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SCHOOL OF MATHEMATICS

THE CAUSAL RELATIONSHIP BETWEEN STOCK PRICE AND INTEREST RATES

BY

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DECLARATION

DECLARATION BY STUDENT

I declare that this is my own work and has not been presented to any other University for a degree award.

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I46/69055/2013

Signature.....Date.....

DECLARATION BY SUPERVISORS

This project has been submitted for the award of Postgraduate Diploma in Actuarial Science of the University of Nairobi with my approval as the university supervisor.

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DEDICATION

This research project is dedicated my late mother, S. Cheayonnoh Freeman.

May her soul rest in peace.

ACKNOWLEDGEMENT

I want to be grateful to the Almighty God for His grace and strength that enabled me to go through this program. I also want to thank the CEO, Mr. Sam O. Mintah and the Management of the Insurance Company of Africa, Monrovia-Liberia, for the opportunity afforded me to enroll in this program. I thank my supervisors, Dr. Ngare and Mr. Achola for their guidance.

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ABBREVIATIONS AND OR ACRONYMS

NSE	Nairobi Stock Exchange
CBK	Central Bank of Kenya
VAR	Vector Auto Regression
CBR	Central Bank Rate
DMAX	Maximum order of integration
EMH	Efficient Market Hypothesis
ANOVA	Analysis of Variances
MWALD	Modified WALD
SUR	Seemingly Unrelated Regressions

ABSTRACT

The relationship between the movements of interest rates and stock prices has been the subject of much speculation and empirical investigation. This is understandable, given the important role they play in the economic development of a country. The relationship between the two is of interest not only to economic theorists but also to investors who have to grapple with issues regarding asset allocation and market timing. This study examines the relationship between stock prices and interest rates and attempt to determine if there's any causal link between the two. Interest rate is represented by the weighted average lending rate of commercial banks in Kenya and stock prices are proxied by the NSE 20 share index. Secondary data, in the form of weekly observations for the period January 2004 to December 2013 is utilized. Time series analysis and the Granger causality test is employed to examine the relationship. The results indicate that there is no significant causal relationship between interest rate and share price.

CHAPTER ONE

INTRODUCTION

1.1 Background

The relationship between the movements of interest rates and stock prices has been the subject of much speculation and empirical investigation. The relationship between the two is of interest not only to economic theorists but also to investors who have to grapple with issues regarding asset allocation and market timing.

The fundamental principle for the relationship between interest rate and stock market returns is that stock prices and interest rates are negatively correlated. Higher interest rate resulting from tightening monetary policy usually has negative effects on stock market returns. This is due to the fact that higher interest rate reduces the value of equity as indicated by the dividend discount model and consequently, makes fixed income securities more attractive as an alternative to holding stocks. As a result, this may reduce the propensity of investors to borrow and invest in stocks and also, raises the cost of doing business and hence affects profit margin. On the other hand, lower interest rates resulting from expansionary monetary policy also boost stock market.

In financial theory, valuation begins with a simple question: if you put money into this company, what are the chances you will get a better return than if you invest in something else? Interest rates play an important part in determining what that something else might be.

Essentially, interest is nothing more than the cost someone pays for the use of someone else's money. Generally, interest rate is considered as the cost of capital, which means it is the price paid for the use of money for a period of time. From the point of view of a borrower, interest rate is the cost of borrowing money (borrowing rate). From a lender's point of view, interest rate is the fee charged for lending money (lending rate).

The interest rates that apply in this study are the weighted average lending rate by commercial banks in Kenya. This is the cost that banks charge for lending money out.

Effects of an Increase in CBK Lending Rate

When the CBK increases its funds rate, it does not have an immediate effect on stock prices. Instead, the increased funds rate has a single direct effect - it becomes more expensive for banks to borrow money from the CBK. Increases in the funds rate also cause a ripple effect, however, and factors that influence both individuals and businesses are affected.

The first indirect effect of an increased funds rate is that banks increase the rates that they charge their customers to borrow money. Individuals are affected through increases to credit card and mortgage interest rates, especially if they carry a variable interest rate. This has the effect of decreasing the amount of money consumers can spend. After all, people still have to pay the bills, and when those bills become more expensive, households are left with less disposable income. This means that people will spend less discretionary money, which will affect businesses' top and bottom lines (that is, revenues and profits).

Therefore, businesses are also indirectly affected by an increase in the funds rate as a result of the actions of individual consumers. But businesses are affected in a more direct way as well.

They too borrow money from banks to run and expand their operations. When the banks

make borrowing more expensive, companies might not borrow as much and will pay higher rates of interest on their loans. Less business spending can slow down the growth of a company, resulting in decreases in profit.

Stock Price Effects

Clearly, changes in the funds rate affect the behavior of consumers and businesses, but the stock market is also affected. One method of valuing a company is to take the sum of all the expected future cash flows from that company discounted back to the present. To arrive at a stock's price, the sum of the future discounted cash flow is taken and divided by the number of shares available. This price fluctuates as a result of the different expectations that people have about the company at different times. Because of those differences, they are willing to buy or sell shares at different prices.

