EMH being the backbone of financial markets, it has a fair share of critics. The main point of contention being that the EMH assumes that investors are rational in their dealings, they all have access to available information and that their market expectations are homogenous. These assumptions beat the point of trading after all given that trade signals existence of heterogeneous expectations. While the seller expects a dip, the buyer anticipates a rise in the stock price, and hence bears and bulls. Further, it is not practical for all market participants to have the same information and if it were so, there would be no need for communication in the market. Likewise, behavioural economists do not agree with the notion of rational investors, it purports irrational exuberance (Shostak, 1997).

2.2.2 Behavioral Finance Theory

Psychologists have alleged that human beings usually exhibit emotional and cognitive biases that lead them to act in a rather irrational behaviour. Behavioural finance was popularized in the 20th century, with Kahneman and Tversky (1974) outlining behaviours and biases that hinder human beings from acting rationally. They labelled these as representative heuristic, anchoring, and the availability bias. These cause people to hold stereotypes, make decisions founded on a whimsical starting point, and evaluate the probability of an occurrence based on similar past events. Behavioural finance holds that stock prices are affected by heuristic errors and biases, emotions, frame dependence, and social influence hence may not be the true fundamental value (Chandra, 2008).

Critics of behavioural finance are mostly supporters of EMH. Fama (1998) insisted that despite there being market anomalies that cannot be elucidated using modern financial theories, EMH cannot be dismissed totally for behavioural finance. He further found that behavioural finance resembles a compilation of market anomalies that are explicable using market efficiency. Behavioural economics' critics contend that the observed heuristics are short-term manifestations that are corrected in the long run. They have often stated that behavioural economics limits itself to digging for failures of computation and cognition. Often people react to new information without looking at the broad picture of other underlying factors resulting to non-proportional changes in stock prices. On the other hand, people who have developed a negative stereotype against a certain security would not dare invest in it even if positive information was put forth in regards to it. Behavioural finance recognizes that people's decisions are not solely driven by logic and rationale, but often influence by personal experiences and preferences.

2.2.3 Agency Theory

Jensen and Meckling (1976) coined the agency theory that explains relationship between the between the principals (shareholders) and their agents (managers). Shareholders are the owners of the company who delegate the day to day operations to managers but retain the oversight function. The origin of this theory is based on the notion that the managers and executives of an organization are working on behalf of and in the interest of shareholders who on most occasions are absent. However, the interests of the executives may not be aligned to that of shareholders resulting to agency problems. As a result, managers may engage in activities for their own benefit rather than owners of the firm. The theory portrays employees in agency problem as individualistic whose priority focusses on rewards and benefits. Some of the remedial measures that can be instituted to avert the potential and real agency problem and align the interests of the shareholders to that of management include: management incentive compensation plans and employee share ownership schemes. Nambiro (2008) states that the firm's managers and executives will more often than not act in their own self-interest which conflicts with the interests of the owners.

This theory is relevant to the study as demutualization of NSE involved separation of trading rights and ownership a shift that brought about an overhaul in the composition of the board of directors. Kathurima (2010) observed that stakeholders were optimistic that NSE's demutualization would improve corporate governance structures and in turn translate into better market efficiency and make NSE more competitive against alternative trading systems. Njiru (2012) affirmed that ownership structure and corporate

governance structures were among the key factors that affected the demutualization process of NSE.

2.3 Determinants of Stock Market Performance

In the stock market, there are the bullish investors, those who invest with the prospect of a rise in stock prices, and the bearish investors, who anticipate for the stock market conditions to worsen and thus stock price to fall accordingly. Regardless, all these investors seek to take advantage of the stock price fluctuations to maximize their returns (Mehwish, 2013). These fluctuations in stock prices are affected by various fundamentals, which include: company's material information and corporate actions, market liquidity, interest rates, inflation, money supply, exchange rates, as well as economic growth of the country (Karitie, 2010).

2.3.1 Company's Material Information and Corporate Actions

Company's material information and corporate actions affect the share price directly through the signaling effect. This could be in the form of profits/losses, future estimated earnings, dividends and other relevant corporate information such as change of management or new projects. According to the signaling theory, financial data serves the purpose of forwarding information from managers to stockholders and market at large. General company performance has a knock-on effect on the overall performance of the various indices of a stock exchange. Dividend announcements are also form part of signaling mechanism. They inform current and potential investors about the future profit prospects of their investments in a company (Osei, 2002). Kane, Lee and Marcus (1985)

gauged abnormal market returns occurring around earnings and dividend notices. The evidence suggested a statistically significant interaction effect.

2.3.2 Liquidity

Liquidity is the ability to quickly convert a security into cash without significant loss of value through reduction of price. A high trading level characterizes liquidity combined with a small bid-ask spreads. Usually, illiquid securities have higher returns compared to liquid ones. The risk premium compensates for the increased risk and higher trading costs. As a result this impacts stock performance as illiquid assets attract risk takers thus increasing their prices (Karitie, 2010).

2.3.3 Inflation

Higher inflation rates lead to higher prices for consumers which tend to slow business and reduce earnings for firms. Higher prices also tend to trigger a higher interest rate regime. Fama (1981) argued that inflation would have a negative correlation with real economic activity, which in turn would have a positive association to market performance. Thus, the stock index should be negatively correlated with the anticipated price level, with short-term interest rates serving as the proxy similar to the International Fisher Effect (IFE).

2.3.4 Interest Rate

The interest rate is dependent on a country's income. The main principal role of interest rates is to mobilize and redistribute financial resources and facilitate the optimal allocation and use of these funds to enhance economic development. Excessive shifts of

interest rates can pose significant threats to earnings and capital base of an organization as well as increase its operating expenses. Interest rate changes may have an impact on asset valuation, liabilities and the present value of expected cash flows (Osoro & Ogeto, 2014). An increase in the rate of interest raises the cost forgone on holding money, resulting in substitution actions between equity stocks and bonds; which bear interest. Higher rates of interest hamper the discounted cash flows which erode viability of investments, hence shrink valuation of stock returns of affected firms (Rahman et al., 2009).

2.3.5 Money Supply

Supply of money is the total amount of liquid currency circulating or in existing in an economy. Monetary base M1 and M2 is the standardized measurement of the money supply. The monetary base is the total of reserve balances and the total amount of currency in circulation. The increase in money supply leads to a more liquid economy with excesses which can be invested. The long-term result will be monetary policy benefiting both the economy and investors in general. On the one hand, an increase in the supply of money results in the availability of liquidity at lower rates of interest (Shiblee, 2009). Inflation is brought about by increased supply of money in the economy which increases the rate of discount at the end affecting returns. The Central Bank of Kenya (CBK) is tasked with the sole responsibility of regulating the supply and demand for money circulating in Kenyan economy. Controlling money supply affects disposable cash which in turn affect share prices and expected returns (Kirui et al., 2014).

2.3.6 Exchange Rate

Very evidently, the prevailing foreign currency rates directly affect the prices along with the value of securities in foreign countries. Fluctuations in currency exchange rates usually reduce or increase the cost of carrying out business in any country. This in turn affects the prices of shares of companies that carry out trade in foreign currency, for instance, banks and companies that import trade goods. Alternatively, depreciation of domestic currency boosts competitiveness of local firms, this leads to an increase in their export revenues and consequently higher stock prices. It is hard to predict the short-term exchange rate fluctuations given that they are often caused by events, announcements and futures trading, as opposed to the long-term fluctuations that are driven by the fundamental market forces of supply and demand (Kuwornu, 2012).

Granger (2000) stipulated that multinational firms are highly affected by exchange rates; volatility in the exchange rates results in fluctuations in the value of a firm's foreign operations. This could result into a profit or loss on its income statement and consequently changing the firm's stock price. This way, changes in exchange rates are expected to cause movements in stock prices. Currency devaluation could lead to either a rise or a decrease in a firm's stock price subject to whether the particular firm is more of an exporting firm or a heavy consumer of imported inputs. Obura and Anyango (2016) found that even firms whose operations are wholly domestic may be affected by fluctuations in exchange rates, if such movements affect their input and output prices, and consequently the demand for their products and services.

