THE EFFECTS OF INTEREST RATES VOLATILITY ON STOCK RETURNS: EVIDENCE FROM THE NAIROBI SECURITIES EXCHANGE

BY

THUO ALLAN NDUNG'U

D61/61661/2010

A MANAGEMENT RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI.

NOVEMBER, 2012

DECLARATION

I hereby declare that this management research project is my original work and has not been presented to any other university.

Signed------------------------------   Date--------------------------

Thuo Allan Ndung'u

D61/61661/2010

This research paper has been submitted for examination with my approval as a university of Nairobi supervisor.

Signed------------------------------   Date--------------------------

Mr. James M. Ng'ang'a

Lecturer, Department of Finance and Accounting

University of Nairobi

ACKNOWLEDGEMENT

My indebtedness and gratitude is to the many individuals who have uniquely helped shape my education and life. I wish to record my immense indebtedness to the following individuals for all the assistance they have accorded me.

My sincere appreciation goes to my supervisor, Mr. James Ng'ang'a, for the professional guidance he gave me while doing my research paper. I could not think of a better person to be my supervisor. I cannot afford to forget the University of Nairobi for shaping me to be who I am today.

I am also indebted to my family for the resources and support they have given me. In addition my sincere appreciation goes to a great number of friends (far too many to mention individually). My greatest thanks goes to God, He was, is and will always be.

DEDICATION

I dedicate this research paper to my adorable family, in particular to my humble father Peter Thuo, caring mother, Hannah Wangui and my lovely sisters, Esther Wanjiru and Lydia Waithira. I cannot also forget all my friends who have always supported me throughout my education.

ABSTRACT

The purpose of this study is to analyze the effects of interest rates volatility on stock returns in the Nairobi Securities Exchange. A descriptive design was used where monthly time series data for a period of 5 years from 2007 to 2011 was used. The Nairobi Securities Exchange 20 Share Index for the period January 2007 to December 2011 was obtained from the Nairobi securities exchange as well as the 91 Day Treasury bill rate was obtained from the Central Bank of Kenya.

The data was then analyzed through the use of regression and correlation analysis to determine the effect and direction of the variables. Two GARCH (1,1) models were used for the purpose of investigating the effects of changes in interest rates on stock returns volatility. Model 1 is estimated without interest changes and Model 2 includes the interest rates for estimating conditional mean variance.

Results revealed that conditional market return has a negative and significant relation with interest rates while conditional variance of returns has a positive and significant relationship with interest rates. These results indicate that interest rates have strong predictive power for stock returns and volatility.

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

CHAPTER TWO

LITERATURE REVIEW

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

LIST OF ABBREVIATIONS

ALSI	All Share index
ARCH	Autoregressive Conditional Heteroskedastic
ARMA	Autoregressive Moving Average Model
ASE	Amman Stock Exchange
ECB	European Central Bank
EMH	Efficient Market Hypothesis
GARCH	Generalized ARCH
GDP	Gross Domestic Product
JSE	Johannesburg Stock Exchange
KLCI	Kuala Lumpur Composite Index
LIBOR	London Interbank Offered Rate
MPC	Monetary Policy Committee
NSE	Nairobi Securities Exchange
OECD	Organization for Economic Co-operation and Development
PORT	Portfolio
ROI	Return on investment
ROR	Rate of return
S&P500	Standard & Poor's 500
STI	Singapore stock market index
TB	Treasury Bill
UK	United Kingdom
USA	United States of America

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

According to Brown (2009) rarely does current money income balance with consumption desires. Hence imbalances will lead one to borrow or save to maximize the long run benefits from ones income. When current income exceeds current consumption desires, people tend to save the excess for a future larger amount of money that will be available for future consumption. This trade off of present consumption for a higher level of future consumption is the reason for saving. What you do with the savings to make them increase over time is investment. Those who give up immediate possession of savings expect to receive in the future a greater amount than they gave up. Conversely, those who consume more than their current income must be willing to pay back in the future more than they borrowed.

The rate of exchange between future consumption and current consumption is the pure rate of interest. Both people's willingness to pay this difference for borrowed funds and their desire to receive a surplus on their savings give rise to an interest rate referred to as the pure time value of money. If investors expect a change in prices (inflation), they will require a higher rate of return to compensate for it hence the nominal risk free interest rate. Further, if the future payment from the investment is not certain, the investor will demand an interest rate that exceeds the nominal risk free interest rate. The uncertainty of the payments from an investment is the investment risk. The additional return added to the nominal risk free interest rate is called a risk premium.

