TESTING EFFICIENT MARKET HYPOTHESIS OF NAIROBI SECURITIES EXCHANGE

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DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere presented for any award or degree. I hereby declare that this document contains no material or published by other people except where due reference is made and author duly acknowledged.

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ABSTRACT

There has been an increased interest in the emerging markets stock exchanges, with scholars and practiooners raising concerns as to the nature of markets in various stock exchange. This study thus will be carried out with an aim to test the efficient market hypothesis at Nairobi Stock Exchange. Specifically the study will: test the random walk hypothesis for the returns of securities traded and determines. To determine whether stock market exhibits a trend towards increased efficiency over time. The study made use of data that was collected NSE NSE 20-share Index from 1st January 2009 to 31st December 2013. The study will use both parametric and non-parametric tests to analyse the results through STATA. Unit root test, runs test and Autocorrelation tests were carried out to test for the efficient market hypothesis at Nairobi Stock exchange. The study results revealed varied results with the runs tests indicating that NSE follows a random walk hypothesis while the autocorrelation tests and unit root tests showed that NSE was not weak form efficient. The research concluded that the NSE was not weak form efficient, with all the tests rejecting the existence of weak form of hypothesis. This indicates that the market has a flow of public information which affect the trading at NSE. The study further recommends the need to put in place policies to ensure continuous flow of information.

Key words: Efficient Market Hypothesis, Random walk Model

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DEDICATION

I dedicate this work to my family and my dissertation supervisor Dr Christine Nanjala: for the assistance that she gave me during the period of my work study. I sincerely appreciate them for their patience and understanding.

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LIST OF ACROYNMS/ABBREVIATIONS

ADF: Augmented Dickey-Fuller Test

ATS: Automated Trading System

BBO: Broker Back Office

CDSC: Central Depository and Settlement Corporation

CHU: Complaints Handling Unit

EMH: Efficient Market Hypothesis

FTSE: Financial Times Stock Exchange

K-S: Kolmogrov-Smirnov Goodness of Fit (K-S) Test

MV/BV: Market Value to Book Value

MOU: Memorandum of Understanding

NASI: Nairobi All Share Index

NSE: Nairobi Securities Exchange

P/E: Ratio Price/Earnings Ratio

P-P: Phillips-Peron Test

P/S: Ratio Price/Sales Ratio

FDIs: Foreign Direct Investments

OPERATIONAL DEFINITION OF TERMS

Excess returns: buy and hold returns that are in excess of the return on a market performance gauge such as the SE 20-share index (Wheeler et al, 2002).

Information: anything which, when known, will cause share price to rise or fall. It must not be related to anything previously known (Abeysekera, 2001).

Pricing efficiency: ability of the stock market to adjust share prices rapidly and accurately to the release of economically significant information (Fama, 2007).

Efficient Market Hypothesis: This is is a market in which prices reflect all available information (Fama, 2007).

INTRODUCTION

1.1 Background of the study

Financial markets have been identified as avenues for increasing economic growth. This is attributed to their ability to improve efficiency and allocation of savings in the economy. The participation of investors in the bourses has had far reaching positive effects on national economies. This has been by way of facilitating capital transfer and allocation of economies stock (Alberta, 2011). The financial markets can only be efficient the moment the security prices reflect the dynamics of the economic output indicators.

The advent of economic liberalization and removal of interest rates regulation has allowed the market forces of supply and demand to dictate the stock prices and influence the performance of share markets. The globalization of business has equally brought along with it the integration of financial markets. This gives the firms trading in the different bourses the benefit of information sharing. On the other hand it has the undoing of getting the different underlying parameters influencing the activities in the varied markets (Jarret, 2008). Financial markets which are well developed are considered efficient and well integrated with other markets with same abilities and characteristics. Price behavior has been a critical underlying factor in influencing the level of development of a financial market and its ability to be efficient.

1.1.1 Efficient Market Hypothesis

A market is efficient if information set at $\emptyset t$,and by trading using information set at $\emptyset t$ its possible to make economic profits (Jensen 1978).According to malkiel(1992) an efficient capital market reflects full and correctly relevant information necessary in determining security prices. The main role of stock market is the allocation of owner's economy capital stock.in an efficient market, prices provide accurate information necessary for resource allocation. This helps firms in making

ideal investment decision and also investors are able to choose securities from this ownership firms under the premise that the securities reflect all available information (Fama, 1970).

The relationship between an asset market that provides all necessary information and the role it has on resource allocation is true. Further the efficient asset market does not need to generate both production efficiency and allocative efficiency economically. This is due to market gaps and information provision role of prices. This is due to cost hence important (Stiglitz, 1981). According to Dycman and Morse (1986), in an efficient security market, securities traded act like they fully reflect all available information and the prices are instantaneous or close but not biased to new information.

Efficient market hypothesis is a key discerning attribute for all. The investors engaging in stock trading are always keen on deriving profits from their investments thus the need to make favourable hypothesis. In the event of a real efficient market hypothesis, asset prices in the financial markets should reflect all the available information. It should also have capacity to adjust driven by the availed information (Sonje, 2010). Market hypothesis was attributed to various forms which entailed weak form market efficiency, semi-strong form and the strong form market efficiency. Fama,(1970) divided efficient market hypothesis into weak form market efficiency, semi-strong form and the strong market efficiency.

The weak form market efficiency applies to situations whereby the security prices reflect information that is in line with historic trends and behaviours of past stock returns. This brings to the fore the aspect of investors failing to earn super normal profits owing to the incapability brought forth by historic trends (Buras, 2010). It leads to a situation whereby the share prices have no inherent social patterns and the future share prices take a random walk owing to the unpredictability.

The semi-strong form of market efficiency gives the opportunity for the market to reflect all the publicly available information. The information which is in the public domain once relied on by the investor's limits them from making above average returns. The information which is availed to the investors gives room for the adjustment of share prices in a quick succession and unbiased manner thus allows the benefit of hindsight to all (Bukayo, 2010). This phenomenon limits the opportunity of investors earning excess profits owing to the fact that neither technical nor fundamental analysis techniques can be priced to exploit the market for investor benefits.

The strong form of market efficiency all information is availed to the public. The veil is lifted above all the organizational secrets and it limits the event of individuals benefitting from insider trading. This causes the security prices to reflect the true value of future prospects in terms of dividends payouts and earnings per share (Mathea, 2011). The share prices reflect all information, public and private and it limits the prospects of excess returns from instances of gaining value advantage form the availed information.

Development of the securities exchanges in the world has been profound. The New York securities exchange is the leading player in the field of securities exchange. It offers financial products and services in cash equities, exchange related products, bonds, market data and commercial technology solutions (Winley, 2013). The NASDAQ stock exchange follows suit in terms of capitalization. It operates twenty four markets, three clearing houses and has the benefit of giving anchorage to three thousand four hundred listed companies to operate in. Tokyo securities exchange, London stock exchange and Shangai stock exchange follow suit in terms of capitalization and market activity. All the top five securities exchange have the benefit of advanced technology and access to a large capital outlay which has greatly boosted their infrastructural capacity (Winley, 2012).

Development of the securities exchange sector in Sub-Saharan Africa has equally been phenomenal. The securities exchanges operate and exist in twenty three Sub-Saharan countries. Most of the security exchanges are new kids on the block with the exception of older exchanges in South Africa, Egypt, Morocco, Zimbambwe, Kenya and Nigeria (IFC, 2013). The integration of regional economies has seen the same applying to the securities exchange sector. This has brought on board the regional exchange of the French speaking states of Ivory Coast, Benin, Burkina Faso, Cote D'vore, Guinea, Bissau, Mali, Muyu, Senegal and Togo. This has had profound impact on the growth of myriad economies by virtue of giving room for the listed companies to target investors from a wider spectrum.

Privatization programmes that have brought across Africa have given great impetus to the opening up of securities exchanges in many countries. The privatization programmes attract a large array of investors who include foreign and domestic individuals institutional investors like insurance companies, pension funds, collective investment programmes like unit trusts and mutual funds equally benefit from them.

The over the counter market is not highly developed in Sub-Saharan countries. This highly impairs the liquidity levels of listed shares in the stock exchanges. A stock exchange gives a good promise for the occurrence of liquidity but it's not a guarantee of the same, (Ndii, 2013). Sub-Saharan securities exchanges have the challenge of failure to create a liquid market as they ought to. This inhibits the interest in trading in the listed securities. This is occasioned by the situation of the dearth of sellers and buyers in many instances. This is opposed to the highly developed securities exchanges whereby the dearth of buyers and sellers is very temporal and short-term.

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Sub-Saharan security exchanges also have the problem of failure to allow market forces to work with ease as they ought to. This is occasioned by the failure by many exchanges to adopt technology and lack of integrated communication facilities with capacity to disseminate information in a timely manner. The failure by the investors to access timely information as regards market moments disenfranchises them on the decision making aspect. It causes them to be highly impaired as regards the aspect of making efficient market hypothesis (Katana, 2012). It occasions the investors inability to act and be proactive on market intelligence exploitation capacity.

1.1.2 The Nairobi Securities Exchange

The Nairobi Securities Exchange was founded in the year 1954. It was then a preserve of the white settler investor community which traded in the bourse. It has gradually had a massive transformation and phenomenal growth. Currently it has fifty listed companies from various sectors of the economy operating in it. The sectors include; the agricultural, commercial and services, telecommunications and technology, automobile and accessories, banking, insurance, manufacturing and allied, and the investment sectors NSE, (2013). The securities exchange has had varying defining moments and hallmarks in the wake of its growth. In the year 1995-2005 it embarked on a privatization programme which earned it recognition from the international forum. The offloading of the government stake in Kenya Airways was a flagship divestiture project. Adoption of international accounting standards, implementation of the central depository trading system and adopting the decentralization of share certificates have been some of the key strides made by the bourse.