2.3.7 Economic Growth

Many scholars agree that an upward rise in economic activity causes growth in stock market returns (Rehman et al., 2009). Gross Domestic Product (GDP) is the most used measurement of economic growth. A growing economy exhibits positive GDP which raises demand for loans (Osoro & Ogeto, 2014). The level of GDP affects the profitability of firms. A rise in economic output raises expected cash flows and hence trigger a rise in prices of shares, with the reverse impact during recession is justified (Kirui et al., 2014).

2.4 Empirical Review

Various studies related to the effect of changes in market micro-structures on stock market performance have been conducted in the recent past. However, most of these studies were carried out in developed markets, with only a small number of them being done in small and emerging markets such as Kenya.

2.4.1 Global Empirical Studies

Mensah, Pomaa-Berko and Adom, (2012) using the Unit Root Random Walk and the GARCH models found that the Ghana Stock Exchange (GSE) was weakly inefficient before and after automation periods. The findings inferred that the automation of the GSE did not achieve the intended improvement in the efficiency. They argue that through reduction of transaction costs and enhanced information dissemination, Electronic trading systems increases liquidity and improve efficiency. They concluded that electronic trading system offers convenient and affordable remote access to investors thereby attracts new pools of liquidity.

Morsy and Rwegasira (2010) evaluated the effect of demutualization on financial performance of stock exchanges that demutualized in the period 1996-2004. The study findings revealed mixed findings in financial performance of the sampled stock exchanges but noted significant increase in most of the profitability ratios. Murinde (2006) conducted a study of African capital markets and observed that institutional micro-structure changes led to improved market efficiency at Nigerian Stock Exchange, NSE, and Johannesburg Stock Exchange. The results further exhibited increased market liquidity and decline in market volatility. The performance of Nigerian Stock Exchange improved substantially after the introduction of the ATS in 1999 (Mailafia, 2012). Similarly, Sunday, Omah and Oladimeji (2012) evaluated the effect of the implementing automation on the trading effectiveness in the Nigerian stock market from 1999 to 2011.

Hughes and Zargar (2006) sought to identify the merits of demutualized stock exchange. The findings indicated that demutualization results in flexible governance structures that promote decision making processes in adapting to more dynamic business environment. Secondly improved governance of an exchange allows greater investor involvement in decision making processes. Thirdly, the conversion offers better platform proactive to potential competitors in the form of alternative trading systems and access to global markets. Demutualization creates suitable environment for faster mergers and acquisition deals among stock exchanges to optimize synergies. Further, equitization leads to increased access to capital raised through public offerings or private placements.

Maghyereh (2005) examined the effect of the automation on efficiency of Amman Stock Exchange (ASE). The study sampled the stocks of the largest companies and most liquid and used their daily price index for a period of 10 years. Results indicated that

automation led to increased volatility but didn't affect the market efficiency. Another study on ASE by Iskandrani & Haddad (2012) evaluated 38 companies for a period of 8 years using their closing prices and trading volumes. Results showed that electronic trading influenced market liquidity and resulted in negative abnormal returns.

Serifsoy (2005) examined the impact of demutualization and outsider ownership structure on the operative performance of stock exchanges. The study applied Envelopment Analysis (DEA) technique to calculate efficiency and productivity. Secondly the derived values were regressed against variables that represent different corporate governance structures which include: mutual, demutualized private owned exchanges and demutualized listed exchanges. The study concluded that demutualized stock exchanges portrayed better technical efficiency compared to mutual ones. However, demutualized exchanges were characterized by poor productivity growth. The study didn't observe any evidence to demonstrate that listed stock exchanges attained better efficiency and productivity compared to private demutualized exchanges.

Mendiola and O'Hara (2003) examined the effects of the change in corporate governance of stock exchanges on their performance and valuation. The study evaluated demutualized exchanges performance using accounting, financial performance, and return measures. The study found that demutualization of stock exchanges brought about changes in corporate governance that led to improved financial performance. However, for some exchanges they noted that the changes in corporate governance could not overcome challenges posed by adverse economic environment. Sarah, Babar and Kashif (2011) argue that demutualization is a complicated undertaking, however, if done

effectively, it results into increased: efficiency, capitalization and improved corporate governance.

Maghyereh and Omet (2003) studied implementation of computer based trading infrastructure at the Jordanian Stock Exchange to evaluate the market efficiency before and after automation. They applied a multi-factor model with time varying coefficients and the GARCH-M model to carry out the data analysis. They found that the shift from manual to the electronic trading platform didn't have an impact on the pricing efficiency. Similarly, deployment of automated trading system at the Tunisian Stock Market did not correct the pricing error and therefore didn't t improve market efficiency.

Fung et al., (2003) made use trade data for a period of six months and observed that Hang Seng index futures did not respond asymmetrically to good or bad news with introduction of automation. The study further realized that there was an increase in transmission of information between futures markets and its underlying instruments. Corroborating with the findings of Fung et al., (2003), Beelder and Massey (2002) affirmed that automation led to increased transmission of information on index futures contract their study on JSE. This was however not the case for the gold futures contracts in the same market.

2.4.2 Local Empirical Studies

Mwangi (2015) investigated how automation affected market trade volumes at the NSE. The study considered secondary data on monthly accumulated stock volume of 31 listed companies from January 2002 to December 2012 and applied descriptive statistics in analysis together with a t-test to test the significance. The study concluded that implementation of the ATS had no statistically significant effect on stock volume at the

NSE. However, few companies had registered surge in traded stock volumes traded after automation, which may have been caused by other factors which were not considered in the research. The effect on traded volume may have been caused by a number of factors which include: organizational related, macro or micro economic and therefore unrelated to the system introduced.

Wathiru (2015) sought to determine whether the introduction of the microstructure changes had improved the informational efficiency of the NSE. The study used secondary data relating to the NSE 20 Share Index for the period spanning 13 years (2001-2014). The data was analysed using non parametric approaches to measure market efficiency before and after market automation. Results indicated that automation led to increased average market returns which were associated with the improvement of the process of price discovery. The market returns in pre and post automation periods did not have a normal distribution. In addition, the normality test revealed that market returns were more random in the period following automation than the prior period. The study concluded that introduction of automation at NSE led to improved market efficiency.

Okumu (2013) examined whether the introduction of the micro-structure changes had improved the informational efficiency at NSE. The study used secondary data relating to the NSE 20 Share Index for the period spanning 12 years (2000-2012). The data was analysed using non parametric approaches to measure market efficiency before and after market automation. The study observed that average market returns increased after automation and had higher volatility than in the period before automation. The study found that market returns were not normally distributed in both periods. In addition, the

runs test results revealed that market returns were more random post automation than the prior period, implying that the market had improved in efficiency.

Njiru (2012) sought to establish the factors affecting demutualization process of the NSE. The study adopted a descriptive research design targeting all the market intermediaries at NSE. She observed that the key factors affecting demutualization were revolving around ownership structure, regulatory framework and governance structures. Separation of trading rights and ownership was reflected in assets and business strategy that was embraced by the firms in responding to changing business environment. She concluded that securities market regulation is critical in ensuring efficiency which when combined with fair practices and integrity fosters credibility a key drive in safeguarding the interest of the stakeholders.

Kathurima (2010) conducted a survey study on market players at NSE with a view of establishing their perceptions on the merits and challenges resulting from demutualization of NSE. Primary data both qualitative and quantitative was collected using open and closed ended questionnaire. She observed that market players were optimistic about the process of demutualization as they felt that it would lead to and improved governance structures, increase market efficiency and make NSE more competitive against alternative trading system.