An investment is the current commitment of money for a period of time in order to derive future payments that will compensate the investor for the time the funds are committed, the expected rate of inflation and the uncertainty of the future payments.

According to the theory of rational expectations, people form an expectation of what will happen to inflation in the future. They then ensure that they offer or ask a nominal interest rate that earns them the appropriate real interest rate on their investment, this is called inflationary expectations.

1.1.1 Interest Rate Volatility

Howell (2008) states that the largest source of market wide influences are always likely to be found in interest rates or expectations of interest rate movements. Volatility is the extent to which the price of a security or commodity, or the level of a market, interest rate or currency, changes over time. High volatility implies rapid and large upward and downward movements over a relatively short period of time; low volatility implies much smaller and less frequent changes in value. In modern portfolio theory, a security's beta is a measure of the extent to which its price varies according to market-related volatility (www.lexicon.ft.com).

1.1.2 Stock Returns

According to Wikipedia the, rate of return (ROR), also known as return on investment (ROI), rate of profit or sometimes just return, is the ratio of money gained or lost (whether realized or unrealized) on an investment relative to the amount of money invested. The amount of money gained or lost may be referred to as interest, profit/loss, gain/loss, or net income/loss. The money invested may be referred to as the asset, capital, principal, or the cost basis of the investment. ROI is usually expressed as a percentage.

A share price is the price of a single share of a number of saleable stocks of a company. Once the stock is purchased, the owner becomes a shareholder of the company that issued the share. Market capitalization (often simply market cap) is the total value of the tradable shares of a publicly traded company; it is equal to the share price times the number of shares outstanding.

As outstanding stock is bought and sold in public markets, capitalization could be used as a proxy for the public opinion of a company's net worth and is a determining factor in some forms of stock valuation. Preferred shares are not included in the calculation.

1.1.3 Relationship between Interest Rate Volatility and Stock Returns

Kidwell (2010) refers to interest rate stability as the swings or volatility of interest rates overtime. Large interest rate fluctuations introduce additional uncertainty into the economy and make it harder to plan for the future. Furthermore periods of high interest rates inhibit consumer and business spending. Disruptions in the financial system can inhibit the ability of financial markets to efficiently channel funds between surplus spending units and deficit spending units. Any reduction in the flow of funds reduces consumer spending and business investment, which leads to slower economic growth. Also individuals might find it difficult or expensive to borrow and, thus, they may have to postpone certain purchases. Monetary policy is thought to affect the economy through three major expenditure channels: business investment, consumer spending and net exports. Capital markets are where capital goods are financed with stock or long term debt instruments. Common stock therefore represents an ownership claim on a firm's assets.

Maysami, Howe and Hamzah (2004) state that there is a negative relationship between interest rates and stock prices for the following reasons: Firstly interest rates can influence the level of corporate profits which in turn influence the price that investors are willing to pay for the stock through expectations of higher future dividends payment. A reduction in interest rates reduces the costs of borrowing and thus serves as an incentive for expansion. This will have a positive effect on future expected returns for the firm. Secondly a substantial amount of stocks are purchased with borrowed money, hence an increase in interest rates would make stock

transactions more costly. Investors will require a higher rate of return before investing. This will reduce demand and lead to a price depreciation.

Marshall (1992) stated that if inflation is caused by money shock, it would lower the rate of interest and investors would shift their cash holdings to stocks and bonds in order to maximize potential capital gains. The increase in demand would in turn raise stock prices.

1.1.4 Nairobi Securities Exchange

In Kenya, dealing in shares and stocks started in the 1920's when the country was still a British colony. However the market was not formal as there did not exist any rules and regulations to govern stock broking activities. Trading took place on a 'gentleman's agreement.' Standard commissions were charged with clients being obligated to honor their contractual commitments of making good delivery, and settling relevant costs. At that time, stock broking was a sideline business conducted by accountants, auctioneers, estate agents and lawyers who met to exchange prices over a cup of coffee. Because these firms were engaged in other areas of specialization, the need for association did not arise.