On 12th July 2012 capital markets authority director noted that since immobilization of securities was done, the industry had made a turn round in eliminating inefficiencies and risks associated with paper certificates through immobilization of securities. Meaning that from the effective date

physical certificates will be surrendered and replaced with electronic record of holding. She noted the mutilation , loss of share certificates, duplication of share certificates, signature mismatches and transfer problems will be eliminated hence the time required for each transaction will be greatly reduced.

The regulator which is the capital markets authority has set in place stringent standards which ensure that information from all the listed companies is put into the public domain. Standards in line with the international best practices have been employed to ensure that the listed companies publish their annual financial results and caps have been placed on the shareholding to minimize incidences of insider trading and undue influence from the shareholders as regards policy making in the listed companies (Mbui, 2012). The boards of management of the listed companies are supposed to reflect adequate professionalism and diversity in the membership to ensure shareholder interests are safeguarded. The Nairobi securities exchange has always displayed tendencies of reacting to the dynamics of the macro-economic indicators which entail the exchange rates, interest rates and costs of doing business (Mbui, 2012).

1.2 Statement of the problem

Efficient market hypothesis is used to explain the relationship between the amount of information and its impact in the price of securities trading in the stock market. In efficient markets, there is a presumption that securities fully reflect all relevant information about their true value. The implication of market efficiency is that security prices may not always reflect their true value. Stocks with low intrinsic value will mobilize higher capital while higher intrinsic value stocks will have difficulties in raising capital. This will impact on investment in a given country. Efficient market indicates that change in share prices have effect on the returns of a security. Market efficiency have implication in that new information will cause excess volatility in the

short run due to reactionary pressure. This was similar to studies in Shanghai securities exchange and Abu Dhabi securities exchange (Sonje, 2010).

A study carried out by Alberta (2011) in the New York securities exchange showed that the level of access to information by various investors with regard to their insightfulness have always shaped the market hypothesis. Similar studies carried out in the Johannesburg exchange by Mothane, (2013) showed that the exchange had a semi-strong form of market efficiency. All listed companies were required to disclose all relevant information to existing and potential investors.

The Kenyan situation has equally had a reflection of semi-strong efficiency with regard to market hypothesis (Mbui, 2012). The testing of EMH in Kenya is important because it will address the implication on local investors and also foreign investors who rely on information about risk and return tradeoff on investment. This identifies with the position taken by Nyoro, (2014) when he argued that the Kenyan securities market is very sensitive to the flow of information as regards the dynamics of the companies quoted in the exchange. He cited the Centum and Home Afrika counters which had varied performance as motivated by the publicly available information. Both entities have interests in the real estate sector and Centum's performance improved at the advent of the real estate development in the coast. Home Afrika's performance declined owing to a low uptake of the investments it had made in Kiambu County. The study thus seeks to find out if the same applies to the other listed companies or what other dynamics influence the performance of the Kenyan securities exchange. This is with a focus on finding out if the Kenyan securities exchange obeys the random walk hypothesis and whether it exhibits a trend towards increased efficiency over time.

1.3 General objective
Testing efficient market hypothesis of Nairobi Securities Exchange

1.3.1 Specific objectives

i) To test the random walk hypothesis for the returns of securities traded

ii) To determine whether stock market exhibits a trend towards increased efficiency over time.

1.3.2 Research questions

i) To what extent do the securities traded in the Nairobi Exchange confirm the random walk hypothesis?

ii) Has the stock market exhibited a trend towards increased efficiency over time?

1.4 Significance of the study

The stock market is a very important tool in the financial markets. It has a significance bearing on how the economy of a jurisdiction performs. It plays a very key role on the overall national economic outlook. It influences how the various facets of the economy perform in the wake of having service delivery and production activities realized. Many investors in the stock exchange and securities market are influenced by the hypothesis that they make on the profitability of the entities that they invest in. In the wake of making good hypothesis, they realize gains and good profits from their investments. The study will thus have a significant bearing on the capacity to make good hypothesis and its impact on the profits posted by investments.

Many companies have strived to satisfy the capital markets regulatory requirements and gained listing in the stock exchange. This not so easy to achieve. On the other hand despite exercise of prudence and good corporate governance structures, the investors are not able to realize good returns from their investments. This may be signaled by the value of the shares and the dividends declared by the companies. It denotes failure to achieve efficient market hypothesis. The study

will thus shed light on the varying dynamics which motivate the underlying situations with a view of aiding future and present investors to always realize efficient market hypothesis and the resultant value from their investments.

The study may equally be of great significance to the players in the capital markets industry. This is occasioned by the fact that they also need to undertake efficient market hypothesis in the wake of guiding and advising their clients. They may thus gain insights and exposure on how to ply their trade in a more efficient manner for the good and benefit of their clients and overall market standing.

The securities industry is attracting scholarly attention from the many students partaking studies in the arena. The study may thus be of immense value to the field with regard to making a contribution to the body of scholarly works in the same or related fields.

1.5 Justification of the study

The securities industry has been prone to many challenges. The eroding of shareholder confidence due to malpractices by various players flouting the rules and procedural requirements has been the norm. Many investors have made hypothesis going by the observation of organizational books of accounts and failed in some cases to reap from them. This has been linked to the practice of having manipulated books by some wayward companies and the situation of directors being taken to court has given credence to the position. The study thus seeks to undertake research to find out the underlying factors driving investors to making hypothesis with a view of finding out how they can be effectively cushioned from losses.

Investors have on many occasions gone through the pain of making losses attributed to failing to make good hypothesis of the securities market. Some have been driven by the economic outlook indicators on a wider spectrum without a clear focus on the sector specific parameters. Others have been attributed to a sudden change of dynamics without due reference and forecasting of envisaged changes. There is thus great essence of carrying out studies on the parameters affecting the market hypothesis on a holistic angle.

The stock exchange has gradually gained acceptance and great credibility as an investment avenue for individuals in society to build and grow their wealth. It is thus imperative that the various factors affecting the market hypothesis of the stock exchange are examined and understood with a view of helping establish the most efficient manner to derive benefits for the investors.

1.6 Limitations of the study

The study anticipates the following limitations:-

1.6.1 Derivative Instruments

The study may encounter the limitation of the instruments that it envisages to employ. This is driven by the fact that the Nairobi Stock Exchange is growing gradually and the employment of derivatives is at its nascent stages. This is a factor which may be an impediment to the study. The launch of derivatives market should be fast tracked by capital markets authority in order to attract more instruments from both local and foreign investors and enhance investment.

1.6.2 Liquidity

The performance of the stock market is mainly influenced by the liquidity of the financial markets. In the event of excess liquidity, the market may get to be volatile and display abnormal

tendencies. In the event of low liquidity, the activities in the market may be depressed and the share index may be low. This is a factor which may impair the study.

1.7 Scope of the study

The study seeks to test the efficient market hypothesis of Nairobi Securities Exchange. It has a focus on the listed companies in the exchange. It has an aim of covering the period of ranging from 2009 to 2013. It has a focus on companies which have been in operation within the period.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The study seeks to test the efficient market hypothesis of Nairobi Securities Exchange. The study seeks to test the random walk, hypothesis for the returns of the Nairobi Securities Exchange; it seeks to determine whether the NSE exhibits a trend towards increased efficiency over time.

2.2 Theoretical Review

2.2.1 Efficient Market Hypothesis

Efficient and well divulged financial markets have an assurance for increased economic growth by virtue of guaranteeing efficiency in the allocation and utilization of savings in an economic jurisdiction. Capital markets have an objective of seeing to it that the capital stocks of an economy are efficiently allocated (Gandhi; Buisara; and Pooja, 2013). The ideal situation of the market exists when prices of different securities trading from varying counters give an indication of accurate signals for the investment decisions made by the investors. The behavior of the share price in the stock market is an apt indicator of the market efficiency. It underscores the capacity of the investors to make good decisions driven by the available information.

The efficiency of capital markets can be correlated to the capacity of the financial markets to process information in optimum time. The capacity of the investors to exploit the information availed and have it work to their advantage is a large premise of market efficiency. The equal ability of the market to effectively adjust to the availed information and have it reflect on the asset and share prices is equally an attribute of market efficiency (Mlonzi, 2011). The market thus delivers accurate and apt signals for resource apportionment. The release of new information is expected to have a re-alignment as regards prior adjustment on the securities at stake (Henant and Kumar, 2013). Many studies have been conducted to test the validity of the efficient market

hypothesis concept and varied results have been reported. A critical aspect of testing for efficient market hypothesis has been the stock market reaction the information availed in public from the companies and other industry players.

EMH can also be likened to the capacity to fairly rapidly adjust to the availed information. The capacity to adjust to the availed information on the other hand must reflect the availed information in past, present and future in asset prices. The market thus has the capacity to process the availed information to reflect the prevailing stock prices (Jordan, 2012). This limits the possibility of the investors making abnormal profits from the availed information. It gives all the participants an equal playing agreement with regard to the availed opportunities. It thus deters the possibility of individual making abnormal profits and exploiting the available systems to confer themselves personal benefits.

Market efficiency is a critical aspect which negates the impact of security selection. This is because all the availed stocks would ultimately take particular trends and patterns for trading. It would thus render the fund managers, stock brokerage and mutual fund managers redundant (White, 2012). This would ultimately work out good for the players in the stock market taking into account that they would trade at a reduced cost. This is occasioned by the minimal changes occasioned to the players by the costs normally loaded by the many intermediaries to the investors seeking professional advice and allied sources.

EMH has an implication of setting accounting standards. This is attributed to the fact that the essence to having good accounting standards to product the massive investors and to limit instances of insider trading (Ayiro, 2012). The capacity to have all the availed information

effectively reflecting on the trading prices correctly and instantaneously thus protects the investors. It sees to it that all trade on the same footing with regard to available information.

EMH equally has an implication of negating the need to time the market. Market timing is an expansive undertaking for investors and it involves high transaction costs in the wake of making money in and out of the market based on their expectations. The transactions entailing capital flight may lead to dispersed activities in a market hence under-performance (Jagdesh, 2012). EMH may thus deter the practice and confer stability to the stock markets owing to limited capital flight instances. It may safeguard share indexes and give optimum returns to all investors because current prices reflect the availed information.