Nyamoita (2009) assessed the performance of 49 firms listed at NSE before and after the implementation of ATS. She observed that upon implementation of the ATS there was remarkable growth in the following market parameters: NSE's market capitalization, volume and turnover of shares traded, number of deals per trading session and the NSE

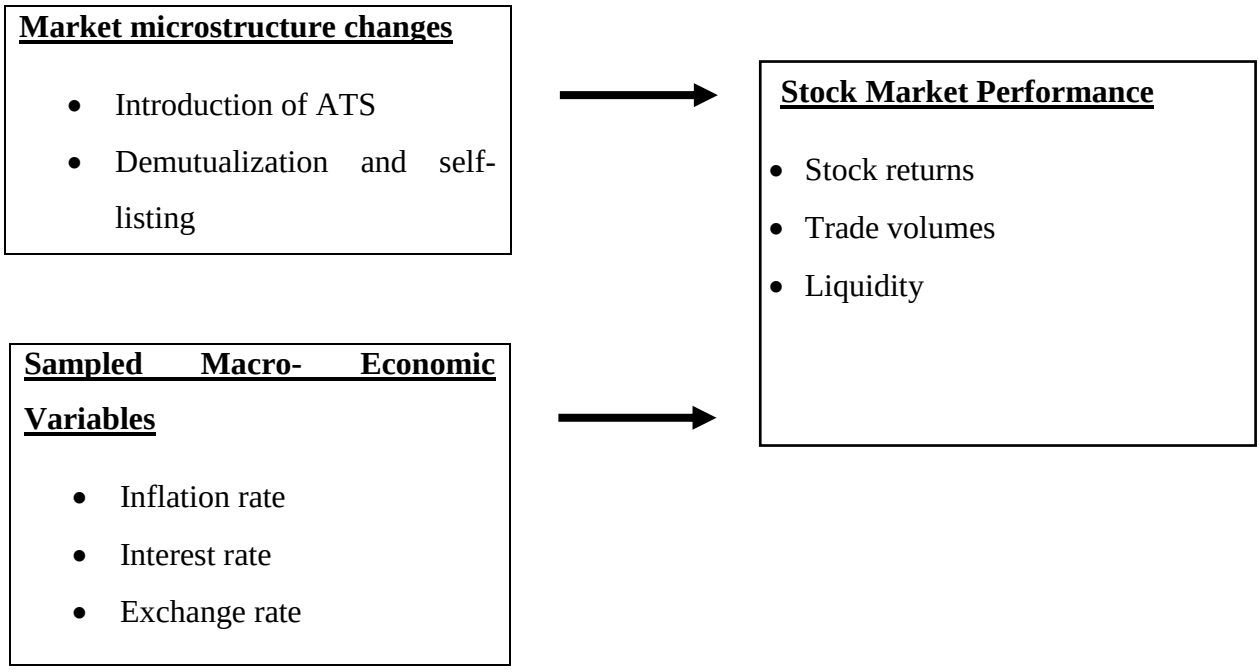
20 share index. Further, the ANOVA results revealed that the growth in all the performance indicators considered was significant. The study concluded that the implementation of automated trading systems at the NSE led to improved stock market performance.

2.5 Conceptual Framework

Literature reviewed shows that most of studies have found a positive relationship between automation and stock market performance. Such studies include Domowitz and Steil (2001), Amihud et al., (1997), Wathiru (2015) and Okumu (2013) among others. In some studies however, the effect of automation on stock performance could not be established. On the other hand, demutualization is seen to positively impact market performance by authors such as Faina and Lopez (2006); Akhtar (2002) and Hughes and Zargar (2006). Similar to automation, there exists a number of studies (Mendiola and O'Hara, 2004; Worthington and Higgs, 2006) that do not establish the effect of demutualization on market performance.

There are other explanatory variables other than automation; demutualization and self-listing that are likely to influence performance at the NSE. Some of these variables have been selected in the study and were used in regression analysis. The selected macro-economic variables for this study were inflation rate as measured by inflation deflator on a monthly basis, interest rates as measured by monthly CBK lending rate and exchange rates as measured by monthly exchange rate between Ksh/Usd.

Figure 2.1: Conceptual Framework



2.6 Summary of the Literature Review

This chapter reviews both the theoretical and empirical literature about the research objective presented in this study. Domowitz and Steil (2001), Amihud et al., (1997) and other studies shows that developed stock exchanges which have automated trading infrastructure, have registered a positive impact, characterized by market efficiency, increased liquidity, and lower volatility. Those with differing findings include Frino et al., (1998) and Pirrong (1996). Fung et al., (2003) found no impact on information asymmetry upon introduction of ATS in the market. Global studies (Faina and Lopez, 2006; Akhtar, 2002; Hughes and Zargar, 2006) show that demutualization has a positive effect on the performance of stock exchanges and consequently the listed firms. However, there also exist a host of studies (Mendiola and O'Hara, 2004; Worthington

and Higgs, 2006) that found no effect at all arising from demutualization. This implies that at a global level, there exists differing opinions as to the effect of demutualization. Clearly, these results are mixed and therefore not conclusive. Due to lack of common agreement, it is significant to examine the effects of changes in market micro-structure on the performance at the NSE. Motivated by this gap, this study, therefore, sought to examine the effect of changes in market micro-structure on performance of the NSE.

2.7 Summary of Research/Knowledge Gap

Author	Focus of Study	Methodology	Findings	Knowledge Gaps
Mwangi (2015)	To examine the effect of automation on trade volume at NSE	The study used secondary data on monthly accumulated stock volume of 31 listed companies from January 2002 to December 2012. Descriptive statistics together with a t-test to test the significance.	Implementation of the ATS had no statistically significant effect on traded volume at the NSE.	Need to better understand the volume - volatility relationship.
Wathiru (2015)	To determine whether the introduction of the microstructure changes had improved the informational efficiency of the Nairobi Securities Exchange	The study used secondary data relating to the NSE 20 Share Index for the period spanning 13 years (2001-2014). Data was analysed using non parametric approaches.	Introduction of automation in the Kenyan securities market has led to improved market efficiency.	The effect of changing automation within a market is an important and that there is limited empirical studies.
Okumu (2013)	Whether the introduction of the microstructure changes had improved the informational efficiency at NSE.	The study used secondary data relating to the NSE 20 Share Index for the period spanning 12 years (2000-2012). The data was analysed using non parametric approaches.	Introduction of automation in the Kenyan securities market has led to improved market efficiency	Information lacking on how such changes micro structure have affected the informational efficiency of the Nairobi Securities Exchange.

Nyamoita (2009)	Assessing the performance of the Nairobi Stock Exchange before and after the implementation of automated trading systems (ATS).	A survey was carried out on 49 companies that were continuously listed at the NSE during the period of study. The data collected was analysed using descriptive statistics.	The implementation of automated trading systems at the NSE led to improved performance of the stock market as measured by market capitalization, number of shares traded, value of shares traded, number of deals and the NSE 20 share index.	Few studies have been done on the subject particularly on Nairobi Stock Exchange.
Njiru (2012)	To determine factors affecting demutualization at NSE.	The study adopted a descriptive research design. The target population comprised of all 25 stakeholders at the NSE.	Factors that affect demutualization of the NSE include: ownership structure, government policy and regulatory framework and also corporate Governance.	There are limited studies on the subject matter.
Kathurima (2010)	To identify main challenges facing demutualization of NSE.	Questionnaires were used for data collection and the research design employed was a survey.	Main challenges were seen as squabbles between the Capital Markets Authority (CMA) and NSE mutual membership. Study concludes that demutualization improves governance, and market	Limited Studies on the subject matter locally.

			efficiency.	
Mensah, Pomaa-Berko and Adom (2012)	To assess whether Automation Improves Stock Market Efficiency of the Ghana Stock Exchange.	The study used daily market returns from the Ghana Stock Exchange All-Share index from 2006 to 2011. The Unit Root Random Walk and the GARCH models were used to analyse the efficiency of the GSE.	Automation of the GSE didn't not achieve the required impact towards improving the Exchange.	Automation of the GSE didn't improve the efficiency of the exchange.
Murinde (2006)	Study of institutional changes (Microstructure) on market efficiency.		There was improved market liquidity and decrease in market volatility.	
Maghyereh (2005)	To examine the effect of the automation of Amman Stock Exchange (ASE) on the market efficiency.	Study used data consisting of closing prices and trading volume for 38 companies for a period of 8 years and conducted an event study for the monthly relative means of 'trading volume' as a proxy for liquidity and stock price behaviour.	Automation increased volatility and had no significant effect on market's efficiency.	
Maghyereh and Omet (2003)	To examine implementation of computerised trading mechanism on market		Shift from manual to the electronic trading platform didn't have impact on the	

	efficiency of the Jordanian Stock Exchange.		pricing efficiency.	
Morsy and Rwegasira, (2010)	To examine the effect of demutualization program on financial performance of stock exchanges.		Findings exhibited mixed changes in performance of the sampled demutualized stock exchanges.	Mixed findings from the earlier studies and the need to conduct further studies.
Omah & Oladimeji (2012)	To examine the effect of automation of trading on the trading effectiveness in the Nigerian stock market.		ATS was an effective trading system and that it had brought about an efficient settlement system and fostered new trading opportunities.	
Fung et al., (2003)	To investigate the effects of the migration of the Hang Seng Index futures from open-outcry trading to electronic trading.	The study used secondary data and applied the Chow test analysis.	The study found no evidence of asymmetric response to good/bad news between Hang Seng Index futures.	
Domowitz and Steil	To assess the impact of Innovation In		Automation suggests that the execution process of trades	

(2001),	Equity Trading Systems Transactions Costs and Cost of Capital, Technological Innovation and Economic Performance		becomes faster and less costly.	