If a company is seen as cutting back on its growth spending or is making less profit - either through higher debt expenses or less revenue from consumers - then the estimated amount of future cash flows will drop. All else being equal, this will lower the price of the company's stock. If enough companies experience declines in their stock prices, the whole market, or the indexes that many people equate with the market, will go down.

Investment Effects

For many investors, a declining market or stock price is not a desirable outcome. Investors wish to see their invested money increase in value. Such gains come from stock price appreciation, the payment of dividends - or both. With a lowered expectation in the growth and future cash flows of the company, investors will not get as much growth from stock price appreciation, making stock ownership less desirable.

Furthermore, investing in stocks can be viewed as too risky compared to other investments.

When the CBK raises the funds rate, newly offered government securities, such as Treasury bills and bonds, are often viewed as the safest investments and will usually experience a corresponding increase in interest rates. In other words, the "risk-free" rate of return goes up, making these investments more desirable. When people invest in stocks, they need to be compensated for taking on the additional risk involved in such an investment, or a premium above the risk-free rate. The desired return for investing in stocks is the sum of the risk-free rate and the risk premium. Of course, different people have different risk premiums, depending on their own tolerances for risk and the companies they are buying into. In general, however, as the risk-free rate goes up, the total return required for investing in stocks also increases. Therefore, if the required risk premium decreases while the potential return remains the same or becomes lower, investors might feel that stocks have become too risky, and will put their money elsewhere.

The interest rate has a wide and varied impact upon the economy. When it is raised, the general effect is a lessening of the amount of money in circulation, which works to keep inflation low. It also makes borrowing money more expensive, which affects how consumers and businesses spend their money; this increases expenses for companies, lowering earnings somewhat for those with debt to pay. Finally, it tends to make the stock market a slightly less attractive place to invest.

However, these factors and results are all interrelated. Interest rates are not the only determinant of stock prices and there are many considerations that go into stock prices and the general trend of the market - an increased interest rate is only one of them. One can never say with confidence, therefore, that an interest rate hike by the CBK will have an overall negative effect on stock prices.

1.2 Problem Statement

Changes in interest rates impact the theoretical value of companies and their shares: basically, a share's fair value is its projected future cash flows discounted to the present using the investor's required rate of return. If interest rates fall and everything else is held constant, share value should rise. Conversely, if interest rates goes up (holding everything else constant), share values ought to fall.

Interest rates impact a company's operations too. Any increase in the interest rates that it pays will raise its cost of capital. Therefore, a company has to work harder to generate higher returns in a high interest environment. Otherwise, the bloated interest expense will eat away at its profits. Lower profits, lower cash inflows and a higher required rate of return for investors all translate into depressed fair value for the company's stock.

Alternatively, performance of companies and businesses in Kenya may impact economic growth. As a direct or indirect consequence of this economic growth, interest rates levels may eventually be affected. Policy makers, scholars, economists, business owners, regulators and the general public is grappling with figuring out the relationship between stock prices and interest rates.

1.3 Research Objective

The general objective of this study is to analyze the correlation between the stock market prices (proxied by the NSE share index) and interest rate movement in Kenya. From this above outlined general objective, the specific objectives are as follow:

- i. To investigate the presence of causal relationship between stock market prices and interest rates movement.
- ii. To examine the direction of the causal relationship between stock market prices and interest rate movement, that is determining whether the relationship is uni-directional or bi-directional.
- iii. To examine the response to certain shocks, like political instability, in the Kenya market

1.4 Significance of the Study

Apart from the fact that the empirical findings of this study will contribute to the existing body of knowledge, it is also going to be of interest to investors and potential investors. Investors will get to understand interactions between interest rates and stock prices. This in turn will go a long way in helping in their investment decisions and also in the management of their portfolios.

The Central Bank of Kenya, being a regulator in the financial sector and a major player in the economy could also use the findings of this study. Through its monetary or interest rate policy, the CBK can move to act in a way that will positively impact the stock market and the economy as a whole.

1.5 Scope of the Study

The scope of this study covers the period from January 2004 to December 2013, giving a total of 120 observations. The Kenyan Government through the Kenyan National Bureau of Statistics provides data on monthly observations of the Nairobi Securities Exchange 20 share index. Data on interest rates is culled from the website of the Central Bank.

1.6 Organization of the Study

The study consists of five chapters as follows:

Chapter one comprises the background of the study, statement of the problem, objectives of the study, significance of the study, scope and limitation of the study and the organisation of the study.

Chapter two presents a review of the relevant literature on interest rate and exchange rate changes on stock market that will form the theoretical framework for the study.

Chapter three gives detail research methodology. It delineates the sources of data, and empirical design.