2.3 Forms of Market Efficiency

The efficient market hypothesis was an evolutionary concept developed from the PHD dissertation of Eugene For a in the year 1960. The scholar convincingly argued that an active market which includes many were informed and intelligent investors securities will be appropriately priced and reflect all the available information. Market efficiency is thus premised on the assumption that there is a relationship between the market information and share prices in the capital market. The EMH distinguishes three forms of market efficiency which are the weak form, semi-strong form and the strong form majorly influenced by the availed information to the investors participating in a given market.

2.3.1 Weak Form Efficiency

Weak form efficiency is synonymous to a situation whereby security prices reflect all the market information availed from the history of post prices and returns. In the event of weak form efficient markets, investors cannot earn super-normal profits from the employment of previous strategies

used to benefit the other investors. The stock returns are not thus predictable and the share prices do not exhibit serial dependences thus no patterns to stock prices (Roja, 2013). The future of prices is determined by information which is not contained in the previous price patterns and the prices are unpredictable and take a random walk.

Studies by Karemera (2009) which employed the multiple variance ratio and auto-regressive functionality tests for the data of new US-dollar based national equity indexes from the period of 1999-2009. The tests used the variance ration tests and GPH tests for random walk and different market efficiency tests. The study established that emerging markets of Argentina, Brazil, Chile and Mexico followed a random walk based on multiple variance test and GPH and the direct tests of market efficiency revealed that all the markets other than Chile were weak form efficient.

Gabalawa (2010) studied the weak form efficiency of the Nigerian stock exchange to see whether the prices are adjustable to historical information or not. Correlation analysis was used for the period of 2000-2010. Correlation analysis was used for the monthly data and technical rules were also used as measures for the purchase of sales decision of a stock. It was found that security price always adjust to the historical price information thus lending credence to the weak form efficiency of Nigerian Stock markets.

Guidi; Gupta and Maheshawari (2011) tested the weak form of market hypothesis for central and eastern European Equity markets for the period of 1999 to 2009. The study employed the auto-correlation analysis to confirm the capacity of the two consecutive returns to the independent of each other. The run test was used and the variance ration tests conducted to confirm the ability to post incremental difference in the series going by the assumptions of homoscedastic and heteroscedastic random walks. The results were a pointer to different inferences with the auto

correlation analysis indicating that the central and Eastern Europe equity markets do not fulfill a random walk. The variance test was equally a reflection of the rejection of the random walk hypothesis. This was reflective of the central Eastern Europe markets showing different patterns and negative for the weak form market efficiency.

Studies carried out in the Bahrain Stock Exchange with an aim of measuring the behaviour of the stock prices and establishing whether a weak form of efficiency existed employed unit root tests, auto-regressive moving and the exponential smoothly methods (Asiri, 2010). The tests supported the road which hypothesis and found out that the Bahrain Stock Exchange was weak form efficient.

An empirical analysis of the weak form efficient market hypothesis of the Nairobi Securities Exchange carried out by Kamau (2013) showed that the market was not weak form efficient. The study employed the parametric tests. The study considered results from trading activities ranging from 2008 to 2012. It employed the unit root test and auto correlation. It established that the NSE was not weak for efficiency.

2.3.2 Semi-strong Form Efficiency

Semi-strong form efficiency states that security prices reflect all publicly available information. Investors base their decisions with publicly available information thus reducing the possibility of the investors making abnormal returns from their financial investments. The situation allows the share prices to adjust to the publicity available new information rapidly and in an increased manner. The situation negates the import of both fundamental and technical analysis in the event of the stocks getting to produce excess returns (Bulsara, 2013).

A semi-strong form of market hypothesis holds the premise that the share prices reflect all the available information which is in the public domain. The advent of public announcements like the initial public offerings (IPO's) posting of profit warnings and announcements on dividends payouts have always been reflected on the stock prices. Events on the world economic front have equally been attributes which have influenced the performance of stock and their prices in semi-strong form efficiency. Incidences of terror alerts and allied circumstances have heavily influenced the stock performance (Mlonzi, 2011).

Studies carried out by Jordan, 2012 showed that the capital markets react to information released especially the surprise announcements that have a huge impact on the performance of the stock. In the event of earnings announcements, the stock prices may have a significant change especially prior to the announcements when the investors are anticipating it. In semi-strong form efficient markets, there have been incidences of abnormal market performance prior to the release of the earnings reports. This is a pointer to the capacity of the earnings reports to heavily influence the performance of the stocks with regard to prices.

Reaction to stock splits has been confirmed to sway the scales in favour of semi-strong form efficient markets. Situations of currently existing shareholders receiving new shares in exchange for the old shares that they hold have always positively impacted on the performance of the available stocks (Chemarum, 2010). The Kenyan phenomena is replislident of the situation taking into account the evidence of general rise in the volumes of share trading has been confirmed. This is an apt indicator of the stock splits heralding a wave of excitement in the existing and potential investors leading to increased activity and rising demand for the shares.

The event of cross listing is equally a medium of assuring the semi-strong efficient markets capacity to have increased activity. Cross listing allows the firm to have their equity shares traded in other exchanges in addition to the home exchange. It allows savings on costs and gives room for the participation of international investors in the firm's activities. Information on cross listing has been confirmed to trigger a rallying of prices on the listed companies. Evidence of value creation at the advent of cross listing has been confirmed in the London Stock Exchange, New York Stock Exchange and the Abu Dhabi Exchange (Cheol, 2012).

The Sub-Saharan markets equally had good ridings occasioned by cross listing. The evidence of improved stock prices was confirmed at the advent of listed firms spreading their wings into the regional markets (Muloyi, 2011). The Southern Africa Development Trading Block had the listed firms from the member states reflecting heightened activity and an increase of share prices at the advent of cross listing in the other bourses.

Dividends announcements have also been confirmed as an alternative medium o informing the investors about the future profitability of their shares. The effects of news releases informing the investors of dividend announcements have been confirmed to influence changes on the affected stocks. Evidence derived from the means variance and serial correlation reflected consecutive positive price changes at the declaration of dividends by the listed firms. Evidence from the Nairobi Securities Exchange confirmed that dividends accounts had a positive effect on the stock prices (Okutoyi, 2012).

Announcements of bonus share issues have equally motivated increased share prices. Studies carried out in the Indian Stock Market reflected the evidence of semi-strong efficiency of the market (Amrutajan, 2011). Evidence of abnormal returns for a week before the actual bonus

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announcements was confirmed in the Indian market. This was inflictive of the investors seeking to capitalize on the anticipated returns and have increased actively on the particular counters.

2.3.3 Strong Form of Market Efficiency

Strong form efficiency identifies with a market whereby the prices reflect all the available information which is public and non-public. The strong form of efficiency posts that whether investors having access to public information which is public or non-public can beat the market and achieve abnormal rates of return. The strong form of efficiency thus holds the premise that regardless of access to insider information or lack of access to it, the investors stand an equal chance as regards their economic prospects and capacity to realize returns from their activities (Pinkerton, 2011). The premise of strong form of efficiency may thus be fundamentally flawed taking into account that the public and non-public information cannot be reflected in the price of stock that has not reached the market as yet.

Strong form efficiency can be analyzed by way of conducting an analysis of the advantages of institutional investors. This is attributed to the fact that they have the benefit of insider information accruing from their knowledge of the on goings of the firms as regards investment plans and allied activities. Studies carried out by Zarnowiski (2011) vouched for the strong form of market efficiency. The researcher argued that that the fund manager's skills of selection and market timing were an integral component of price forecasting. The skills were effectively correlated with the anticipated future situation of the market. This was thus a confirmation of the strong form efficiency hypothesis. It is attributed to the fact that the information availed to the fund managers does not allow them to have an abnormal rate of return. The selection skill in the fund managers was argued as having capacity to increase the price efficiency of by a wise choice of stocks based on public and new public information.

Market timing equally is an attribute of strong form of market efficiency. Capacity of the fund manager to effectively advise the investors on the best choice of stocks based on public and non-public information. The capacity to deduce and make effective assessment of the best time to change the proportion of risky assets in portfolios is a great undertaking performed by the fund managers. This is occasioned by their ability to understand and assess the market in totality (Bjorn, 2012). Timing is correlated with the capacity to understand the projected future situation of the market. Availing of public and non-public information is thus a key attribute which enables market timing and it's a strong attribute for the study efficiency.

The strong form efficiency can be effectively assessed by way of scrutinizing the capitalization index of the listed firms. The market index can be a key indicator of the capacity of the investors to post returns from their investments. An evaluation of the large institutional investors with a good representation on the board can act as a measure of evaluating the strong form of market efficiency. The capacity of the investors to realize profits and profit from the insider information before it gets public is a key attribute of the strong form efficiency (Graber, 2010).

The strong form efficiency hypothesis was however contested on the premise of having insiders exploiting access to information to profit from the system. The possibility of achieving profits which are abnormal from the market average has been confirmed owing to the access to non-public information. Evidence of statistical and economic relevance of the recommendations made by analysis geared towards changing firms' fortunes has been confirmed. The information has been used to confer benefits to insiders with the knowledge about it and having them profit from it (Ambuka, 2012). This is contrary to the premise of strong forms market efficiency and it's a contrarian aspect of the hypothesis.

The proficiency of the future forecasts made by analysts working for the stock brokerage firms was equally questioned. The poor dependency between the forecast returns and the prices realized cast a cloud on the ability of price analysts to effectively realize the anticipated returns. This was an indication that dispute insider information and access to technical skills as regards the trends of the market, the analysts were not able to make good forecasts (Pinkerton, 2011). This was a strong argument for the strong form of market efficiency and it was an indicator of the fact that the access to information did not confer benefits to the privileged persons.