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes methods of research applied to objectively establish the effect of market micro-structure changes on performance of Nairobi Securities Exchange. It also outlines the research design, the population of study, data collection criteria and data analysis.

3.2 Research Design

This research used a longitudinal research design as it emphasizes the status of time and the study of a phenomenon over time. It also involves taking repetitive measures overtime for the purpose of comparing stock market performance in the pre-automation and post-automation periods, and pre-demutualization and post-demutualization periods. The use of the time is a design characteristic in which the extent of a phenomenon is measured after successive time period, and the effect of intervention influences are time related and data is collected several times, before and after an intervention. This design is therefore suitable in analyzing and comparing the behavior of returns, liquidity and trade volumes during these periods.

3.3 Data Collection

The study used secondary data obtained from NSE, CBK and Kenya National Bureau of Statistics (KNBS). The data collected included: NSE 20 share index figures and stock prices for related stocks, as tabulated and stored by the NSE, for the period between 1st January 2001 and 31st December 2016. The country's inflation rate on monthly basis was collected from the KNBS while data on monthly interest rates and exchange rates was collected from the CBK.

3.4 Diagnostic Tests

Linearity show that two variables X and Y are related by a mathematical equation Y=bX where c is a constant number. The linearity test was obtained through the F-statistic in ANOVA. Normality is a test for the assumption that the residual of the response variable are normally distributed around the mean. This was determined by Kernel density test. Autocorrelation is the measurement of the similarity between a certain time series and a lagged value of the same time series over successive time intervals. It was tested using Durbin-Watson statistic (Khan, 2008).

Multicollinearity is said to occur when there is a nearly exact or exact linear relation among two or more of the independent variables. This was tested by the determinant of the correlation matrices, which varies from zero to one. Orthogonal independent variable is an indication that the determinant is one while it is zero if there is a complete linear dependence between them and as it approaches to zero then the multi-collinearity becomes more intense (Burns & Burns, 2008).

3.5 Data Analysis

The data will be sorted, classified, coded and then tabulated for easy analysis. The study will apply both descriptive and inferential statistics to analyze the data. The Statistical Package for Social Sciences (SPSS) version 21 computer software will be used in the analysis since it's more user-friendly. The data will be inputted into the SPSS and examined using descriptive, correlation and regression analyses. In descriptive statistics, the study will use mean, standard deviation and scatter plot. In inferential statistics, the study will use multivariate regression analysis to determine the relationship between the dependent variable (Stock market performance) and independent variables: Interest

Rates, Inflation Rate, automation, demutualization and self-listing which will be represented by respective dummies.

3.5.1 Analytical Model

There are other explanatory variables other than automation; demutualization and self-listing that might play an important role in determining stock market performance at the NSE. The study estimated the following simple regression to examine the effect of factors, automation and demutualization on the stock market performance at the Security Exchange. This helps to control for the effect of these factors. The following model was used;

$$\mathbf{Y = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + d1 + d2 + ε}$$

Where:

Y is stock market performance as measured by stock returns, trade volumes & liquidity

$ß_0$ is the regression constant (parameter of the function)

$ß_1$, $ß_2$and$ß_3$ are the coefficients of independent variables

X_1 is average monthly inflation rates as measured by CPI

X_2 is average monthly interest rates as measured by bank rates

X_3 is average monthly exchange rates between Ksh/Usd

d1 Automation Dummy which takes the value of zero (0) in the period before automation, that is between January 2001 and May 2006 and the value of 1 in the period after automation that is between July 2006 and December 2016.

d2 Demutualization dummy which takes the value of zero (0) in the period before demutualization, that is between January 2001 and June 2014 and the value of 1 in the

period after demutualization and self- listing that is between October 2014 and December 2016.

ε the error term

3.5.2 Tests of Significance

Parametric tests i.e. F-test in Analysis of Variance (ANOVA) and t-test were used to measure statistical significance in the difference of mean ratios. The F statistic was utilized to establish a statistical significance of regression equation while the t statistic was used to test statistical significance of study coefficients.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND INTERPRETATION

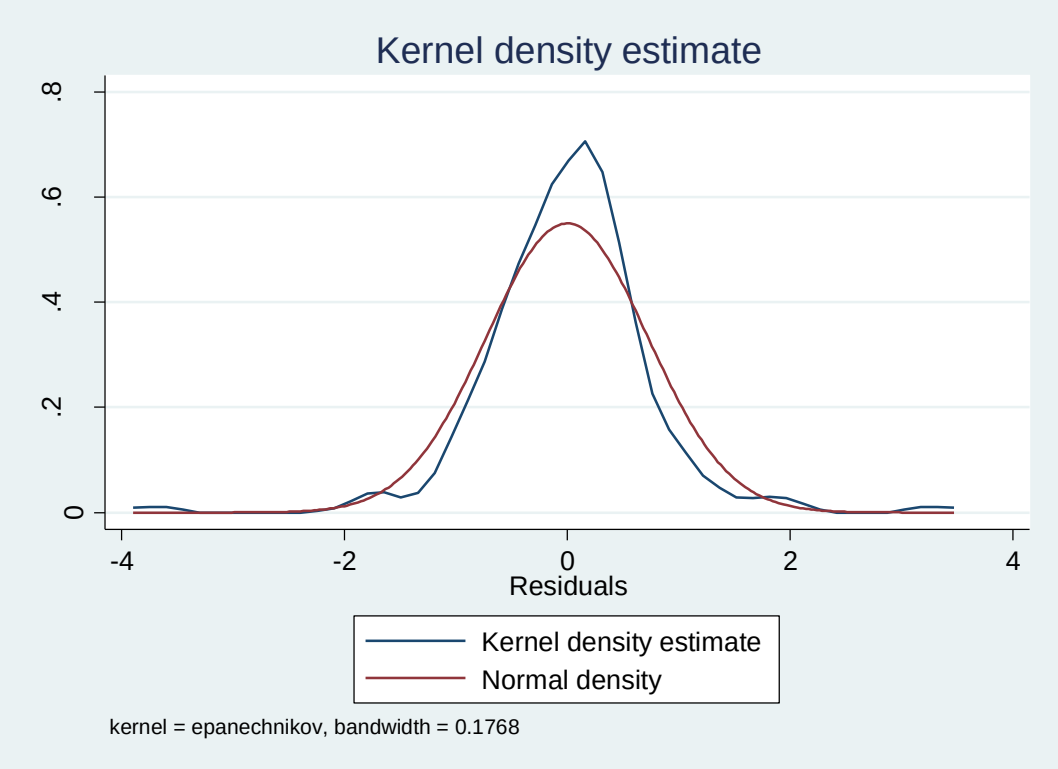
4.1 Introduction

This chapter focused on the analysis of the collected data from NSE, CBK, KNBS to establish the effect of demutualization and automation on stock market performance as measured by returns, equity trade volumes and liquidity. Using descriptive statistics, correlation analysis and regression analysis, the results of the study were presented in tables and figures as shown in the following sections.

4.2 Diagnostic Tests

The data was subjected to diagnostic tests to check for normality and heteroscedasticity. Kernel density was used to test for normality. Figure 4.1 shows that the data is normally distributed.

Figure 4.2: Normality test



Cameron & Trivedi's IM-test used to test for heteroscedasticity. The null hypothesis states that there is no heteroscedasticity. Results in Table 4.1 show that the p-value (*p=0.3629*) is greater than the critical value of 0.05. Therefore, we fail to reject the null hypothesis and conclude that the variance is homogenous.

Table 0.1: Cameron & Trivedi's decomposition of IM-test

Source	chi2	Df	P
Heteroskedasticity	18.42	17	0.3629

4.3 Descriptive Analysis

Descriptive statistics gives a presentation of the average, maximum and minimum values of variables applied together with their standard deviations in this study are as shown in Table 4.2.