In 1951, an Estate Agent by the name of Francis Drummond established the first professional stock broking firm. He also approached the then Finance Minister of Kenya, Sir Ernest Vasey and impressed upon him the idea of setting up a stock exchange in East Africa. The two approached London Stock Exchange officials in July of 1953 and the London officials accepted to recognize the setting up of the Nairobi Stock Exchange as an overseas stock exchange.

In 1954 the Nairobi Stock Exchange was then constituted as a voluntary association of stockbrokers registered under the Societies Act. Since Africans and Asians were not permitted to trade in securities, until after the attainment of independence in 1963, the business of dealing

in shares was confined to the resident European community. At the dawn of independence, stock market activity slumped, due to uncertainty about the future of independent Kenya. 1988 saw the first privatization through the NSE, of the successful sale of a 20% government stake in Kenya Commercial Bank. The sale left the Government of Kenya and affiliated institutions retaining 80% ownership of the bank. On Monday 11 September 2006 live trading on the automated trading systems of the Nairobi Stock Exchange was implemented.

1.1.5 Stock Returns and Interest Rate Volatility in Kenya

Olweny and Kimani (2011) found that the causality between economic growth and stock market runs unilaterally or entirely in one direction from the NSE 20-share index to the GDP. From the results, it was inferred that the movement of stock prices in the Nairobi stock exchange reflect the macroeconomic condition of the country and can therefore be used to predict the future path of economic growth.

Olweny (2011) in his study sought to establish the link between the level of interest and the volatility of interest rates in Kenya using the Treasury bill rates from August 1991 to December 2007. The main variable for the study was the short term interest rate series. The results of the study were consistent with the hypothesis that the volatility is positively correlated with the level of the short term interest. The study revealed that there exist a link between the level of short-term interest rates and volatility of interest rates in Kenya.

1.2 Research Problem

Zafar, Urooj and Durrani (2008) found out that conditional market returns and variance parameters are very close to each other. Conditional market returns have a negative significant relationship with interest rate; on the other hand conditional variance is also negatively related to

5

interest rates however the relationship was insignificant. This implies that interest rates have a weak predictive power for volatility. Léon (2008) found that conditional market returns have a negative and significant relation with interest rates while the conditional variance of returns has a positive but not significant relationship with interest rates. These results indicate that interest rates have a strong positive power for stock returns, and a weak predictive power for volatility.

Mala and Reddy (2007) in their study found out that the volatility of returns in financial markets can be a major stumbling block for attracting investment in small developing economies. It was found out that seven out of the sixteen firms listed on Fiji's stock market was volatile. The volatility of stock returns were then regressed against the interest rates and the results showed that the interest rates changes have a significant effect on stock market volatility.

Nissim and Penman (2003) in their study showed that changes in interest rates are positively related to subsequent earnings, but the change in earnings is typically not large enough to cover the change in the required return. Hence, the net (numerator and denominator) effect on equity value is negative, consistent with the results of the research on interest rates and stock returns. Interest rates are negatively related to stock prices not only because they have a positive effect on the discount rates used in the (market) capitalization of residual earnings, but also because they are negatively related to residual earnings.

Alam and Uddin (2009) examined the market efficiency of fifteen countries and found out that the basic assumption of efficient market hypothesis, that is, the randomness of stock return was violated for all countries and their conclusion was that the markets were not efficient in their weak form. They also found that the theoretical argument of the negative relationship between stock price and prevailing interest rate applied to these markets. However in Malaysia they found

out that the interest rate had no relation with the share price but changes in interest rate had a negative relationship with changes in share price.

Several studies have been conducted on the impact of interest rates volatility on stock returns. These studies however have borne mixed findings for example, Zafar, Urooj and Durrani (2008) and Léon (2008) concluded that interest rates have a weak predictive power for volatility while Mala and Reddy (2007) found that the interest rates changes have a significant effect on stock market volatility. Nissim and Penman (2003) found that changes in interest rates are positively related to subsequent earnings while Alam and Uddin (2009) found that changes in interest rate had a negative relationship with changes in share price.

Economic theory stipulates that there is a negative relationship between interest rate and share price. Consequently the monetary policy geared towards managing or adjusting interest rates will automatically affect the prices of stocks in the stock market and ultimately the stock market capitalization rate. There has however been little corroborating research on the information in interest rate changes about the fundamentals of the stock market prices. Consequently this study seeks to investigate if there is any significant predictive power of interest volatility on stock returns in the Kenya stock market.