Chapter four reports the empirical results. It covers data presentation, analysis and discussion. Here secondary data obtained using various means outlined in the methodology is organized into a meaningful data format, analysed and discussed in order to draw conclusions.

Chapter five presents the findings from the data analysis and offers conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

The stock market plays an important role in the economic development of any nation.

Besides serving as an instrument for the mobilization of domestic capital for the corporate sector, the mere presence of the market boosts the international investment climate of a country. Theoretically, capital market not only knots the domestic macroeconomic indicators within an economy, but also with the outside economy as well. Trade, capital and other flows are all tied to it. The relationship between interest rates and stock prices is of great interest to many academics and professionals since they play an important role in the economy.

The literature review is organized into four main areas. The first is the review of the theories that affect the individual variables that form part of the research question, namely share prices and interest rates. The second section summarizes the conceptual framework and the hypothesis that link share prices to interest rates. The third section reviews the empirical evidence. Finally, this chapter concludes with how this research will contribute to the existing literature.

2.1 Share Price and Market Theories

There are two broad theories that attempt to explain the movement in share prices in the stock market. The first is the Efficient Market Hypothesis and the other is Behavioural Finance.

Efficient Market Hypothesis

An investment theory that states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information. According to the EMH, stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should be impossible to outperform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments. Although it is a cornerstone of modern financial theory, the EMH is highly controversial and often disputed. Believers argue it is pointless to search for undervalued stocks or to try to predict trends in the market through either fundamental or technical analysis.

Meanwhile, while academics point to a large body of evidence in support of EMH, an equal amount of dissension also exists. For example, investors, such as Warren Buffett have consistently beaten the market over long periods of time, which by definition is impossible according to the EMH. Detractors of the EMH also point to events, such as the 1987 stock market crash when the Dow Jones Industrial Average (DJIA) fell by over 20% in a single day, as evidence that stock prices can seriously deviate from their fair values.

The related random walk hypothesis of the early 1960s was an empirical result. Based on time-series analyses of past stock prices, researchers concluded that the prices behaved like geometric random walks. This threw cold water on the practice of technical analysis—the study of stock price charts to divine future price movements. It did not, however, rule out fundamental analysis—the study of a company's business, its market and/or the overall economy to divine future price movements. Developed by Eugene Fama in the late 1960s and

early 1970s, the efficient market hypothesis went beyond the random walk hypothesis to reject both technical analysis and fundamental analysis.

Between 1965 and 1970, many empirical studies were performed on stock price behavior or investment managers' performance. These culminated in 1970 with Fama's second landmark paper, which appeared in the *Journal of Finance* and was titled "Efficient capital markets: A review of theory and empirical work." In it, Fama elaborated on his theory of efficient markets and reviewed the developing literature. Based on the terminology of his colleague Harry Roberts, he reported on empirical tests for three different levels of market efficiency:

- A market has **weak efficiency** if prices fully reflect any information contained in past price data. Weak efficiency rejects technical analysis. It is essentially the random walk hypothesis but without as full a characterization of the stochastic process that describes price behavior.
- A market has **semi-strong efficiency** if prices fully reflect all readily-available public information—past prices, economic news, earnings reports, etc. Tests of semi-strong efficiency are those that study stock price movements following announcements, such as stock splits or earnings announcements.
- A market has **strong efficiency** if prices fully reflect all public and privileged information. Privileged information includes knowledge available to a market maker, insider information available to corporate managers, or information that investment managers spend time and money to compile for their own use.

Behavioral Finance Theory

Behavioral finance is the study of the influence of psychology on the behavior of financial practitioners and the subsequent effect on markets. Behavioral finance is of interest because it

helps explain why and how markets might be inefficient. Behavioral finance takes issue with two crucial implications of the EMH: (1) that the majority of investors make rational decisions based on available information; and (2) that the market price is always right. Proponents of behavioral finance, or behaviorists, as they often are known, believe that numerous factors—irrational as well as rational—drive investor behavior. In sharp contrast to efficient markets theorists, behaviorists believe that investors frequently make irrational decisions and that the market price is not always a fair estimate of the underlying fundamental value. Refuting Fama’s crucial assertion that the market price is always right, behaviorists “believe investor psychology can drive market prices and fundamental value very far apart (H. Shefrin).

The origins of today’s school of behavioral finance are generally traced back to the work of two psychologists, Daniel Kahneman and Amos Tversky, on how people make decisions involving risk. In the 1980s behavioral finance researchers, such as Werner De Bondt, Robert J. Shiller, Andrei Shleifer, and Richard Thaler, to name a few, began to focus on the study of the time series properties of prices, dividends, and earnings. The objective was to determine whether stocks exhibit volatility in excess of the amount predicted by the efficient market hypothesis.