The corporate governance systems and structures also reflect a measure of strong form efficiency in the stock prices of listed companies. The ability of the companies to effectively take charge of the non-disclosure of information for personal gain may heavily sway the realization of strong form efficiency situations of members of the board exercising prudence and not exploiting information that they come across for individual gain may act as a move in the positive direction for the organizations (Nabukwesi, 2011). Capacities to observe and adhere to the envisaged corporate governance systems may aid confer benefit to all and sundry in a given market. It may aid realize the achievement of strong form market efficiency and confirm benefits to all the players.

2.3.4 Random Walk Theory

The random walk theory posits that the prevailing stock prices have no relation to the previous patterns as regards price rates. The theory takes the position that the prevailing of new information into the market influences random deviation from the intrinsic value of the stock. Availing of new information leads to a revision of the stock prices leading to the stocks being non-stationary essentially having a random behavior as regards the pricing rates.

The random walk theory aptly captures the thrust of EMH taking into account that the stocks take a random behavior and no investor can exploit the previous patterns for profit. It thus avails a fair and balanced trading opportunity for all and it gives the investors capacity to benefit from the available opportunities. It occasions the investors the benefit of profiting from the availed reformation despite their levels of interaction with the market and their abilities with regard to intellect and sophistication.

2.3.5 Mathematical Presentation of the EMH

In 1970, Fama proceeded to present the Efficient Market Hypothesis mathematically in the following equation;

$$E(P_{j,t+1}/\emptyset_t) = [I + E\ (r_{j,t+1}/\emptyset_t)P_{jt}$$

where, E is the expected value operator, P_{jt} is the price of security j at times t, $P_{j,t+1}$ is the price of security j at time t+1, $r_{j,t+1}$ is return in percentage over period, equal to $(P_{j,t+1}$-$P_{jt,}$ $\emptyset_t$ is the symbol of the given set of information assumed to be "fully reflected" on the price of security j at time t.

2.4 Implications of EMH

Market efficiency is a critical aspect which negates the impact of security selection. This is because all the availed stocks would ultimately take particular trends and patterns for trading. It would thus render the fund managers, stock brokerage and mutual fund managers redundant (White, 2012). This would ultimately work out good for the players in the stock market taking into account that they would trade at a reduced cost. This is occasioned by the minimal changes occasioned to the players by the costs normally loaded by the many intermediaries to the investors seeking professional advice and allied sources.

EMH has an implication of setting accounting standards. This is attributed to the fact that the essence to having good accounting standards is to produce the massive investment and to limit instances of insider trading (Ayiro, 2012).The capacity to have all the availed information effectively reflecting on the trading prices correctly and instantaneously thus protecting the investors. It sees to it that all investors trade on the same footing with regard to available information.

EMH equally has an implication of negating the need to time the market. Market timing is an expansive undertaking for investors and it involves high transaction costs in the wake of making money in and out of the market based on their expectations. The transactions entailing capital flight may lead to dispersed activities in a market hence under-performance (Jagdesh, 2012). EMH may thus deter the practice and confer stability to the stock markets owing to limited capital flight instances. It may safeguard share indexes and give optimum returns to all investors because current prices reflect the availed information.

2.5 Empirical Evidences of EMH in Developed Countries

Brown, Richardson and Trizauka (2009) confirmed the presence of strong from for efficiency in the Canadian stock exchange. The major focus was on the forecasts of stock prices made by stock brokerage companies in the exchange. The study found out that the forecasts were an accurate estimator of the future prices of the stocks trading in the exchange. This lends credence to the EMH. It was a confirmation of the capacity of the investors to make an efficient production and gain for the stocks invested.

A study carried out in the Warsaw stock exchange was equally reflective of the capacity of the investors to get profits from the hypothesis made. The study assessed the skills of the fund

managers with regard to selection of profitable stocks and market timing. The different phase of hibernation, manipulation and speculation with regard to the stocks at hand was carried out (Czeckaj, 2011). The study confirmed that availability of information and the intuitive skills conferred the fund managers with the benefit of effectively advising their clients. It gave them capacity to derive gain from their investments and it was reflective of capacity to achieve EMH.

The significance of the calendar effects was articulated by Hansen, Lundu and Nason (2009). They argued that specific months of the year like at the start and the end of the calendar had peculiar patterns on the stock prices. This was a confirmation of the variation of stock prices as motivated by the time and period of the year. It was a vivid contradiction of the EMH in that the calendar trends motivated the peculiar patters of the stock prices. In the end of the year at the advent of dividends pay out, the share prices heralded a rise owing to increased demand and stabilized after the waning of the excitement.

Similar contrarian trends were noticeable at the turn and start of the week. This was evidenced by the need to offload some units by investors for recurrent expenditure and reduced activities at the event of other underlying financial commitments. This negated the import of EMH and it was an indicator of the market adjusting itself to the forces of supply and demand as influenced by the client preferences (Odundo, 2011).

Small firm effect happens when firms with small market capitalization outperform larger firms over long duration. According to Banz and Reinganum (1981) small capitalization firms on NYSE earned a return in excess of what would be predicted using CAPM model. However this has decreased in recent times due to differential risk premium for small capitalization stocks (G.Schwert 2003). Price earnings ratio effect occurs when stocks with low price earnings ratio

outperform portfolios with high price earnings ratio. A research carried out by Basu in 1977 showed that investors holding stocks with low price earnings ratio earned higher returns.

2.5.1 Empirical Evidence of EMH in Emerging Economies

The institutional infrastructure to regulate the financial market was also deemed as wanting (Amrutajan, 2011). This was an aspect which facilitated the insiders to beat the market and get abnormal returns from the inefficiencies at hand. These are key aspects in many other emerging markets like Korea, Malaysia, Philippines and Taiwan. The study confirmed that despite the liberalization of the financial markets and reforms instituted to ensure efficiency, there was still some element of bias which facilitated the institutional investors to profit and exploit the market weaknesses.

Increased innovations with regard to cross listing of entities in regional markets and trading blocs have seen increase efficiency of the African stock exchanges. Uptake of technology and the reduction of the manual transactions have equally enhanced the overall efficiency of the markets. This has seen a great boost to the capacity of the markets to satisfy the client requirements (Mulozi, 2011). Enactment of legislation to anchor the operations of the markets in statute has also proved to be a good tiding. This has seen the investors effectively cushioned from rogue practitioners and their investments safeguarded.

2.5.2 Empirical Evidence in Developing Countries

The efficiency of the Indian markets which is an emerging economy was tested by Mishran (2011). The study employed the two regime threshold auto-repressive model with an auto regressive unit root to examine the efficiency. The essence of focusing on the Indian market was the realization of the fact that the information disbursement system in the market was not

very developed. This led to slow reaction to information about the available security prices and it at times aided the investors profit from the slow reception.

A study of the Belgium Stock Exchange confirmed that prior to joining the EU, the market was proved inefficient. However on the integration with others and the realization of good fundamentals as regards the underlying policy and guiding regulations, the market had enhanced efficiency. This was thus a confirmation that integration and increased development were key parameters guiding and enhancing market efficiency (Meher, 2012).

2.5.3 Efficient Market Hypothesis in Africa

Africa has had a slow development of the financial and capital market. The saturation of the developed economies with the latest as regards financial information and knowledge has exposed the African financial markets as latent and highly potent avenues for investments (Mulonzi, 2011). This has given a leeway for the African stock exchanges to act as the viable route for foreign direct investment by the international entities plying their trade and business activities in Africa. It has been a major boon for institutional investors and individuals seeking a stake in the African companies.

The privatization activities carried out by the African countries have equally acted as a function of new investment opportunities. They have heavily catalyzed the trading activities in the African stock exchanges taken into account that the governments have consistently use them as the vehicles for offloading their stakes in public entities. This has really spurred their growth and sustained their momentum and continued resilience despite economic stocks (Odundo, 2011). It has seen them continually divulge and give room for new investors in a sustainable manner.

Studies on the African Stock Exchanges have been diverse and varied. Tests by Aldgene (2009) and Adebayo (2010) on the stock markets of South Africa, Ghana, Nigeria, Egypt and Tanzania

indicated that the markets were semi-strong form efficient. They attributed the fact to the capacity of the markets to adequately reflect on all the public information into the current stock prices. Evidence was adduced from changes in product lines, key managerial staff and allied activities impacting on the prices of the stocks.

2.5.4 Constraints in the African Security Markets

Market liquidity is a heavy constraint in the African markets. The event of the markets attracting a higher number of investors seeking to buy stocks than those seeking to sell their units portends a precarious situation for the market. This leads to the event of excess liquidity in many instances and it may occasion the occurrence of overpriced stocks (Boodan, 2012). This is a factor which has mainly been motivated by the continued rise of the members of institutional and international investors.

The regulatory frameworks governing most of the African stock exchanges are deemed to be weak. They have in many instances occasioned investors losses owing to the exploitation by the rogue players in the market who do not abide by the rules. Strengthening of the governance systems and structures has been earmarked as the panacea which can effectively guarantee and secure portfolios (Chesoni, 2012).

Foreign exchange risk is an imminent risk which occasions the African economies the risk of undue exposure. The advent of unfavourable weather, increased security risks portend imminent possibilities of the devaluation of the currencies. Over-reliance on the US dollar and sterling pound for international commercial transactions equally expose the African investors, trading in the stock exchanges to potent risks. The Euro zone crisis and the Middle East crises are vivid indicators of the same (Adan, 2012). These are factors which have deterred many foreign investors from putting their money in the African markets.

2.6 Conceptual Framework

The conceptual framework provides a linkage between the independent and dependent variables looked at in the literature review.