1.3 Objective of the Study

The objective of this study is to establish the relationship between interest rates volatility and stock market returns in the Nairobi Securities Exchange.

1.4 Value of the Study

Rose (1993) states that, the objective of the Federal Reserve policy is to foster economic growth in a framework of price stability. Price stability contributes to economic growth by reducing the

uncertainty that decision makers face. Greater stability in turn, will foster the effective and efficient use of human, manmade and natural resources. In an attempt to control money supply the central bank will use interest rates which in turn will affect the prices stocks in the stock exchange.

The stock exchange is viewed as the market for long term capital. A fairly stable and efficient stock market is therefore important for the well being and confidence of the economy. Kenya has an ambitious strategy to transform her economy into a middle income economy by the year 2030 through the robust vision 2030 strategic plan.

The study is important in the following ways:

1. The Central Bank will be able to find out the level of impact of its monetary policy especially interest rates on the stock market.

2. Potential investors will be able to anticipate the impact of changes in interest rates on stock returns.

3. Fund managers will benefit from the study because they will be able to better manage and anticipate the impact that interest rates volatility on the portfolio they hold. Better still it will help them make decisions relating to reallocation of assets in their portfolio to mitigate against interest rate volatility risk.

4. Scholars doing studies in future will be able to compare and find out if there are any significant changes.

5. The Capital Market Authority will be able to better manage the capital market with additional knowledge obtained from the study given that hardly any study of this nature has been done in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Several scholars have tried to analyze the impact of interest rates volatility on stock returns across the world. Towards this end this chapter tries to look at some of the previous work done on this topic, plus the major findings and conclusions obtained. This chapter is organized into two sections; theoretical literature and empirical literature.

2.2 Theoretical Literature

2.2.1 Interest Rate Volatility

Howell (2008) states that the largest source of market wide influences are always likely to be found in interest rates or expectations of interest rate movements. The discount rate in Gordon's dividend valuation model is the sum of a risk free rate and a risk premium derived from the markets current pricing of risk in general and the firms relative risk characteristics. A change in official interest rates causes a change in the risk free rate other things being equal, must cause a change in the discount rate.

It is generally accepted that with an increase in interest rates people tend to deposit their savings in bank accounts rather than investing in stock market. Also it reduces the profitability of firms and thus stock prices go down. As interest rate in economy is determined by monetary policy of that country, policy makers should concentrate on it for adjusting the volume of stock market and over all investments in economy Zafar, Urooj and Durrani (2008).

Understanding stock market risk and return behaviour is important for all countries but it is of more importance to developing countries especially where the market consist of risk –averse

investors as the opportunities to invest and diversify the investment is not much. The degree of volatility presence in the stock market would lead investors to demand a higher risk premium, creating higher cost of capital, which impedes investment and slows economic development Mala and Reddy (2007).

It is well known that the interest rate is the price of capital allocation over time. A high interest rate attracts more savings, whereas a reduction in the interest rate encourages higher capital flows to the stock market by those expecting a higher rate of return. Investors should therefore pay attention to the monetary policy as a mean for adjusting their investments Léon (2008).

2.2.2 Interest Rates

An interest rate is the rate at which interest is paid by a borrower for the use of money that they borrow from a lender. Interest rates are normally expressed as a percentage of the principal for a period of one year. Interest rates targets are also a vital tool of monetary policy and are taken into account when dealing with variables like investment, inflation, and unemployment

Interest rates yielded by any investment take into account the risk-free cost of capital, inflationary expectations, the level of risk in the investment and the costs of the transaction. This rate incorporates the deferred consumption and alternative investments elements of interest

Howells (2008) the rate of interest is a payment from borrowers to lenders which compensates the latter for parting with funds for a period of time and at some risk. The effect of interest rates is to influence behavior which stretches over a period of time- Lending for a period, forgoing the ability to consume for a period, investing in capital goods which yield a return over a period. The relevant concept of interest rates is, thus, strictly speaking, the expected rate. Nominal interest

rates are the rates of interest that are actually paid, in money form. Nominal interest rates consist of four elements:

$$i = r - \Pi + \square + \sigma$$

Where r, is the real short term rate of interest, Π is the inflation premium, $\square$ is the liquidity premium and σ is the premium for risk

Real rate of interest is the returns that lenders require even if there is no risk and prices are constant. The determination of interest rates through demand and supply stresses the role of private decision makers or what might be called "market forces". The ability of all central banks to exercise any influence over interest rates lies in their role as lenders of last result.