“The [pricing] anomalies that had been discovered [in the 1970s] might be considered at worst small departures from the fundamental truth of market efficiency, but if most of the volatility in the stock market was unexplained, it would call into question the basic underpinnings of the entire efficient markets theory,” Shiller (2003) wrote. In 1981 Shiller published an article in the *American Economic Review* in which he documented evidence of price movements much greater than an efficient market would allow. Four years later Richard Thaler and Werner de Bondt (1985) published a study that concluded that the stock market tends to overreact to a long series of bad news.

Werner F. M. De Bondt and Richard Thaler published 'Does the stock market overreact?' in the *The Journal of Finance* (De Bondt and Thaler 1985), effectively forming the start of what has become known as behavioral finance. They discovered that people systematically overreacting to unexpected and dramatic news events results in substantial weak-form inefficiencies in the stock market. This was both surprising and profound.

2.2 Interest rate theories

Interest rate is the price paid for money borrowed which is in turn invested in viable economic activities with a view of generating returns. Interest rate in any country is determined by a number of factors. The key theory is the demand for money and supply of money framework. Some of the other factors include the growth in the economy, monetary policy driven by central banks, rate of inflation among others.

2.3 Theories linking interest rates and share prices

Theoretical framework

Fama (1981) argues that expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market. Therefore stock market returns should be negatively correlated with expected inflation, which is often proxied by the short-term interest rate.

In theory, the interest rates and the stock price have a negative correlation (Hamrita & Abdelkader, 2011). This is because a rise in the interest rate reduces the present value of future dividend's income, which should depress stock prices. Conversely, low interest rates result in a lower opportunity cost of borrowing. Lower interest rates stimulate investments and economic activities, which would cause prices to rise.

2.4 Research hypothesis

Null hypothesis

There is no significant causality relationship between stock prices and interest rates

Alternative hypothesis

There is a significant causality relationship between stock prices and interest rates

2.5 Empirical evidence

Hamrita and Abdelkader (2011) examined the multi-scale relationship between the interest rate, exchange rate and stock price using a wavelet transform in US over the period from January 1990 to December 2008. The exchange rate returns and stock index returns were found to have a bidirectional relationship in this period at longer horizons.

Findings from other research specifically point out that the interest rate changes affect the stock market in the long run and there is no significant influence in the short run. According to Amaresh Das (2005) on his study on the interrelationship between the stock prices represented by market index and interest rates measured by three month Treasury bills for monthly observation from 1985 to 2003 by sampling three Asian countries including Bangladesh, the codependence among variables shows that the relationship between stock prices and interest rate is not significant for Bangladesh and Pakistan except India. The paper further documents that the time series data for Bangladesh and Pakistan reflects strongly common cycles. In related studies, Officer (1973) explained the drop in stock market volatility in the 1960s with a reduced variability in industrial production. Schwert (1989) and Hamilton and Lin (1996) discovered that stock market volatility increases in times of

recession and Glosten et al.(1993) find interest rates to be an important factor in explaining stock market volatility.

Hasan and Samarakoon (2000) studies the ability of interest rates, measured by treasury bill rates of three maturities; 3,6 and 12 months which tracks the expected monthly, quarterly and annual returns in the Sri Lankan stock market for the period 1990 to 1997. The stock return is measured by the continuously compounded monthly returns on the All Share Price Index (ASPI) and Sensitive price index. Through the application of the OLS method it was suggested that the short-term interest rates are positively related to future returns and they are able to reliably track expected returns prospects. The authors also concluded that the 12 months maturity is the most powerful tool to track monthly and quarterly expected return among all the three maturities.

In a study conducted by Lobo (2002) which examines the impact of unexpected changes in the federal funds target on stock prices from 1988 to 2001; Measures of interest rate surprises are constructed from survey data and changes in the 3-month T-bill yield. It was discovered that surprises associated with decreases in the target cause stock prices to rise significantly. Surprises associated with increases in the target increase stock market volatility on the announcement day, with volatility reverting to pre-surprise levels on the day after the announcement. This volatility pattern is only evident since 1994. An implication is that concerns about immediate disclosure causing persistent and heightened stock market volatility might be misplaced.

Gazi and Mahmudul (2009) sought to find evidence supporting the existence of share market efficiency based on the monthly data from January 1988 to March 2003 and also shows empirical relationship between stock index and interest rate for fifteen developed and developing countries For all of the countries it is found that interest rate has significant

negative relationship with share price and for six countries it is found that changes of interest rate has significant negative relationship with changes of share price.

2.7 Conclusion

From the literature and empirical evidence review there is mixed findings. There are studies done by Hsing (2004), Arango (2002), Gazi and Mahmudul (2009) in different countries that have found a negative relationship between interest rates and share prices. However, Lee (1997) found the relationship changing gradually from a significantly negative to no relationship, or even a positive although insignificant relationship. Gupta et. al (n.d) in their research failed to establish any consistent causality relationships between interest rates and share prices. Therefore, there is still no unanimity in the study of the relationship between interest rate and share prices.