Figure 1 : Conceptual Framework

Independent Variables

Intervening Variable

Dependent Variable

Random Walk Hypothesis of returns

Increased Efficiency Over Time

Stock Prices

Efficient Market Hypothesis
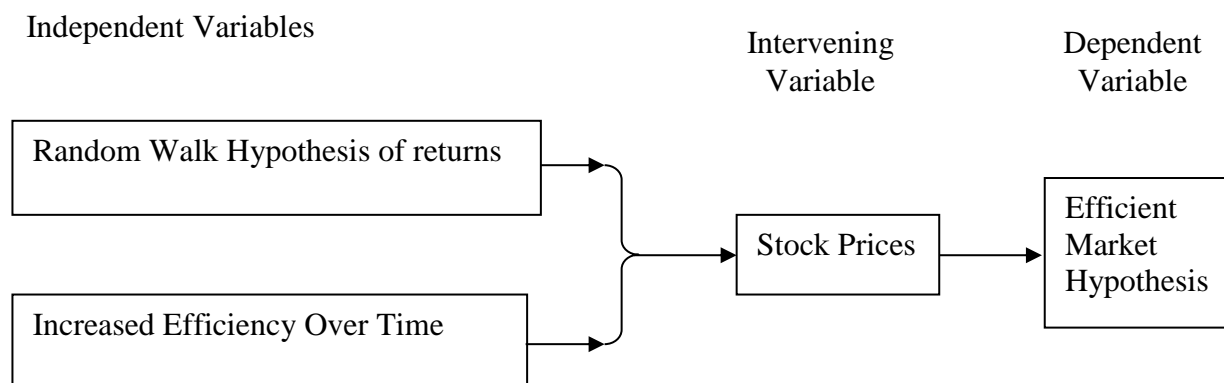
Variables

The daily and monthly market returns which was derived from the daily NSE 20 share index will be employed as the variable. This will be with a view of determining if the returns have a random walk with regard to the shares traded and if the returns exhibit a trend towards increased market efficiency. In the event of increased efficiency, the investors and investment analysts are able to make a good forecast and the stock prices are reflective of the dynamics in the market. This guarantees the investors capacity to realize worthwhile returns from the investments.

Description of the variable

The Daily market returns was used for analysis. The returns determine the capacity of the investors to gain from their investments. They determine if the investors made efficient market hypothesis in the investments made.

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Name of variable	Proxy	Description
Daily Market Return	R1	Natural Logarithm of Market Returns

$$Rt = In (P_t / P_{t-1}) \tag{2.2}$$

Where; R is the Market return in period t, P is the price index at day t, P_{t-1} is the price index at period t-1 and 1n is the natural logarithm of the daily market returns.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter the researcher discussed the research design that was used in the study. This involved discussing data collection techniques, the population under study and data analysis techniques.

3.2 Research Design

The study employed time series model in order to find out whether stock prices listed in Nairobi stock exchange follows random walk hypothesis and if they exhibit trend towards increased efficiency over time. According to Yin, (2009) the aim of research design is to avoid a situation where evidence fails to address research question and to ensure results are reliable, valid and credible. This was necessitated by the nature of the study under investigation.

3.3 Study Population

The population under study constituted of daily and monthly closing NSE 20 share price index of 5 years period from 1st 2009 to 31st December 2013. This was in line with the objective of testing the efficient market hypothesis of Nairobi stock exchange for the stated period of time.

3.4 Study Sample

The NSE 20 share index consists of 20 best performing public listed companies. The average of these 20 companies was used in the study. According to Nairobi securities exchange press release of 9th June 2014, the NSE 20 share index consist of;(see Appendix 1)The reason behind choosing these companies in the study was influenced by their trading activity measures which are; liquidity, market capitalization, shares traded and turnover. (NSE June 09, 2014). These companies have a free float of at least 20% and minimum market capitalization of Kshs. 20 million. Above all these companies are the best performing public listed companies (blue chip), with superior profitability and dividend record (NSE June 09, 2014).The sample had 1257 daily and 60 monthly observations from period of 1st January 2009 to 31st December, 2013. The period

was fair enough in ensuring that the possibility of shorter economic productions and stocks were minimized (Jarrel and Kyper, 2005).

In developing economies like Kenya, stock markets have a problem of thin trading which can result in empirical bias and therefore the use of high frequency data was employed in the study. This is uncommon in developed countries stock markets (Jarres and Kyper, 2005).

3.5 Data Collection

Secondary data of NSE 20 share index was used in the study for observations from period 1st January 2009 to 31st December, 2013. In order to compare the stock prices patterns this data was necessary in identifying the behavior of stock prices.

3.6 Data Analysis

Time series model and univariate time series analysis was used in the study. The descriptive statistics and inferential test was carried out in the study process.

3.6.1 Descriptive Statistics

In order for the researcher to fully understand characteristics of time series model, descriptive statistics were used. The characteristics of this statistics were mean, median and standard deviation. This enabled the researcher to check distributional properties of the model.

3.6.2 Normality Test

Normality tests were carried out in order to ascertain if NSE 20 share index data set was normally distributed. It was also carried to determine the independence of random variables underlying NSE 20 share index data set .In descriptive statistics, these tests help in measuring the goodness of fit in a normally distributed data.

In high frequency data the NSE data was tested against null hypothesis:

(H0): data is normally distributed, Alternative hypothesis

(H1): data is not normally distributed

Kolmogorov-Sminorv Test (K-S)

This is non-parametric test used in the study to test goodness of fit.it is used to test whether the distribution is normal and to prove if daily and monthly returns series follows a random walk model. It compares the cumulative distribution function of returns with normal distribution in order to find out if they are similar. The null hypothesis would be accepted if k-s is greater than (>) or (=) to p-value.

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3.6.3 Unit Root Test

Unit Root Test was used in the study in order to find out if the time series variables in NSE 20 share price model are stationary or not through the use of autoregressive model. . Kolmogorov-Sminorv Test was used in the study to test whether the series was stationary and integrated of order (I).   Kolmogorov-Sminorv Test is a non-parametric test employed to overcome the problems of auto correlation among the errors. Being non – parametric means the researcher was not required to select level of serial correlation as in Augumented Dickey-Fuller test (ADF). The test is Robust with regard to auto correlation and heteroscedasticity in the Error term process or disturbances of the test Equation.

To Test for non – stationary, the researcher fitted

AR (1) and tested if $\emptyset < 1$

The test hypothesis was:

Ho: $\delta = 0$ (series is not stationary) market returns

H1: $\delta < 0$ (Series is stationary)market returns

If the absolute t – value > dickey – fuller table

Value, then Ho will be rejected thus series is stationary.

Time plots, correlograms, observation tables, Autocorrelation tables and partial autocorrelation graphics was used in the study to show clear presentation and pictorial presentation are easier to understand.

3.6.4 Run Test

Run test are non-parametric test used to determine if data is from a random process. The Run test was used to Test if the NSE 20 share price indices are from a random process and whether efficient. A series of increasing and decreasing values is known as a run. There are (+) positive runs, (-) negative runs and (0) runs. A run constitute number in which a sign changes plus in one (1) in a given period. A larger run represents positive serial dependence in price changes while for smaller run represent the number of expected run in the NSE 20 share index returns.

In order to test for efficient market hypothesis of Nairobi securities exchange, the researcher used run test.

The test statistic is given by:

$$Z = R - \overline{R}/\delta_R$$

Z= Test statistic of the market

R = Observed number of runs

$\overline{R}$ = Expected number of runs = 2(n + 1)/3

δ_R = Standard deviation of expected number of Runs

Where;

$$R = \frac{2n_1\ n_2+1}{n_1 + n_2}$$

$$\delta_R = \frac{2n_1\ n_2\ (2n_1\ n_2 - n, - n_2)}{(n_1 + n_2)^2\ (n_1 + n_2 - 1)}$$

n_1 = Number of positive values in Nse Returns

n_2 = Number of Negative values in Nse Returns

The test hypothesis per the Nse 20 share index returns is:

H_0 : Return on NSE 20 share index prices follow a random walk, NSE is efficient

H_1 : Return on NSE 20 share index prices do not follow a random walk.

The null hypothesis is rejected if

$$|Z| > Z_{1-\alpha/2}$$

Where n, > 10 and n2 > 10 for a large sample test.

Mean at 5% significance level, a test statistic with absolute value greater than 1.96 indicates that there is no randomness and therefore returns not efficient and the reverse is true.

3.6.5 Auto correlation Test

The auto correlation test was used to detect whether there is dependence or independence of random variables in the series. The study used autocorrelation test in order to ascertain whether NSE 20 share indices data follows a random walk model. This is a process where current stock prices are composed of past value prices plus error term known as white noise (normal variable with zero (0) mean and variance (1). The model was expressed as:

$$X_{t=X_{t-1}} + e_t$$

Where X_t = is the value of daily NSE 20 share price indices at time t

X_{t-1} = Is the value of daily NSE 20 share price indices in period t – 1. (Meaning on period before or preceding).

e_t = Is the value of the error term in period t.

The implication of this type of process is that the prediction of stock prices X for next period is the current value of today stock prices; meaning the process does not allow for prices prediction changes. (X_t – Xt_{-1}). Meaning change of prices X is absolutely random.

Prices in random walk process are constant while their variances are not. This process is non-stationary the variances increases with t. The forecast in Random walk process are simple since all future prices values of Xt+s for S>O, are simply Xt.

Durbin – Watson statistic will be used in the study to test for serial correlation.

This test for relationship between Errors and immediately previous values.

The test statistic is =

$$DW = \frac{\sum_{t=2}^{T} (\sum^{\wedge} - \sum_{t-1}^{\wedge})^2}{\sum_{t=1}^{T} e_t^{\Delta^2}}$$

Where T = the number of periods

DW statistic will lie in the 0 – 4 Range

The test hypothesis is:

Ho: $\rho = O$ Independence of values t – 1 and t

$H_1 : \rho \neq 0$

If rejected then there is no reason to believe that there exist relationship between successive residual which in the researcher case is the stock prices returns. If the values in DW statistic are nearing 2 then there is no first order serial correlation. For positive serial correlation the DW values are below 2 signifying that there is stock return predictability. Negative serial correlation have values above 2 signifying a revision in stock returns meaning for stock below the average price in the market. There exists a reason to believe that this stock price will eventually rise to the level of average price.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

The chapter presents statistical analysis of secondary data. The purpose for collecting the data was to fulfilling the research objectives outlined in previous chapters. Using the methodology considered in the previous chapter, data analysis was conducted through STATA statistical package. The findings of the study are thus presented (EMPEA 2011),

4.2 Descriptive Statistics

The essential supposition while undertaking a random walk mode test is that the time series should have normal distribution. Table 1 below summarises the descriptive analysis of the distribution of the natural logarithm of the market returns.