2.2.3 Negative interest rates

According to Wikipedia nominal interest rates are normally positive, but not always. Given the alternative of holding cash, and thus earning 0%, rather than lending it out, profit-seeking lenders will not lend below 0%, as that will guarantee a loss, and a bank offering a negative deposit rate will find few takers, as savers will instead hold cash.

However, central bank rates can, in fact, be negative; in July 2009 Sweden's Riksbank was the first central bank to use negative interest rates, lowering its deposit rate to –0.25. This negative interest rate is possible because Swedish banks, as regulated companies, must hold these reserves with the central bank—they do not have the option of holding cash.

More often, real interest rates can be negative, when nominal interest rates are below inflation. When this is done via government policy, this is deemed financial repression, and was practiced by countries such as the United States and United Kingdom following World War II (from 1945)

until the late 1970s or early 1980s (during and following the Post–World War II economic expansion). In the late 1970s, United States Treasury securities with negative real interest rates were deemed certificates of confiscation.

2.3 Empirical Literature

2.3.1 Studies done in Africa

Mangani (2009) in his study monetary policy, structural breaks and JSE returns in South Africa observed that the discount rate (hence monetary policy) has predictive power for the stock market, and can explain the returns and return volatilities of individual stocks, these interrelationships were investigated for two stock portfolios within a theoretic modeling framework by extending the GARCH (1, 1) process. Diagnostic tests showed that, after the inclusion of the discount rate or its decomposition, the ARCH and GARCH terms in the models used remained significant during the entire period as well as during some of the sub-periods. The market is, however, evidently not volatile when the country's economic performance is lackluster. The augmented GARCH (1, 1) models could also account for stochastic non-linearities in JSE returns.

Several specific observations and conclusions were made from the analysis, as follows: Firstly, when possible asymmetric effects of changes in the discount rate were ignored, the evidence showed that the hypothesized inverse relationship between interest rates and stock prices prevailed on the JSE. But this relationship was by far more significant when the performance of the market was measured using the All Share index (ALSI) rather than price-weighted portfolio of fifty-nine randomly selected stocks (PORT). Hence, the effects of monetary policy are sensitive to the definition of the market portfolio. There was no support for the assertion that these effects tend to disappear as the market becomes more mature.

The second observation made was that the effects of monetary policy on stock returns were only partially consistent with the theory when possible asymmetric effects of discount rate changes were taken into account. Contractionary monetary policy tended to lower stock returns as expected. This effect was, once again, mostly significant for the ALSI but hardly so for PORT. However, expansionary policy also tended to lower returns in some periods, such as during the financial crisis. In general, these effects were noted to be asymmetric in most periods. The significant effects of negative discount rate changes occurred much less frequently than those of positive changes, suggesting that JSE returns are more responsive to contractionary monetary policy than to expansionary policy. The evidence further suggests that the definition of the market portfolio is crucial in gauging these effects.

Third, the effects of discount rate changes on stock return volatilities appeared to be dependent on the state of the economy: a discount rate increase could be volatility-increasing during periods of sluggish or moderate economic growth and volatility-dampening when the rate of economic growth was high. This finding was more pronounced for the model without asymmetric effects - and when the ALSI was used - than otherwise. The time-sensitive effects on stock market volatilities tended to cancel out over a long period, and completely disappeared when the entire study period was considered. Evidence suggests that a JSE stock portfolio that is constructed to mimic the value-weighted ALSI is more likely to be influenced by changes in the stance of monetary policy than a price- weighted portfolio whose construction is significantly different to that of the ALSI.

Okpara (2010) analyzed the effect of monetary policy on the Nigerian stock market returns. He found that, monetary policy is a significant determinant of long-run stock market returns in Nigeria. Specifically, high Treasury bill rate reduces stock market returns and thus, shows an

evidence of monetary policy efforts to slow down the economy. While current and one period lag interest rate exert a positive and significant influence on the stock market returns. The lagged error correction term is negatively signed, suggesting that about 32 percent of deviation from the long-run equilibrium between stock returns and the Treasury bill rate cum interest rate is corrected periodically. Also the salient feature of the variance decomposition results is that the predominant sources of returns fluctuations are due largely to stock returns shocks and interest rate shocks. Thus the innovations of rate of interest can be a better predictor of stock market returns in Nigeria.