This proposed research will contribute to the growing literature by employing the Toda and Yamamoto (1995) method in the Kenyan scene. Toda and Yamamoto (1995) proposed a simple procedure requiring the estimation of an “augmented” VAR, even when there is cointegration of different orders, which guarantees the asymptotic distribution of the MWALD statistic.

Hsing (2004) adopted a structural VAR model that allows for the simultaneous determination of several endogenous variables such as, output, real interest rate, exchange rate, the stock market index and found that there is an inverse relationship between stock prices and interest rate.

Lee (1997) used three-year rolling regressions to analyze the relationship between the stock market and the short-term interest rate. He found that the relationship is not stable over time. It gradually changes from a significantly negative to no relationship, or even a positive, although insignificant relationship.

Ishfaq, M., Ramiz, Rehman & Awais, Raof (2010) examined the relationship between stock return, interest rate and exchange rates in Pakistani economy over the period of 1998-2009. A multiple regression model was applied to test the significance of change in interest rate and exchange on stock returns. The results indicated that both the change in interest rate and change in exchange rate have a significant impact on stock returns over the sample period .

Hashemdah and Taylor (1988) found bi-directional relationship causality present in regression models between money supply and stock return. However, with respect to interest rates the result was inconclusive.

Gupta et. al (n.d) studied the relationship between exchange rate, interest rate and stock prices in Indonesia. The study was conducted for five year period from 1993 to 1997 which was divided into three sub periods. The overall evidence, however, failed to establish any consistent causality relationships between any of the macro economic variables under study.

CHAPTER THREE

RESEARCH METHODOLOGY

Research methodology refers to the scientific and systematic search of pertinent information on the research topic. This chapter explains the data collection and analysis method used in this study. This chapter is organized in the following sections; Research design, Population and Samples, Data collection Criteria and finally Data analysis.

3.1 Research Design

Research Design is a detailed outline of how an investigation will take place. A research how the instruments will be used and the intended means for analysing data collected.

This study adopts a causal relationship research design to investigate the causal relationship between the stock market prices and interest rates in Kenya. This enabled the researcher to understand how one variable under study affected, or was responsible for changes in another variable. According to Cooper and Pamela Schindler (2006) the use of a causal research design eases the understanding, explanation, prediction and control of any relationship between variables under study. The study will use an empirical design in which the secondary data will be analyzed and the research hypothesis tested.

Characteristic of this study from other literature is the former tests monthly trends, rather than cross count every week stock prices index and the interest rates. The Toda and Yamamoto

(1995) method of testing causality is used here to check the relationship between the variables

In summary, in order to apply Toda and Yamamoto method, firstly, the VAR order, k , and the maximum order of integration of the variables, D_{max} , should be determined in the VAR model. To employ causality test, modified Wald test (MWALD), is applied to the first k VAR coefficients to investigate the causality.

3.2 Population and Sample Design

Two variables have been used in this study, interest rates stated as the weighted weekly average lending rates by commercial banks in Kenya and NSE share index. The study considers the NSE's 20 share index which tracks the performance of the shares of twenty companies as selected by management of NSE over time.

The sample data considers NSE stock index values for a period between first week of January 2004 and the last week of 2013. The interest rates for the same period of January first week 2012 and the last week of 2013 are selected for use in the study. The 520 weeks period provides 120 data points that are considered adequate after sample group of 120 created by getting the weighted average from the 520 weekly secondary data.

3.3 Data collection

The data used in this study is secondary data. The weekly data on the NSE share index was obtained from the NSE. Weekly data on average interest rate was obtained from CBK.

3.4 Data analysis

Conventionally, to test for the causal relationship between two variables, the standard Granger (1969) test has been used. It states that, if past values of a variable X significantly

contribute to forecast the value of another variable Y_{t+1} , then X is said to Granger cause Y and vice versa. More precisely, variable X is said to Granger-cause another variable, Y , if the current value of Y (y_t) is conditional on the past values of X ($x_{t-1}, x_{t-2}, \dots, x_0$) and thus the history of X is likely to help predict Y (Seabra and Flach, 2005). Granger causality measures whether one thing happens before another and helps predict it – and nothing else (Bent, 2005). The co-integration methodology basically characterizes the existence of a long-run relationship. To analyze Granger causality between interest rate and security market price, this study will employ Toda, Yamamoto (1995) procedure.

Toda and Yamamoto model

The integrated properties of the stock price and interest rates series are not important in Toda and Yamamoto method, providing that the risk of misspecification of the order of integration of the series is minimized. Hence, the causality relationship between series which are integrated in different orders can be investigated. In order to apply Toda and Yamamoto method, first, the VAR order, k , and the maximum order of integration of the variables, d_{max} , should be determined in the VAR model. The sum of k and d_{max} is taken into consideration as the total order of VAR, i.e. $(k+d_{max})$ th order of VAR is estimated.