Table 1: Descriptive Statistics and Distribution of the Daily Market Returns

Variable	Obs	Mean	Std. Dev.	Min	Max	Variance	Skewness	Kurtosis
ln_Rmt	1246	4.2958	0.2112648	3.702971	4.722975	.0390182	.0478316	2.510667

A mean of 4.2958 was observed from table 1 above in the return series. This indicates a positive average NSE daily market returns, specifically from their investment.

The standard deviation of 0.211248 was observed from the return series therefore showing risk that investors are exposed to when investing in the NSE. These results attested to NSE as a relatively low risk investment, considering the value of the standard deviation. Standard deviation and the variance were used to measure risk, with the former being the square root of variance. The standard deviation gives the original unit, the daily market return in this case, as opposed to the squared unit when variance is considered.

The minimum daily return of investing in the NSE is 3.702971 while the maximum daily return that an investor can make equals to 4.722975. Skewness was used in the data analysis to indicate asymmetry and general distribution of data from normal distribution. The observed skewness of 0.0478316 indicated that the data was right skewed with most data been concentrated on the left of the mean and with some extreme observation found on the right of the mean. This indicates the relative inactivity of the market towards the closing stages of the year.

Kurtosis is an indicator in data analysis that is used to indicate the sharpness or flatness of the peak of observations. The kurtosis value 2.510667 indicated a less sharper than normal distribution of observations. The value being greater than 2 also indicates that the distribution is not normal and this affirms the data as time series.

4.3 Objective one: Market Efficiency at Nairobi Stock Exchange

To confirm the findings of the distribution of data in the series, a non-parametric test in the form of the Kolmogorov-Smirnov (K-S) test was applied to the time series and the results presented in table 2 below.

Table 2: Kolmogorov-Smirnov Test on the NSE Daily Market Returns

Smaller group	D	P-value	Corrected
ln_Rmt:	0.0650	0.000	
Cumulative:	-0.0429	0.010	
Combined K-S:	0.0650	0.000	0.000

The test compared the cumulative distribution to K-S sample to detect homogeneity between the respective values. The D value represented the test statistic or difference and the P and combined K-S values represented the chances of observing the D value or more extreme values. Since the P value is <0.05, the null hypothesis that the data was normally distributed was not accepted and the return series was therefore not normally distributed. To complement the K-S test for normality, a histogram was generated to show the distribution of the data, as shown below.
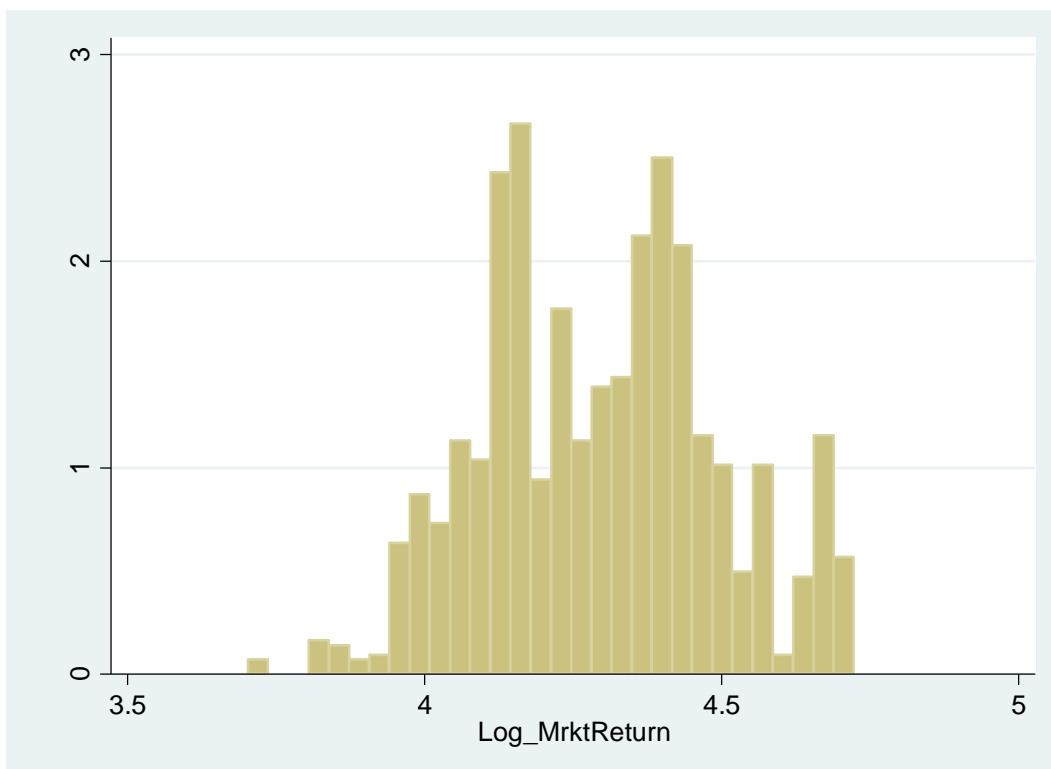
The time series data appears to be skewed to the right, with extreme values on the right side of the histogram. This certainly means that the data is not normally distributed, since a mirror image would not be replicated if figure 1 above would be split right down the middle. The major implication of having asymmetrical data is that one assumption of the random walk is that the data should be normally distributed. Normality absence in the time series model meant that the researcher had to include non-parametric tests. The non-parametric tests are best applied in non-normal data, even though both tests were performed for consistency of results.

In sum, the preliminary statistical results clearly indicate that the assumption of normality cannot be maintained for the daily index returns. The index returns are positively skewed and the evidence of peakedness is inconsistent with a normal distribution. To this end, we employ the non-parametric runs test which is robust to deviations from normality in a return distribution.

Further test on market efficiency was carried out through run test, which is a non-parametric test that was employed to detect randomness of data in the daily market return series. The runs test ignores the distributional properties of data, regardless of normal or non-normal distribution of data.

Table 3: Runs Test on the NSE Daily Market Returns - 02 Jan 2009 to 31 Dec 2013

```
. runtest Log_MrktReturn
 N(Log_MrktRe~n <= 4.293349027633667) = 623
 N(Log_MrktRe~n >  4.293349027633667) = 623
                obs = 1246
            N(runs) = 2
                 z  = -35.26
          Prob>|z| = 0
```

The runs test results were presented in table 3 above with the probability value being greater than alpha (0.05). This means that the value of z (-35.26 fell between the required ± 1.96 for the time series to be random. The null hypothesis was therefore accepted and the return series was said to generate successive returns randomly.

4.4 Autocorrelation Tests

Autocorrelation tests compare the value of current market returns to previous market return values to detect any form of dependence between the values. A random walk model is supposed to have independent change of market returns, a condition which was tested in the study.

The autocorrelation test was conducted using the Durbin-Watson. The findings were presented in table 4 below.

Table 4: The Durbin's Alternative Test for Autocorrelation

lags(p)	chi2	df	Prob > chi2
1	2736.951	1	0
H0: no serial correlation			

Table 4 above tested the time series for autocorrelation with results showing that Prob > chi2 is zero (0). This means that the returns of the market on a daily basis were serially correlated and therefore the daily market return time series was concluded not to be efficient in weak form.

Durbin's alternative test was also employed in the study, with the results presented in table 4 below.

Table 5: Durbin-Watson d-statistic

Durbin-Watson d-statistic (2, 1246) = .2801249

The value 0.2801249 indicated a relatively weak positive autocorrelation in the time series. The daily market returns on the NSE were therefore serially correlated which led to the rejection of the null hypothesis of independence of successive daily returns. The Durbin-Watson d-statistic values range between 0 and 4, with a value of two indicating absence of autocorrelation between successive observations in the time series. If the Dublin-Watson Statistic is substantially less than 2, then there is evidence that series has positive correlation and if the Dublin-Watson statistic is substantially greater then there is evidence that series has positive serial correlation. Thus the D

Statistic of .2801249 is less than 2 indicating that the hypothesis of efficient market hypothesis is rejected.

Stationary of the Series

Market efficiency could be also analysed by running unit root tests for a time series of stock returns. These tests are based on the presumption that if a time series has a unit root it does not follow a deterministic process and is, therefore, hard to predict. In other words, if stock returns are not stationary, they may keep a weak-form efficiency. In terms of calculation, unit root tests are close to autocorrelation tests. There are two main modifications of unit root tests: the Augmented Dickey–Fuller (ADF) test and the Phillips–Perron test. In the study ADF regressions include a lagged dependent variable was used. The test for stationary is be shown below.

4.4 Objective Two: Random Market Hypothesis

This was analysed through unit root test, through the Augmented Dickey-Fuller Test was used to test whether the time series was stationary or not. The presence of a unit root signifies non stationary and therefore a random walk, which is the null hypothesis of the study. The first test for stationary was conducted using a line plot, presented in figure 3 below.

From figure 3 below, the time series appeared stationary, since the spikes oscillate around the same area. The time series appeared not to contain a unit root, therefore the null hypothesis was accepted and the return series concluded to conform to the random walk. The period between January 2009 and January 2013 appears to show that market returns appears to be negative between jan 2010 to Jan 2013. This is associated with the electioneering period. However from Jan 2013 to Jan 2014 there appeared to be positive market returns in the stock market, with this associated with increased confidence in the market by investors.

These observations were supported by the line plot where a correlogram was used to detect stationarity. Figure 4 shows the findings.