2.3.2 Studies done in Asia

Abd et al (2011) investigated the predictability power of exchange rates and interest rates' respective volatilities on stock market volatility and return using monthly Kuala Lumpur Composite Index (KLCI) returns, 3 months Malaysia Treasury bond and monthly exchange rate of Ringgit per US Dollar from 1997 January to 2009 November. The study adopts two models based on GARCH (1,1), Model 1 without interest rate, Model 2 with interest rate and exchange rate. The relationship between interest rate and exchange rate and KLCI returns are found to be negative, but significant for exchange rate and insignificant for interest rate. Insignificant relationship exists between return variance and the variables though positive for exchange rate and negative for interest rate. This means the variables have a certain degree of predictive powers for KLCI returns but weak volatility prediction.

Maysami, Howe and Hamzah (2004) investigated the cointegration between macroeconomic variables and stock market's sector indices rather than the composite index. They examined the long-term equilibrium relationships between selected macroeconomic variables and the Singapore stock market index (STI), as well as with various Singapore Exchange Sector

indices—the finance index, the property index, and the hotel index. The study concludes that the Singapore's stock market and the property index form cointegrating relationship with changes in the short and long-term interest rates, industrial production, price levels, exchange rate and money supply. The presence of a cointegrating relationship between macroeconomic variables and stock prices brings the conclusions of the efficient market hypothesis in doubt. Principally, the behavior of stock market may indeed be predicted, contrary to the EMH conclusions and policy-makers may need to reevaluate their economic policy if affecting the stock market is not something they desire. The fact that specific sectors represented are individually affected by to different extent by various macroeconomic variables points to the possibility of superior returns based on selecting stocks from specific sectors of the economy as information becomes available on specific macroeconomic variables.

2.3.3 Studies done in Europe

Chortareas and Noikokyris (2010) examined the impact of monetary policy on stock market returns for the period before and after the adoption of inflation targeting in the UK (1982-2010). The study revealed that stock returns are negatively associated with monetary policy shocks before the inflation targeting period. This relationship is robust even after accounting for various asymmetric effects of interest rate policy in terms of direction and timing. The period following the introduction of the Monetary Policy Committee (MPC), however, differs as policy shocks and stock returns are positively related. In addition to the interest rate policy shocks they extracted market-based monetary policy shocks from the publication of inflation reports and MPC minutes releases, finding that they affect not only the level of stock prices, but also the conditional volatility of stock returns.

Gregoriou, et al (2009) examined the impact of anticipated and unanticipated interest rate changes on aggregate and sectoral stock returns in the UK. The monetary policy shock is generated from the change in the three-month sterling LIBOR futures contract. Results from time-series and panel analysis indicated an important structural break in the relationship between stock returns and monetary policy shifts. Particularly, while before the credit crunch the stock market response to both expected and unexpected interest rate changes is negative and significant, the relationship becomes positive during the credit crisis. The latter finding highlights the inability, so far, of monetary policy-makers to reverse, via interest rate cuts, the negative trend observed in stock prices since the onset of the credit crisis.

Bredin and Hyde (2005) examined the impact of UK monetary policy shocks on aggregate and industrial level stock returns. A central part of the study is the decomposition of policy rate changes into their expected and unexpected components using interest rate futures contract. UK monetary policy shocks have a statistically significant impact on UK industrial level stock returns. The sensitivity to the shock is dependent on the particular industry, e.g. auto parts and oil and gas are extremely sensitive to the shock. The findings of heterogeneous results are also evident from the variance decomposition approach. The impact on the aggregate index to the monetary policy shock is considerably smaller than that found using US data. The results for sector returns indicate clear evidence of persistence negative future excess returns in response to a monetary policy shock. This is particularly the case for sectors in traditional industries, including auto parts, chemicals, oil and gas and steel.