Table 0.2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Returns	192	-17.9	23.8	.33	5.31
Volume Traded	176	2519747	2154897342.0	320496610.815	306649286.15
Liquidity	176	.6	402.9	31.560	33.8608
Inflation rate	192	.46	19.716	8.35	4.71
Interest rate	192	.83	18	8.71	3.51
Exchange rate	192	62.03	105.29	82.52	9.17

From the data, inflation recorded a mean of 8.35 with a standard deviation of 4.71 while Exchange rate had a mean of 82.52 and a standard deviation of 9.17. Stock return had a mean of 0.33 with a standard deviation of 5.31. Volume traded recorded a mean of 320496610.815 and a standard deviation of 306649286.15 while liquidity recorded a mean of 31.56 and a standard deviation of 33.86.

4.4 Correlation Analysis

Correlation analysis is used to establish if there exists a relationship between two variables which lies between (-) strong negative correlation and (+) perfect positive correlation. Pearson correlation was employed to analyze the level of association between the stock market performance (stock return, volume traded and liquidity) and the independent variables for this study (inflation, interest rates, exchange rates, demutualization and self-listing dummy and automation dummy). The results are as shown in Table 4.3

From the correlation results presented in table 4.3, there is a weak positive correlation between the volume traded and inflation. There is a significant positive correlation between volume traded and automation, demutualization, interest rate and exchange rate. We can then conclude that there is evidence that the volume of shares traded is related to automation as the coefficient is close to one.

Liquidity has a very weak negative correlation with inflation, exchange rate, automation and demutualization. However, it has a positive correlation with automation. There is a weak and negative correlation between returns and inflation rate, interest rate, exchange rate, automation and demutualization.

Focusing on the independent variables, there is a negligible positive correlation between inflation and interest rate and automation, while there exists a weak negative correlation between inflation rate and exchange rate and demutualization. Exchange rate has a strong and positive correlation with demutualization while it has a moderate positive correlation

with automation. Demutualization has a negligible positive correlation with liquidity but has a negligible negative correlation with returns and inflation rates.

Table 0.3: Correlation Analysis									
		Returns	Volume Traded	Liquidity	Inflation Rate	Interest rate	Exchange rate	Automation	Demutualization
Returns	Pearson Corr	1	-.053	.070	-.027	-.139	-.197**	-.163*	-.169*
	Sig. (2-tailed)		.487	.356	.725	.065	.009	.031	.026
Volume Traded	Pearson Corr	-.053	1	.187*	.123	.161*	.475**	.928**	.355**
	Sig. (2-tailed)	.487		.013	.105	.033	.000	.000	.000
Liquidity	Pearson Corr	.070	.187*	1	-.006	-.047	-.083	.125	-.026
	Sig. (2-tailed)	.356	.013		.935	.534	.273	.100	.734
Inflation rate	Pearson Corr	-.027	.123	-.006	1	.027	-.144	.088	-.177*
	Sig. (2-tailed)	.725	.105	.935		.723	.057	.249	.020
Interest rate	Pearson Corr	-.139	.161*	-.047	.027	1	.269**	.291**	.177*
	Sig. (2-tailed)	.065	.033	.534	.723		.000	.000	.020
Exchange rate	Pearson Corr	-.197**	.475**	-.083	-.144	.269**	1	.457**	.773**
	Sig. (2-tailed)	.009	.000	.273	.057	.000		.000	.000
Automation	Pearson Corr	-.163*	.928**	.125	.088	.291**	.457**	1	.336**
	Sig. (2-tailed)	.031	.000	.100	.249	.000	.000		.000
Demutualization	Pearson Corr	-.169*	.355**	-.026	-.177*	.177*	.773**	.336**	1
	Sig. (2-tailed)	.026	.000	.734	.020	.020	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

4.5 Regression Analysis

4.5.1 Stock Returns regression results

Stock return was regressed against five predictor variables; inflation, interest rates, exchange rate, automation dummy and demutualization dummy. The regression analysis was undertaken at 10% significance level. The critical value obtained from the F – table was compared with the one obtained from the regression analysis.

The study obtained the model summary statistics as shown in table 4.4 below.

Table 0.4: Model Summary for Stock Return

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.226a	.051	.025	5.3505
Predictors: (Constant), Demutualization, Inflation rate, Interest rate, Automation, Exchange rate Dependent Variable: stock return				

The results show that there is a low degree of correlation between the stock returns and the explanatory variables. R squared, being the coefficient of determination indicates the deviations in the response variable that is as a result of changes in the predictor variables. The R^2 indicates that only 5.1% of the variation in stock returns is explained by demutualization, inflation rate, interest rate, automation and exchange rates.

Table 0.5: Stock Returns ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	279.682	5	55.936	1.954	.088[b]
	Residual	5210.317	186	28.628		
	Total	5489.999	191			
Predictors: (Constant), Demutualization, Inflation rate, Interest rate, Automation, Exchange rate						

The results show that there is a statistically significant difference between the means of regression and the residual at 10 significance level, this is depicted by the one-way ANOVA (F (5,182) = 1.954, *p=0.088.*

The results for the regression model for returns is shown in Table 4.6

Table 0.6: Model Coefficients-Returns

	Unstandardized Coefficients		Standardized Coefficients		
Returns Model	B	Std. Error	Beta	T	Sig.
(Constant)	7.707	4.785		1.611	.109
Inflation rate	-.036	.085	-.031	-.417	.677
Interest rate	-.109	.122	-.069	-.897	.371
Exchange rate	-.067	.062	-.120	-1.080	.282
Automation	-.820	.898	-.072	-.914	.362
Demutualization	-.744	1.714	-.048	-.434	.665

The coefficient of both automation and demutualization are not significant and thus cannot explain the movement in stock returns.

4.5.2 Volume Traded regression results

Table 0.7: Model Summary for Volume Traded

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.939[a]	.882	.878	.2745195	1.727
a. Predictors: (Constant), Demutualization, Interest rate, Inflation rate, Automation, Exchange rate					
b. Dependent Variable: Volume Traded					

The model precisely predicts the volume traded with an R value of 94 percent. Consequently, 88 percent of the variability in Volume traded is explained by demutualization, interest rate, inflation rate, automation and exchange rate.

Table 0.8: Volume Traded ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	93.549	5	18.710	248.268	.000[b]
	Residual	12.510	166	.075		
	Total	106.059	171			
a. Dependent Variable: Volume Traded						
b. Predictors: (Constant), Demutualization, Interest rate, Inflation rate, Automation, Exchange rate						

There was a statistically significant difference between the means of regression and the residual, this is depicted by the one-way ANOVA (F (5,166) = 248.268, *p=0.000.*

The regression model for volume traded was log-linear and the results are as shown in Table 4.9

Table 0.9: Model Coefficients-Volume Traded

Log of Volume Traded Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.658	.300		22.230	.000
Inflation rate	.010	.005	.062	2.250	.026
Interest rate	-.030	.006	-.134	-4.732	.000
Exchange rate	.008	.004	.094	2.093	.038
Automation	1.482	.050	.915	29.598	.000
Demutualization	.020	.091	.009	.223	.824

Compared to the period before automation, volume traded increased by 91 percent post automation. This result is significant at 1 percent level of significance and is consistent with that of Mailafia (2012), Iskandrani & Haddad (2012) and Nyamoita (2009). On the other hand, the effect of demutualization on volume traded is not significant and this is in line with the findings of Serif soy (2005) and Morsy and Rwegasira (2010) where demutualization is seen to impact more on corporate governance than the market

performance. Interest rate has a negative on volumes traded and is significant effect at 1 percent level of significance. The effect of inflation and exchange rate on volumes traded is positive and significant at 5 percent level of significance.

4.5.3 Liquidity Regression Results

Table 0.10: Model Summary for Liquidity

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.221[a]	.049	.020	33.8712	1.826
a. Predictors: (Constant), Demutualization, Interest rate, Inflation rate, Automation, Exchange rate					

The findings show that, about 4.9% of the variation in liquidity is explained by demutualization, interest rate, inflation rate, automation and exchange rate. The model has a relatively low correlation between Liquidity and the predictor variables. The results of the Durbin-Watson statistics (1.826) show that there is no autocorrelation in the sample used.