Figure 2: Line Plot of the NSE Daily Market Return Series
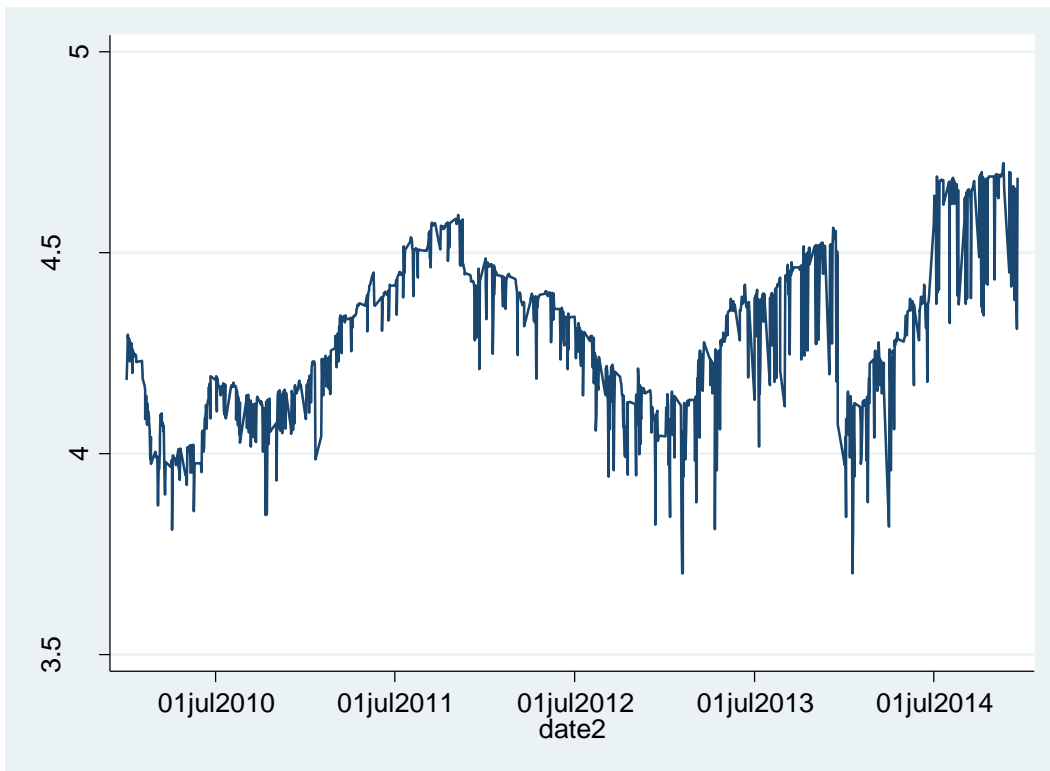
Figure 3 : Correlogram of the NSE Daily Market Return Series

Bartlett's formula for MA(q) 95% confidence bands
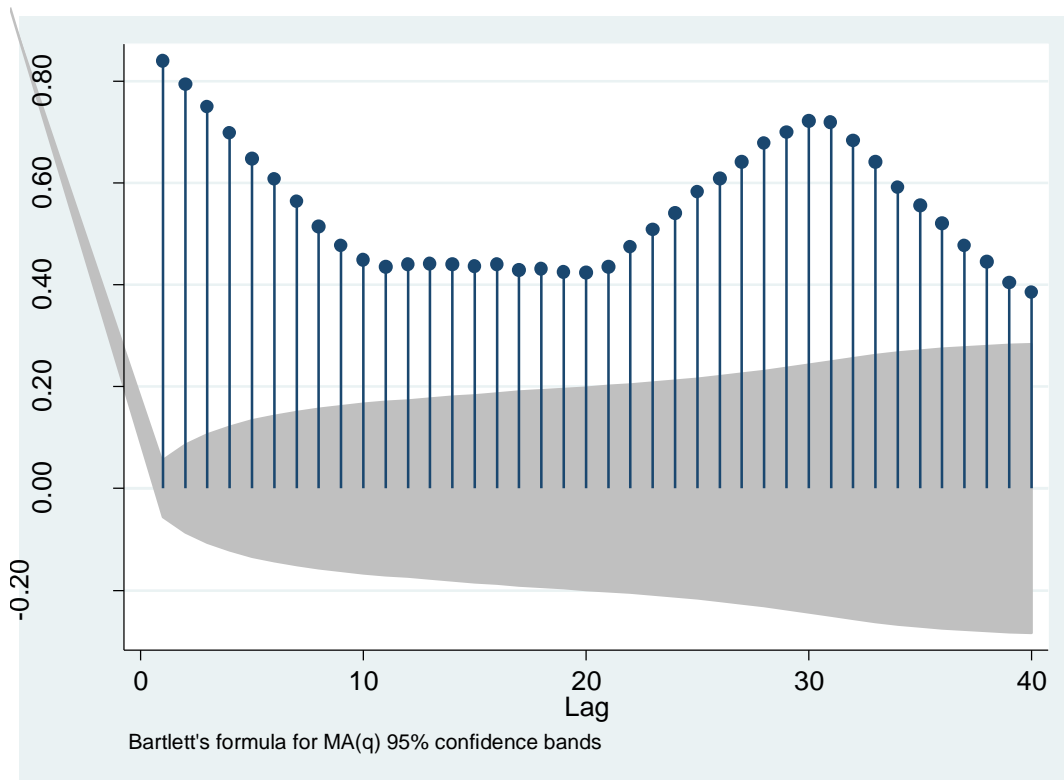
The lags start decaying to zero after lag 5. No slow decay of the lags is noticed; that's why the series appears to be stationary, thereby rejecting the null hypothesis of presence of a random walk in the return series

The Augmented Dickey-Fuller Test was then performed on the NSE time series, with tables 6, 7 and 8 presenting the results. Three forms of the random walk model were considered, namely the pure random walk model, random walk with a trend that is deterministic and random walk with a drift.

Table 6: Pure Random Walk Hypothesis

.dfuller log_mrktreturn, noconstant regress lags(4)

Augumented Dickey-fuller test for unit root number of obs = 1236

Interpolated Dickey-Fuller

Test statistic	1% Critical Value	5% Critical value	10% Critical value	
Z(t)	-0.094	-2.580	-1.95	-1.620

D. Log_MrktReturn	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Log_MrktReturn						
L1.	.0000491	.0005251	0.09	0.926	-.0009811	.0010794
LD.	-.6962298	.0284345	-24.49	0.000	-.7520152	-.6404444
L2D.	-.4902419	.0339688	-14.43	0.000	-.5568849	-.4235988
L3D.	-.2535964	.0341371	-7.43	0.000	-.3205697	-.186623
L4D.	-.1010023	.028629	-3.5	0.000	-.1571694	-.0448352

Comparing the computed test statistic value of 0.094 to the critical values at 1% (-2.58) , 5% (-1.95) and 10% (-1.620) significance levels, it was clear the computed absolute value is significantly less than the absolute values at the levels which are critical. Therefore, the null hypothesis of presence of a unit root in the daily market return series was not accepted. L.D in the table refers to local drift that in the regression model is normal at 0.0001 thus indicating no abnormality in NSE returns.

Table 7: Random Walk with a Trend

.dfuller Log_MrktReturn,trend regress lags(4)

Augemted Dickey-Fuller test for unit root Number of obs = 1236

Interpolated Dickey-Fuller

Test statistic	1% Critical Value	5% Critical value	10% Critical value	
Z(t)	-0.094	-2.580	-1.95	-1.620

macKinnon appropriate p-value for Z(t)=0.0604

D.

Log_Mrkt~n	Coef.	Std. Err.	t	P>t	[95% Conf.Interval]	
Log_MrktRe~n L1.	-.0451393	.0135269	-3.34	0.001	-.0716778	-0186008
LD.	-.6611822	.0302105	-21.89	0.000	-.720452	-.6019124
L2D.	-.4637178	.0347666	-13.34	0.000	-.5319262	-.3955094
L3D.	-.2556059	.0344397	-6.84	0.000	-.3031729	-.1680388
L4D.	-.0912824	.0286732	-3.18	0.001	-.1475363	-.0350284
_trend	.000013	7.07e-06	1.84	0.67	-8.88e-07	.0000268
_cons	.1862235	.0562297	3.31	0.001	.0759067	.2965402

For the random walk with a trend, the computed test statistic is -3.337, and is significantly less than the critical values at 1% (-3.960), 5% (-3.410) and 10% (--3.120) significance levels. The null hypothesis (presence of a unit root in the return series) is therefore rejected and the series is concluded to be stationary. L.D in the table refers to local drift that in the regression model is normal at 0.0008 thus indicating no abnormality in NSE returns.

Table 8: Random Walk with a Drift

.dfuller Log_MrktReturn,trend regress lags(4)

Augemted Dickey-Fuller test for unit root Number of obs = 1236

Interpolated Dickey-Fuller

Test statistic	1% Critical Value	5% Critical value	10% Critical value	
Z(t)	-0.094	-2.580	-1.95	-1.620

p-value for Z(t)=0.0064

D.

Log_Mrkt~n	Coef.	Std. Err.	t	P>t	[95% Conf.Interval]	
Log_MrktReturn L1.	-.0299043	.0120034	-2.49	0.013	-.0534537	-.0063549
LD.	-.6823083	.0299771	-22.76	0.000	-.7411203	-.6234964
L2D.	-.4973559	.0353453	-14.07	0.000	-.5666999	-.428012
L3D.	-.2909104	.0371518	-7.83	0.000	-.3637985	-.2180223
L4D.	-.166047	.03504	-4.74	0.000	-.234792	-.097302
_cons	.1289549	.0515998	2.50	0.013	.0277213	.2301885

The third unit root test performed was the random walk with a drift, which had a computed test statistic of -2.491, a value much smaller than the absolute critical values at 1% (-2.329), 5% (-1.646) and 10% (-1.282) significance levels. The null hypothesis was therefore rejected and the return series adjudged to be stationary and therefore the random walk model did not apply to the NSE. L.D in the table refers to local drift that in the regression model is normal at 0.0001 thus indicating no abnormality in NSE returns.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The data analysis in chapter four used descriptive statistics, non-parametric tests (the

Kolmogrov-Smirnov test and runs test), parametric tests (autocorrelation tests) and finally the unit root test.