In order to employ causality test, modified Wald test (MWALD), proposed by Toda and Yamamoto (1995) is applied to the first k VAR coefficients to investigate causality. This test has an asymptotic chi square (χ^2) distribution when a VAR $(k + d_{max})$ is estimated. A Monte Carlo experiment, presented in Zapata and Rambaldi (1997), provides evidence that the MWALD test has a comparable performance in size and power to the likelihood ratio and WALD tests if; (i) the correct number of lags for estimating $k+d_{max}$ is identified, and (ii) no important variables are omitted, provided a sample of 50 or more observations is available.

According to Zapata and Rambaldi (1997), the advantage of this procedure is that it does not require the knowledge of co-integration properties of the system. Moreover, according to Toda and Yamamoto, the MWALD statistic is valid regardless of whether a series is I (0), I (1) or I (2), non-co-integration or co-integration of an arbitrary order.

To analyze *Granger* causality between interest rate and stock market price by using Toda and Yamamoto procedure, the following VAR system should be estimated.

$$\begin{aligned} in_t &= \alpha_0 + \sum_{i=1}^k \alpha_{1i} in_{t-i} + \sum_{j=k+1}^{d \max} \alpha_{2i} in_{t-i} + \sum_{i=1}^k \lambda_{2i} stp_{t-j} + \sum_{j=k+1}^{d \max} \lambda_{2i} stp_{t-i} + \mu_{1t} \\ stp_t &= \beta_0 + \sum_{i=1}^k \beta_{1i} stp_{t-i} + \sum_{j=k+1}^{d \max} \beta_{2i} stp_{t-i} + \sum_{i=1}^k \theta_{2i} in_{t-j} + \sum_{j=k+1}^{d \max} \theta_{2i} stp_{t-i} + \mu_{2t} \end{aligned}$$

Where in_t and stp_t are, respectively, the logarithm of interest rate and share price index, k is the optimal lag order, d is the maximal order of integration of the series in the system and μ_1 and μ_2 are error terms that are assumed to be white noise. Conventional Wald tests were then applied to the first k coefficient matrices using the standard χ^2 - statistics. The main hypothesis set can be drawn as follows: (a) in equation (1), interest rate “Granger-causes” share price index if it is not true that $\beta_i = 0 \forall i \leq k$; (b) analogously, in equation (2), share price index “Granger-causes” interest rate if it is not true that $\beta_i = 0 \forall i \leq k$.

As pointed out by Yamada and Toda (1998), the lag selection procedure is a crucial step for the augmented Granger causality test, especially when theory and statistical results indicate a small number of lags in the VAR component. For the present case a short lag structure is expected due to the time to technological and capital accumulation. To choose the optimum lag length (k), the Schwarz selection criterion was implemented. A series of diagnostic tests were also conducted to ensure the standard properties of the test. The SPSS statistical package was used to run the tests.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

This chapter provides a summary of the data analysis, results of the study and the discussion on the results of the study. The chapter is organized as follows: section 4.1 describes the data analysis and the results of the study and section 4.2 discusses the implication of the findings of the study.

4.1 Data analysis and results

This study used the secondary data for the weekly share prices and the interest rates for the period between the first week of 2004 and last week 2013. The data for share prices and interest rates were obtained from NSE and the CBK respectively. Based on the weekly data obtained we produced the two time series graph one for interest rates and the other for share prices and plotted independently.

By observing the trends on the two graphs in figures one and two below, one for interest rates and the other share prices we note an important pattern and relationship. The two series trend in almost opposite directions. For instance, between the first few weeks of 2004 and the whole 2005 weeks the share prices trended upwards while the interest rates were trending downwards. Moreover for the period 2009 and the last weeks of 2010 the interest rate aloft as the share price within those weeks trended down. In the weeks of 2007/2008 mainly the last and the first 18 weeks of the years respectively share prices toppled sharply while the interest rates increased slightly. When taking the spearman correlation coefficient of the two variables the result is negative 0.058. This depicts a very weak negative correlation between

them. The following Figures 1 and 2 shows the graphical analysis of the share prices and interest rates series:

Figure 1: Graphical analysis of share prices series

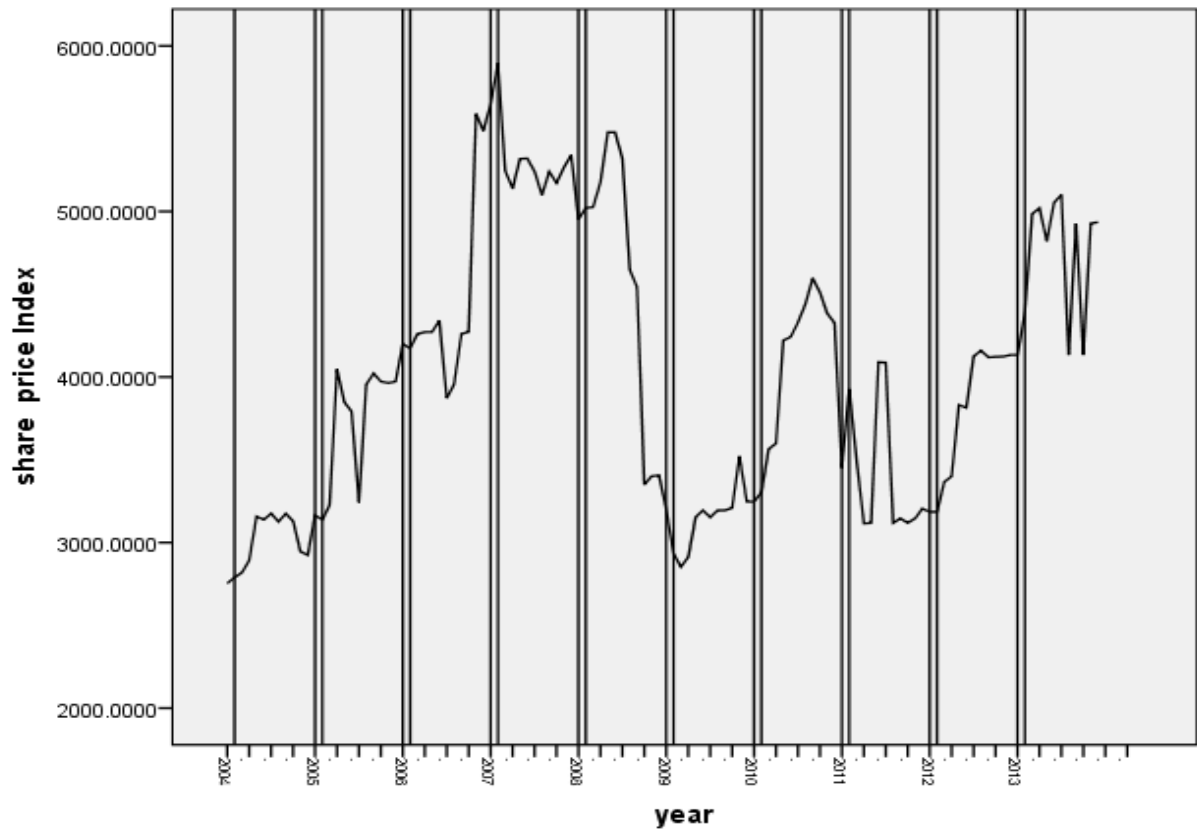
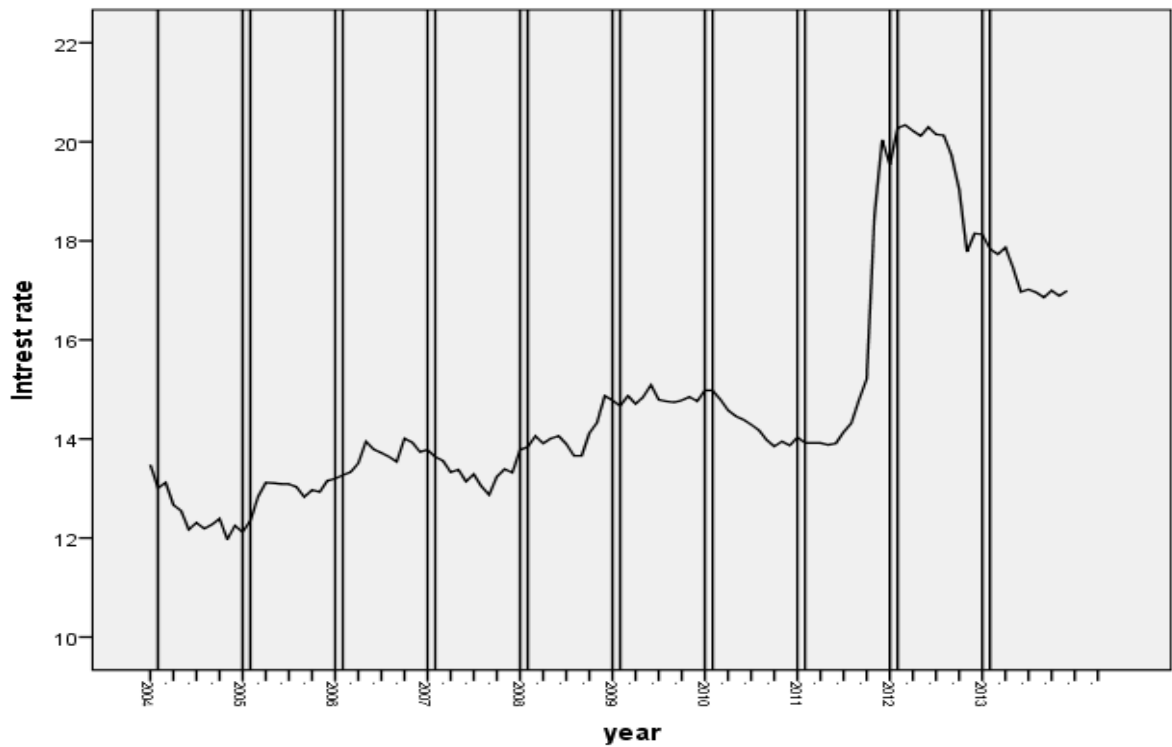


Figure 2: Graphical analysis of interest rates series



The causality test is now carried out in order to statistically and empirically establish a relationship between interest rates and share prices, if any.