Table 0.11: Liquidity ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9813.194	5	1962.639	1.711	.135[b]
	Residual	190445.274	186	1147.261		
	Total	200258.468	191			
Predictors: (Constant), Demutualization, Interest rate, Inflation rate, Automation, Exchange rate						

The results show that there is no statistically significant difference between the means of regression and the residual, this can be shown by the one-way ANOVA (F (5,166) = 1.711, *p=0.135.*

Table 0.12: Model Coefficients-Liquidity

Liquidity Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	103.606	36.955		2.804	.006
Inflation rate	-.298	.564	-.041	-.529	.598
Interest rate	-.593	.775	-.062	-.765	.446
Exchange rate	-.919	.474	-.248	-1.939	.054
Automation	15.793	6.179	.224	2.556	.011
Demutualization	8.848	11.261	.094	.786	.433

The regression results with liquidity as the dependent variable show that exchange rate is negatively associated with liquidity at 10 percent level of significance. An increase in the exchange rate by one unit reduces the liquidity by 0.25 units. Effect of automation on liquidity is positive and significant at 5% level of significance. Compared to the period before automation, automation increased liquidity by 0.224 units. The results are consistent with the studies done by Murinde (2006), Iskandrani & Haddad (2012) and Mensah, Pomaa-Berko and Adom, (2012) where automation is seen to improve market liquidity. Results on demutualization are positive but not significant. This is consistent with other studies as demutualization is seen to indirectly influence market performance through improved efficiency in the management of the markets.

4.6 Discussion of Research Findings

The study sought to determine the effect of demutualization and automation on stock market performance of Nairobi Securities Exchange Limited as measured by stock market returns, equity trade volumes and liquidity using monthly secondary data collected from NSE, CBK and KNBS for the period 2001-2016. The independent variables for the study were automation and demutualization of the stock exchange and

they were represented by dummies that took a value of zero before the event and a value of one after the event. The control variables were average monthly inflation rate as measured by CPI, average monthly interest rates as measured by bank rates and average monthly exchange rates as measured by KSH/USD. Multivariate linear regression was employed using the Statistical Package for Social Sciences (SPSS) version 21 computer software.

The Pearson correlation coefficients between the variables revealed that a significant weak negative correlation between returns and exchange rate and returns and demutualization. The volume traded was found to be significantly positively correlated with interest rate, exchange rate, automation and demutualization. There was also correlation between dependent variables (returns, volume traded and liquidity) but this association was found to be insignificant. The results of correlation further revealed that the independent variables selected for this study also had some significant association.

The model summary revealed that the independent variables: inflation, interest rates, exchange rate, automation dummy and demutualization dummy explains 88% of changes in the stock volume traded at the NSE as indicated by the value of R^2 which implies that the are other factors not included in this model that account for 12% of changes in volume traded at the NSE. The model is fit at 99% level of confidence since the F-value is 248.268. This shows that the overall multiple regression model is statistically significant and is an adequate model for predicting and explaining the influence of the selected independent variables on the stock volumes traded at the NSE.

This study is in agreement with Nyamoita (2009) who assessed the performance of 49 firms listed at NSE before and after the implementation of ATS. She observed that upon

implementation of the ATS there was remarkable growth in the following market parameters: NSE's market capitalization, volume and turnover of shares traded, number of deals per trading session and the NSE 20 share index. Further, the ANOVA results revealed that the growth in all the performance indicators considered was significant. The study concluded that the implementation of automated trading systems at the NSE led to improved stock market performance.

The study is in contrast with Mwangi (2015) who investigated how automation affected market trade volumes at the NSE. The study considered secondary data on monthly accumulated stock volume of 31 listed companies from January 2002 to December 2012. Descriptive statistics was used for analysis together with a t-test to test the significance. The study concluded that introduction of the ATS had no statistically significant effect on stock volume at the NSE. However, few companies had registered surge in traded stock volumes traded after automation, which may have been caused by other factors which were not considered in the research. The effect on traded volume may have been caused by a number of factors which include: organizational related, macro or micro economic and therefore unrelated to the system introduced.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the previous chapter, conclusion, limitations encountered during the study. This chapter also elucidates the policy recommendations that policy makers can implement to achieve the desired impact of micro- structure changes on stock market performance. Lastly the chapter presents suggestions for further research which can be useful to future researchers.

5.2 Summary of Findings

The study sought to determine the effect of demutualization and automation on stock market performance of Nairobi Securities Limited as measured by returns, equity trade volumes and liquidity using secondary data collected from NSE, CBK and KNBS. The study made use of both descriptive and inferential statistics to analyze the data using the Statistical Package for Social Sciences (SPSS) version 21 computer software.

From the results of correlation analysis, the study found that a significant weak negative correlation exists between stock market returns and exchange rate in Kenya. The same is also applicable between stock market returns and demutualization. The volume traded was found to be significantly positively correlated with interest rate, exchange rate, automation and demutualization. The association between liquidity and all the independent variables were found to be insignificant.

Regression results when trading volumes is used as the dependent variable produced an R square of 88 percent which means that the independent variables: inflation, interest rates, exchange rate, automation dummy and demutualization dummy explains 88% of changes

in the stock volume traded at the NSE which implies that there are other factors not included in this model that account for 12% of changes in volume traded at the NSE. The model is fit at 99% level of confidence since the F-value is 248.268. This shows that the overall multiple regression model is statistically significant and is an adequate model for predicting and explaining the influence of the selected independent variables on the stock volumes traded at the NSE. The model for stock market returns and liquidity were found to be insignificant.

Results show that introduction of ATS at the NSE led to an increase in volumes traded and improved market liquidity. This finding implies that automation improved market performance of the NSE while the impact of automation on market returns could not be established.

Results on demutualization were not significant across the three regression equations and had mixed signs. This in line with the previous studies where demutualization of stock markets is seen to be done when existing mutual ownership structures fall short of providing adaptability and financial support needed to thrive in current competitive environment. Demutualization is therefore more of a governance tool and may not directly impact on market performance.

5.3 Conclusions

This study found that stock market trading volumes are significantly affected by the selected predictor variables (inflation, interest rates, exchange rates, automation and demutualization) and therefore this study concludes that a unit increase or decrease in these variables will lead to a significant effect on the stock market trading volumes at the

NSE. The study further concludes that automation is a significant determiner of stock market trading volumes as shown by a high t- value and a p- value that is less than 0.05.

This study concludes that independent variables selected for this study inflation, interest rates, exchange rates, automation and demutualization influence to a large extent stock market trading volumes at the NSE. It is sufficient to conclude that these variables significantly influence stock market trading volumes as shown by the p value in anova summary. The fact that the five independent variables explain 88% of changes in stock market volume traded implies that the variables not included in the model explain 12% of changes in stock market trading volumes at the NSE.

This study is in agreement with Nyamoita (2009) who assessed the performance of 49 firms listed at NSE before and after the implementation of ATS. She observed that upon implementation of the ATS there was remarkable growth in the following market parameters: NSE's market capitalization, volume and turnover of shares traded, number of deals per trading session and the NSE 20 share index. Further, the ANOVA results revealed that the growth in all the performance indicators considered was significant. The study concluded that the implementation of automated trading systems at the NSE led to improved stock market performance.

5.4 Recommendations

Based on the study findings, the following recommendations have been made: The NSE should continue implement the ATS upgrades and leverage on technology so that volume traded and liquidity can continue to grow. Introduction of sponsored automated order routing, direct market access and algorithm trading would help in realizing the full benefits of technology in enhancing efficiency and integrity in stock trading.

Need to introduce the on-line discount trading services which are more appropriate for individuals who require fast execution, lowest commissions and have the expertise to make their own trading decisions without the direction of a full service broker.

Introduction of securities lending and borrowing could enhance market liquidity particularly in regards to long-term portfolio held by institutional investors and high net worth investors. Deployment of superior technology is an important aspect in reducing the settlement cycle which is currently T+3 to a shorter time; this would go a long way in enhancing market liquidity.

The above initiatives should go hand in hand by creation of an enabling environment for capital market growth and development for the results of automation to be maximized. Critical aspects for consideration include enabling legislations and subsidiary regulatory framework as well as incentives to attract investors.

5.5 Limitations of the Study

The scope of this research was for ten years 2001-2016. It has not been determined if the results would hold for a different study period. Furthermore, it is uncertain whether similar findings would result beyond 2016. A longer study period is more reliable as it will take into account major economic conditions such as booms and recessions. Unlike the period post automation, the data obtained for the period during the open outcry may be prone to human errors and therefore yielding to wrong conclusion.