Extent do the securities traded in the Nairobi Exchange confirm the random walk hypothesis

This objective was tested by the use of unit root to test for presence of non-stationarity in the series. This, the researcher achieved, by first plotting a line plot using the natural logarithm of daily market returns. The line plot on figure 2 showed the NSE daily market return was stationary, thereby rejecting the null hypothesis that the series bourse was non-stationary.

A correlogram was then generated to confirm the findings and the result also concluded the NSE return series to be stationary. The lags as observed in figure 3 started decaying after lag 5 and therefore the slow decay to zero that was required to accept the null hypothesis of stationarity was rejected. This meant that a unit root was not present and the returns were not arbitrary.

The third test employed was the Augmented Dickey-Fuller (ADF) test, which also tested for stationarity of the NSE daily market return series. The research employed the three models for the ADF test, namely; pure random walk, random walk with a drift and random walk with a deterministic trend. The three models tested all gave a result of the computed test statistics being significantly smaller than the t statistic critical values at 1%, 5% and 10% significance levels, concluding that the series had no unit root and hence it was stationary.

Market Efficiency at Nairobi Stock Exchange

This was tested through the following analysis;

Descriptive analysis was carried out with the results presented through tables and followed by interpretation of the results. A mean of 4.2958 signified that the NSE has a positive return and

that the prediction of the same brings negative returns to investors. The study found the standard deviation to be relatively low, meaning the risk of investing in the NSE is quite low for investors. The least return an investor can reap from the bourse is 3.702971, with 4.722975 being highest return an investor can make. The return series of NSE was found to be Leptokurtic with many extreme returns observed and a skewness of 0.478316 meaning most of the investors made returns above zero. The return series, however, was not normally distributed as confirmed by the confirmed Kolmogrov-Smirnov test.

The standard deviation of 0.2112648 was observed from the return series therefore showing risk that investors are exposed to when investing in the NSE. The NSE is therefore a high risk investment, considering the value of the standard deviation. Risk is measured by the standard deviation and the variance, with the former being the square root of variance. The original unit, the daily market return in this case is given by the standard deviation, as opposed to the squared unit when variance is considered.

3.702971 is the minimum daily return of investing in the NSE, whereas 4.722975 is the highest daily return that an investor can make. Skewness was used in the data analysis to indicate asymmetry and general distribution of data from normal distribution. The observed skewness of 0.478316 indicated that the data was right skewed with most data been concentrated on the left of the mean and with some extreme observation found on the right of the mean.

5.1.2 Runs Test

To test whether the daily market returns were random, the runs test performed on the NSE daily return series gave a z value of -1.86 as shown in table 3, and since it fell between the required

±1.96, the successive returns on the NSE were concluded to be generated randomly and the null hypothesis was accepted.

5.1.3 Autocorrelation Tests

The study used a couple of tests to test for independence of successive stock market returns on the NSE, the first one being the Durbin Watson alternative test for autocorrelation. The NSE return series was found to be serially correlated, thus the consecutive returns were not independent of each other. This means the returns are predictable and the null hypothesis was rejected. The Durbin Watson d-statistic was also computed and the value of 0.2801249 was observed. This regarded the NSE returns as very strongly correlated, hence successive returns were said to be predictable.

4 Unit Root Test

The third and final test was conducted to test the NSE return series for presence of a unit root, that is, the presence of non-stationarity in the series. This, the researcher achieved, by first plotting a line plot using the natural logarithm of daily market returns. The line plot on figure 2 indicated the NSE daily market return was stationary, thereby rejecting the null hypothesis that the series bourse was non-stationary.

A correlogram was then generated to confirm the findings and the result also concluded the return series of NSE to be stationary. The lags as observed in figure 3 started decaying after lag 5 and therefore the slow decay to zero that was required to accept the null hypothesis of stationarity was rejected. This meant that a unit root was absent and the returns were not random.

The third test employed was the Augmented Dickey-Fuller test, which also tested for stationarity of the NSE daily market return series. The three ADF model tests, namely; pure

random walk, random walk with a drift and random walk with a deterministic trend were employed by the research. The three models, as observed in tables 6, 7 and 8 all gave a result of the computed test statistics being significantly smaller than the t statistic critical values at 1%, 5% and 10% significance levels, concluding that the series had no unit root and therefore was stationary.

5.2 Conclusion

The general argument based on the reviewed literature was that for a stock market to be efficient in weak form, the market returns and prices have to be random and unpredictable. This is done using three main tests, namely the runs test, autocorrelation tests and the unit root test which tests a time series for stationary.

Mixed results were obtained from the research, with the runs test agreeing with the null hypothesis that the successive NSE returns are random in nature. The runs test, however, could be considered a test for linearity and therefore not very reliable for the study. Mlambo and Biekpe (2007) in their test of efficiency of ten African stock markets concluded that market returns are generated in a non-linear process and the weak structures of the African markets violate linearity. Linear models would therefore lead to wrong conclusions.

The autocorrelation tests all found serial correlation in the return series, rejecting the assumption that successive daily market returns in the NSE are independent of each other. This led to the researcher concluding that the Nairobi Securities Exchange was not efficient in weak form. In their study of the Nigerian Stock Exchange, Nwosa and Oseni, 2011, found positive correlation of successive stock prices and concluded that the stock prices would be predicted using previous prices and therefore the market was not efficient in weak form. The study further pointed out that the Nigerian stock market had made positive strides with regard to making the

stock market more efficient, but the global financial crisis in 2008 slowed down the market. This can be compared to the NSE, where in addition to the financial crisis; the post-election violence took a toll on the market and slowed down the progress that had been earlier made. The positive correlation in the daily market returns implied the returns were predictable and therefore the market was not efficient in weak form. Guidi, Batuo and Mlambo (2009) suggested that positive correlation found in their study of African stock markets meant that successive prices were predictable and therefore the markets were not informational efficient to be efficient in weak form.

The unit root tests did not find a unit root in the NSE return series, with the Augmented Dickey-Fuller test, the line plot and the correlogram finding the series to be stationary. This led to the conclusion that the NSE return series is not efficient in weak form. The conclusion was that the NSE is not efficient in any form. However, this does not mean that Nairobi stock exchange is fully inefficient. This is because absence of information is not necessary the condition for inefficient market. The presence of a unit root (non-stationarity) in stock prices is only a necessary (but not sufficient) condition for a random-walk process. As Campbell *et al.* (1997) demonstrated, unit root tests only explore the permanent/temporary nature of shocks to the series and, as such, have no bearing on the random-walk hypothesis (or predictability). In this light, the use of unit root tests to examine the random-walk hypothesis appears doubtful and thus may render inefficient market hypothesis as shown in the study. This was also confirmed by Liu *et al*. (2007) and Long *et al.* (2009). Contravention of the random walk, however, does not imply market inefficiency. The unit root tests and autocorrelation tests that show the Nairobi Securities Exchange does not conform to the random walk model and consequently does not mean that the Nairobi Securities Exchange is inefficient.

The study also concludes that Nairobi Stock Exchange does not exhibit weak, semi-strong and

strong market hypothesis. These findings were similar to the res Afego (2012) who established that Nigeria stock exchange has no evidence of non-randomness of index returns. This he attributes to a reflection of "no change" in prices, or "zero returns", which in turn is a result of the prevalence of infrequently traded stocks on the Nigeria stock exchange All share index. The results reported in this study could also be attributed to the peculiar nature of the information environment characterized by poor dissemination of information relating to price movements on the exchange. According to Hirota and Sunder (2002), scant information relating to securities in markets may lead to speculative and or herding mentality amongst investors, ultimately resulting in large and correlated price movements

5.3 Recommendations

The NSE was found not to be weak form efficient, although it was made clear this does not mean that the bourse is not efficient. Various reasons could be behind this, such as thin trading and weak institutional policies. It was therefore suggested that the Capital Markets Authority should ensure that relevant information regarding firms that have been listed on the NSE should be immediately released to give each and every investor a fair playing ground. It should also be noted that infrequent trading on the market may be a cause for the market not conforming to the random walk model. The NSE should take it upon them to properly educate the public and potential investors on the advantages of investing in the NSE.

This finding is visual evidence proving that the market is not yet efficient, though investors usually act similarly making transaction prices predictable. It actually is the situation of the Nairobi stock exchange where legal and regulation mechanisms are not yet comprehensive and the market is still unpredictable. Moreover, investors in stock market are not yet fully professional allowing psychological factors to strongly influence their investment decisions. Since February 2011, however, the Nairobi stock exchange has been improving remarkably

with signs of separate movements in transaction prices of traded stocks. These results were similar to the findings of Cuong and Zhou (2012) who carried out a study on Vietnamese and Thailand stock exchange.

Recommendation for further research

The researcher would also propose that future studies include weekly and monthly return series in addition to the daily return series. This would guarantee the consistent improvement results on the three levels and give the findings more weight and relevance. The use of a longer time period, that is, more than the five year period used for the study, would give more adequate results, since more data is collected.

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APPENDIX 1: LIST OF COMPANIES

Sector	Companies
Agricultural sector	Sasini Limited,
Commercial and Services sector	Kenya Highway Limited, Nation Media group, Scan group Limited and Centium Investment Company Ltd
Banking Sector	Kenya Commercial Bank Ltd., Co-operative Bank of Kenya Ltd., Standard Chartered

	Bank Limited, Barclays Bank limited, Equity Bank Ltd and CFC Stanbic Holding Limited,
Manufacturing and Allied Sector	East Africa Breweries Limited, British American Tobacco Kenya Limited, Athi River Mining Limited and Bamburi Cement limited,
Energy and Petroleum Sector	Kenol Kobil Limited, Kenya power limited and Kenya Electricity Generating Company Limited.
Insurance Sector	British American Investment Company (Kenya) limited
Telecommunication sector	Safaricom limited.