Toda Yamamoto method for causality test

The result of the modified causality Wald test, obtained from the SUR estimation of level VAR model outlined in equations (1) and (2), are depicted in Table 1. The null hypothesis that interest rate do not Granger *cause* share price index was accepted at 95% significance level (see appendix 1). Similarly, the null hypothesis that share price index does not Granger *cause* interest rate was accepted at 95% level of significance (see appendix 2). The results shows that the beta-values are less than the test critical values, the study consequently fails to

reject the two null hypotheses. Therefore, this study doesn't find evidence that there is a bidirectional causality relationship between interest rate and share price index.

Table 1: Test for Granger-Causality applying Toda and Yamamoto Modified Wald test.

Null Hypothesis	Beta	Significance	Lags
Share price does not cause Granger Cause interest rate	-0.006	0.95	16
Interest rates does not Granger Cause share price index	-0.006	0.95	16

Source: SPSS Statistical Package

4.2 Discussion

The study has established insignificant negative relationship between share price and interest rates. When interest rates increase the share prices decline which attests to the expected relationship as proposed by Fama (1981). The findings in Kenya's market case in the two variables was very interesting mainly during election years, a snapshot on the series trends depict abnormal changes to the series pattern for example during, 2005, 2007/2008 and 2012/2013 when the share price reduced sharply and the interest rate reduced marginally. During the above periods the country was going through a referendum and general elections, which was characterized by some political instability. Of course political instability creates

uncertainty in the market and in the economy as a whole. The market response therefore was the sharp fall in share prices.

Portfolio managers are mandated to maximize the wealth for their clients by optimizing portfolio values. The sharp fluctuations in share prices as a result of oscillations in interest rates cause panic among portfolio managers. This may predispose them to liquidate some of the holdings in their portfolios. This may result to a slump in the stock market. On the contrary, when the interest rates decline the portfolio of equity securities may appreciate in value. Therefore, the portfolio managers need a thorough understanding of the relationship between interest rates and share prices. Based, on the results of this study, portfolio managers are better when they dispose shares in their portfolio if they predict increased interest rates. On the flip side, the portfolio managers should increase their positions in equity shares when they forecast a decrease in interest rates.

The regulators such as CBK who are in charge of monetary policy have a reason to be concerned with volatility in interest rates and the resulting impact on the stock market. The findings in this research will assist CBK in mastering the relationship between interest rates and share prices mainly during political periods. This may help them employ the monetary policy tools at their disposal to control the interest rates and consequently averting adverse effect on the stock market. Based on the finding of this research, the consistent sharp increase in interest rates may erode the value of shares. The CBK may intervene to stabilize the interest rates.

The stock market is an important institution for price discovery. The forces of demand and supply in the market determine the market price of shares. This market price is useful in valuation of companies, evaluating portfolio performance, facilitating transfer or disposal of securities among others. High volatility in the interest rates and by extension the stock market

will have an adverse effect on pricing efficiency. If volatility persists for a long time there will be a disruption in the price discovery process in the market. This disruption in price discovery process renders the stock market inefficient.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

The study examined the relationship between interest rates and stock prices in Kenya for the period between January 2004 and December 2013. Weekly data from this period was considered. Based on the results of the MWALD test statistic as well as its beta-value the two null hypotheses were accepted. The results therefore indicated that there is no significant causal relationship between interest rate and share price. With regards to the sign of causality, negative causality exists in both directions. The findings are similar to those of Gupta et. al

who didn't find any consistent causal relationship between interest rates and share prices in Indonesia. However, this research finds negative relationship between the variables, similar to other studies carried in different countries. This study also found that the stock market responded negatively to the uncertainty created in the market by a period of instability. This was characterized by a sharp drop in share prices over the period

5.2 Conclusion

Based on the evidence obtained, this study can conclude that there is no significant causal relationship between interest rate and share price. This study also shows that the market does respond to certain shocks, as in this case, political instability.

5.3 Limitations of the study

This research considered only two variables; interest rates and share prices. The study was limited to average weekly secondary data as opposed to more frequent data observations such as daily data which may have an impact on the findings.

5.4 Recommendations

This study considered only two variables, interest rates and share prices. However, the inclusion of other macroeconomic variables like inflation, money supply and exchange rate which might bring about a different effect to the study. This is important as the government will be able to set up policies that will be helpful in developing the stock market. Additional variables can therefore be considered in another study. Also the significance of the results of this study could possibly be improved upon by applying daily primary data. The use of more frequent observations may better capture the dynamics of stock prices and interest rates interrelationships.

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