One of the limitations of the study is the quality of the data. It is difficult to conclude from this research whether the findings present the true facts about the situation. The data that has been used is only assumed to be accurate. The measures used may keep on

varying from one year to another subject to prevailing condition. The study utilized secondary data, which had already been obtained and was in the public domain, unlike the primary data which is first-hand information. The study also considered selected determinants of and not all the factors affecting the stock market performance mainly due to limitation of data availability.

For data analysis purposes, the researcher applied a multiple linear regression model. Due to the shortcomings involved when using regression models such as erroneous and misleading results when the variable values change, the researcher cannot be able to generalize the findings with certainty. If more and more data is added to the functional regression model, the hypothesized relationship between two or more variables may not hold.

5.6 Suggestions for Further Research

This study focused on micro- structure changes and stock performance at the Nairobi Securities Exchange and relied on secondary data. The study considered three aspects of the stock performance namely: stock return, trade volumes and market liquidity. The stock return was computed from the 20 share index data. Further studies could compute returns from NSE All Share Index, FTSE NSE 15 or FTSE NSE 25 Share index and include in the regression model other aspects of market performance such as volatility as the dependent variable.

The study was not exhaustive of the independent variables affecting stock market performance at NSE and therefore this study recommends that further studies be conducted to incorporate other variables like diaspora remittances, foreign direct

investments, political stability and other macro-economic variables. Exchange rates are a function of many macroeconomic variables.

NSE is currently undertaking microstructure changes particularly enhancing technology and the review of regulatory framework to address the contemporary issues in the capital market. The full impact of automation and demutualization may not have been fully realized owing to the fact that the implementation is still in progress. Finally, due to the shortcomings of regression models, other models such as the Vector Error Correction Model (VECM) can be used to explain the various relationships between the variables.

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APPENDICES 1: DATA ANALYZED

Monthly Total Listed Shares				
Month	**Total Listed Shares**	**Volume Traded Monthly**	**Liquidity**	**Returns**
Jan-01	3,649,022,973	4,387,464	0.0000573	(0.000558)
Feb-01	3,648,428,302	7,462,296	0.0000974	0.000980
Mar-01	3,648,428,302	4,962,768	0.0000648	(0.002465)
Apr-01	3,660,316,072	4,602,070	0.0000599	(0.001827)
May-01	3,695,988,756	4,707,368	0.0000606	(0.003484)
Jun-01	3,769,106,494	6,950,725	0.0000878	0.000637
Jul-01	3,806,506,494	5,099,370	0.0000638	(0.001053)
Aug-01	3,818,129,338	4,130,511	0.0000515	(0.003197)
Sep-01	3,816,066,600	2,542,008	0.0000317	(0.003578)
Oct-01	3,816,066,603	5,453,596	0.0000681	0.002314
Nov-01	4,326,066,603	8,141,130	0.0000896	(0.001637)
Dec-01	4,333,410,325	2,624,118	0.0000288	(0.002752)
Jan-02	4,343,975,505	2,519,747	0.0000276	(0.000386)
Feb-02	4,413,743,811	5,522,767	0.0000596	(0.001117)
Mar-02	4,413,743,811	5,900,957	0.0000637	(0.005181)
Apr-02	4,413,743,811	7,991,393	0.0000862	(0.002208)
May-02	4,431,570,126	4,822,586	0.0000518	(0.002378)
Jun-02	4,431,570,126	5,194,673	0.0000558	0.000488
Jul-02	4,431,570,126	4,932,541	0.0000530	0.000453
Aug-02	4,374,469,117	4,237,680	0.0000461	(0.002299)
Sep-02	4,374,469,117	6,037,882		

			0.0000657	0.000016
Oct-02	4,374,469,117	7,771,470	0.0000846	0.003247
Nov-02	4,374,469,117	8,372,178	0.0000911	0.001939
Dec-02	4,374,469,117	13,922,672	0.0001516	0.009512
Jan-03	4,374,469,117	18,634,652	0.0002029	0.005088
Feb-03	4,374,469,117	11,313,391	0.0001232	0.001553
Mar-03	4,374,469,117	9,076,342	0.0000988	0.001597
Apr-03	4,374,469,117	11,305,261	0.0001231	0.006950
May-03	4,374,469,117	30,062,954	0.0003273	0.005792
Jun-03	4,210,001,587	15,217,503	0.0001721	0.001563
Jul-03	4,248,393,187	14,151,258	0.0001586	(0.003446)
Aug-03	4,248,393,187	18,657,575	0.0002091	0.002394
Sep-03	4,248,393,187	19,471,555	0.0002183	0.005574
Oct-03	4,248,393,187	17,478,215	0.0001959	0.001536
Nov-03	4,248,393,187	15,780,246	0.0001769	0.005755
Dec-03	4,248,393,187	11,887,668	0.0001332	0.000047
Jan-04	4,253,193,187	23,461,383	0.0002627	0.006885
Feb-04	4,275,688,453	36,589,397	0.0004075	0.000298
Mar-04	4,300,767,533	27,105,171	0.0003001	(0.005876)
Apr-04	4,300,767,533	24,732,634	0.0002738	(0.001083)
May-04	4,300,767,533	17,000,942	0.0001882	(0.000290)
Jun-04	4,324,767,533	25,209,373	0.0002776	(0.000871)
Jul-04	4,440,208,387	41,145,438	0.0004413	0.001175

Aug-04	4,440,208,387	18,814,250	0.0002018	0.000024
Sep-04	4,440,208,387	18,513,752	0.0001986	(0.000639)
Oct-04	4,440,208,387	23,246,813	0.0002493	0.003063
Nov-04	5,097,512,042	18,549,926	0.0001733	0.001476
Dec-04	5,097,512,042	19,013,931	0.0001776	0.000459
Jan-05	5,097,512,042	19,190,636	0.0001793	0.002358
Feb-05	5,058,726,078	20,722,015	0.0001951	0.001887
Mar-05	5,058,724,115	15,645,989	0.0001473	(0.001295)
Apr-05	5,058,724,115	18,078,739	0.0001702	0.001528
May-05	5,058,724,115	29,000,501	0.0002730	0.003955
Jun-05	5,058,724,115	49,686,742	0.0004677	0.005983
Jul-05	5,101,394,180	56,691,077	0.0005292	0.000168
Aug-05	5,101,394,180	35,463,894	0.0003310	(0.000468)
Sep-05	5,101,394,180	27,147,465	0.0002534	(0.001230)
Oct-05	5,221,394,216	28,523,929	0.0002601	0.001567
Nov-05	5,221,394,216	40,872,022	0.0003728	0.000467
Dec-05	5,233,394,216	41,948,590	0.0003817	(0.000007)
Jan-06	5,233,394,216	71,731,499	0.0006527	0.002337
Feb-06	5,233,394,216	30,618,720	0.0002786	(0.001395)
Mar-06	5,284,580,804	35,986,581	0.0003243	0.000515
Apr-06	5,284,580,804	28,378,361	0.0002557	(0.001098)
May-06	7,482,942,260	89,688,101	0.0005707	0.003555
Jun-06	7,482,942,260	70,345,339	0.0004477	(0.000970)

Jul-06	7,482,942,260	46,121,644	0.0002935	(0.000018)
Aug-06	7,732,506,810	57,655,004	0.0003551	0.002274
Sep-06	7,915,656,810	-	- 0.004052	
Oct-06	7,918,875,336	-	- 0.004544	
Nov-06	9,073,076,736	-	- 0.002544	
Dec-06	9,298,604,079	-	- 0.000335	
Jan-07	9,885,559,991	-	- 0.001116	
Feb-07	10,382,629,851	-	- (0.003399)	
Mar-07	10,383,629,851	-	- (0.001956)	
Apr-07	12,361,158,951	-	- 0.000698	
May-07	12,369,300,621	-	- (0.001739)	
Jun-07	12,596,159,316	-	- 0.001445	
Jul-07	12,596,159,316	-	- 0.001769	
Aug-07	13,207,188,366	-	- 0.000275	
Sep-07	13,207,188,366	-	- (0.002095)	
Oct-07	13,237,188,366	-	- (0.001520)	
Nov-07	13,386,508,516	-	- 0.002366	
Dec-07	14,535,034,021	-	- 0.002843	
Jan-08	14,698,417,182	197,138,368	0.0006387	(0.006567)
Feb-08	14,982,082,342	198,833,329	0.0006320	0.003610
Mar-08	14,982,082,342	180,643,703	0.0005742	(0.002317)
Apr-08	15,003,399,394	141,766,425	0.0004500	0.004427
May-08	15,003,399,394	168,033,932	0.0005333	(0.001432)

Jun-08	55,009,415,485	2,154,897,342	0.0018654	0.000132
Jul-08	55,195,720,745	1,052,819,494	0.0009083	(0.002722)
Aug-08	55,417,498,522	490,810,425	0.0004217	(0.002156)
Sep-08	55,417,498,522	485,283,030	0.0004170	(0.004688)
Oct-08	55,479,188,177	393,530,199	0.0003378	(0.010759)
Nov-08	55,479,188,177	290,952,988	0.0002497	(0.000348)
Dec-08	59,115,615,777	170,903,933	0.0001377	0.002690
Jan-09	58,942,143,322	177,553,320	0.0001434	(0.004520)
Feb-09	58,945,838,967	150,639,921	0.0001217	(0.012719)
Mar-09	62,278,859,041	207,389,552	0.0001586	0.005869
Apr-09	62,321,622,529	214,086,036	0.0001636	(0.000056)
May-09	62,321,622,529	307,999,937	0.0002353	0.000938
Jun-09	62,321,622,529	377,558,195	0.0002885	0.006953
Jul-09	62,316,832,136	296,190,366	0.0002263	(0.000258)
Aug-09	62,317,432,136	280,892,340	0.0002146	(0.003124)
Sep-09	62,317,432,136	231,691,793	0.0001770	(0.001498)
Oct-09	62,317,432,136	303,297,307	0.0002318	0.001452
Nov-09	62,317,432,136	396,360,128	0.0003029	0.001618
Dec-09	62,344,876,040	214,896,903	0.0001641	0.000954
Jan-10	65,719,188,799	603,905,016	0.0004376	0.004712
Feb-10	62,347,626,040	369,757,668	0.0002824	0.000906
Mar-10	62,340,783,940	627,000,012	0.0004789	0.005073
Apr-10	62,420,783,940	398,608,626	0.0003041	0.001946

May-10	63,780,020,888	933,604,558	0.0006970	0.000115
Jun-10	63,812,173,064	364,706,595	0.0002722	0.001092
Jul-10	63,812,173,064	518,228,979	0.0003867	0.001042
Aug-10	64,549,064,430	515,328,777	0.0003802	0.000223
Sep-10	64,582,584,206	402,237,264	0.0002966	0.001764
Oct-10	64,667,353,083	500,963,725	0.0003689	0.000188
Nov-10	65,237,194,980	498,778,834	0.0003641	(0.002638)
Dec-10	65,222,054,305	527,593,983	0.0003852	0.000397
Jan-11	65,719,188,799	725,053,319	0.0005254	0.000365
Feb-11	66,323,873,189	335,248,661	0.0002407	(0.002574)
Mar-11	66,335,441,585	469,027,076	0.0003367	(0.003736)
Apr-11	66,850,711,949	497,187,089	0.0003542	0.001906
May-11	71,045,690,341	410,874,889	0.0002754	0.000582
Jun-11	71,143,781,196	410,971,267	0.0002751	(0.001293)
Jul-11	71,443,426,708	433,660,365	0.0002890	(0.002813)
Aug-11	71,521,775,240	551,878,374	0.0003674	(0.003401)
Sep-11	73,473,721,796	582,385,335	0.0003774	(0.002406)
Oct-11	73,413,227,090	570,140,825	0.0003698	0.003685
Nov-11	73,473,721,797	398,897,214	0.0002585	(0.004778)
Dec-11	73,473,721,797	336,501,280	0.0002181	0.000839
Jan-12	73,473,721,797	350,563,453	0.0002272	0.000292
Feb-12	73,473,721,797	342,144,645	0.0002217	0.001175
Mar-12	73,690,551,468	366,219,819	0.0002367	0.000875

Apr-12	73,690,551,468	537,953,405	0.0003476	0.002755
May-12	73,749,051,468	543,634,988	0.0003510	0.001332
Jun-12	74,783,905,019	385,509,173	0.0002455	0.000732
Jul-12	77,767,439,639	383,612,319	0.0002349	0.001638
Aug-12	77,769,033,839	338,915,464	0.0002075	0.000420
Sep-12	77,800,911,857	470,256,350	0.0002878	0.001371
Oct-12	77,915,714,748	458,432,419	0.0002802	0.001965
Nov-12	78,059,434,556	836,901,766	0.0005105	(0.000688)
Dec-12	80,128,894,756	461,887,751	0.0002745	0.000679
Jan-13	80,128,894,756	518,714,601	0.0003083	0.003050
Feb-13	80,162,858,224	692,284,390	0.0004112	0.001289
Mar-13	80,162,858,224	571,288,445	0.0003394	0.003942
Apr-13	80,162,858,224	596,930,579	0.0003546	(0.000949)
May-13	80,173,241,009	867,892,967	0.0005155	0.002264
Jun-13	80,573,762,066	727,779,964	0.0004301	(0.004239)
Jul-13	81,008,291,100	615,904,703	0.0003620	0.001766
Aug-13	81,008,291,100	670,380,003	0.0003941	(0.000941)
Sep-13	81,044,273,100	488,787,951	0.0002872	0.000965
Oct-13	81,044,273,100	804,508,379	0.0004727	0.002158
Nov-13	80,961,727,079	645,196,613	0.0003795	0.001078
Dec-13	81,149,372,716	466,250,841	0.0002736	(0.001914)
Jan-14	81,403,527,183	638,480,683	0.0003735	(0.000629)
Feb-14	81,144,979,033	545,319,597	0.0003200	0.001171

Mar-14	81,172,489,917	544,064,990	0.0003192	0.000130
Apr-14	81,172,489,917	727,992,943	0.0004271	0.000038
May-14	81,231,468,332	853,713,492	0.0005005	(0.000647)
Jun-14	81,929,942,215	731,035,438	0.0004249	0.000047
Jul-14	81,936,274,635	625,475,257	0.0003635	0.000204
Aug-14	82,394,207,732	628,637,118	0.0003633	0.002223
Sep-14	82,588,832,732	767,177,355	0.0004423	0.001043
Oct-14	83,151,067,970	506,045,276	0.0002898	(0.000512)
Nov-14	83,333,474,181	665,901,829	0.0003805	(0.000361)
Dec-14	83,479,180,050	899,752,605	0.0005132	(0.000366)
Jan-15	83,578,715,030	414,278,094	0.0002360	0.000927
Feb-15	82,996,005,590	593,241,700	0.0003404	0.002617
Mar-15	82,996,005,590	614,200,635	0.0003524	(0.002050)
Apr-15	83,140,672,257	487,839,444	0.0002794	(0.001506)
May-15	83,140,672,257	683,759,178	0.0003916	(0.003075)
Jun-15	83,181,664,397	680,711,097	0.0003897	0.001183
Jul-15	83,182,264,397	714,882,371	0.0004092	(0.004660)
Aug-15	83,236,253,897	733,757,417	0.0004198	(0.002467)
Sep-15	83,247,151,679	433,964,381	0.0002482	(0.000021)
Oct-15	83,294,605,679	540,044,777	0.0003087	(0.003578)
Nov-15	83,294,605,679	440,591,845	0.0002519	0.001885
Dec-15	83,294,605,679	476,177,628	0.0002722	0.000297
Jan-16	83,307,273,999	422,742,285	0.0002416	(0.003402)

Feb-16	83,307,273,999	341,032,923	0.0001949	0.001126
Mar-16	84,371,581,691	535,924,732	0.0003025	0.001471
Apr-16	84,371,581,691	426,654,391	0.0002408	0.000341
May-16	84,497,772,167	384,799,609	0.0002169	(0.002190)
Jun-16	84,644,809,234	601,399,080	0.0003383	(0.002113)
Jul-16	88,732,300,489	543,562,757	0.0002917	(0.002114)
Aug-16	88,855,858,717	708,070,218	0.0003795	(0.003945)
Sep-16	88,855,859,508	746,887,107	0.0004003	0.000973
Oct-16	89,320,524,708	351,707,111	0.0001875	(0.000199)
Nov-16	89,320,524,708	461,707,698	0.0002461	0.000258
Dec-16	89,320,524,708	289,004,328	0.0001541	(0.000980)