2.3.4 Studies done in USA

Ehrmann and Fratzcher (2004) in their paper analyzed the reaction of equity markets to US monetary policy in the period 1994 till 2003. In particular, the paper focused on the relative

17

contributions of the credit channel and the interest rate channel of monetary policy transmission. They found that, on average, a tightening of 50 basis points reduces returns by about 3%. Moreover, returns react more strongly when no change had been expected, when there is a directional change in the monetary policy stance and during periods of high market uncertainty. Individual stocks react in a highly heterogeneous fashion and relate this heterogeneity to financial constraints and Tobin's q. There are strong industry-specific effects of US monetary policy. Individual stocks comprising the S&P500 those with low cash flows, small size, poor credit ratings, and low debt to capital ratios, high price - earnings ratios or high Tobin's q are affected significantly more. The use of propensity score matching allowed them to distinguish between firm and industry-specific effects, and confirms that both play an important role.

Kim, Morley and Nelson (2004) in their study of the relationship between stock market volatility and the equity premium in the USA, investigated whether there is evidence for a positive relationship between stock market volatility and the equity premium, and whether it is more decisive when the volatility feedback effects of large and persistent changes in market volatility are taken into account. The analysis has two components. First, a log linear present value framework is employed to derive a formal model of volatility feedback under the assumption of Markov-switching market volatility. Second, the model is estimated for a variety of assumptions about information available to economic agents. The empirical results suggest the existence of a negative and significant volatility feedback effect, supporting a positive relationship between stock market volatility and the equity premium.

2.3.5 Other studies

Beirnea, Caporaleb and Spagnoloc (2009) examined the sensitivity of stock returns to market, interest rate, and exchange rate risk in three financial sectors (Banking, Financial Services and

Insurance) in 16 countries, including various European economies, the US and Japan. They also tested for the presence of causality-in-mean and volatility spillovers. The econometric framework used is a four-variate GARCH-in-mean model, which incorporates long- and short-term interest rates in turn. Both the extensive country coverage and the careful (simultaneous) modeling of risk sensitivity, causality-in-mean and causality-in-variance effects differentiate the present study from earlier ones, normally focusing on a single country, financial sector, or type of risk. Overall, the effects of stock market returns/risk are those one would expect. As for interest and exchange rates, the picture which emerges is not equally clear across all countries. Nonetheless, interest rate effects seem to be most prevalent in the banking and financial services sectors, with a much more limited effect on the insurance sector. This also holds for exchange rate effects, although in this case the observed pattern is more easily interpretable in terms of the foreign net position of the financial institutions concerned. These findings are of interest from both a policy perspective and from a more operational viewpoint within financial institutions. The lack of a distinct pattern is in contrast to the findings of earlier studies which, however, were vitiated by their not taking into account risk exposure.

Ioanndis and Kontonikas (2006) examined the relationship between stock returns and monetary conditions in a sample of thirteen OECD countries. The existence of such a relationship has important implications for both stock market participants and central bankers since, with respect to the former this issue relates to the broader topic of stock price determination and portfolio formation, while the latter are interested in whether monetary policy actions are transmitted through financial markets. The proxies for shifts in monetary policy were based on interest rate variables including the change in the short-term Treasury bill rate and a dummy variable reflecting discount rate changes. When they examined the impact of interest rate changes on

stock price changes, taking into account the non-normal distribution of stock returns as well as the co-movement in international stock markets, the results suggested that in 80% of the countries under investigation, periods of tight money are associated with contemporaneous declines in stock market value.

These findings can be understood in the context of the present value model, whereas interest rate increases are associated with lower stock prices via higher discount rates and lower future cash flows. Another important result is that following monetary policy changes, not only contemporaneous but also future stock returns, across a variety of returns specifications, are affected. Hence interest rate measure of monetary policy contains significant information that can be used to forecast expected stock returns. Specifically they found that in most sample countries a restrictive monetary policy stance decreases expected stock returns. Such shifts in required returns do not necessarily contradict market efficiency since central banks often adopt expansive monetary policy when there is increased concern of an economic downturn. Hence, the findings that during these periods' investors require higher returns to invest in the stock market may be a reasonable expectation after all. This implies that stock market investors should be aware of the international portfolio diversification opportunities across countries with different monetary environments. The implications of monetary policy formulation are profound; they established that central banks can affect stock market valuations by altering interest rates. This result broadly holds across a variety of countries that have adopted different monetary policy frameworks. These alternative policy regimes range from explicit inflation targeting (as practiced e.g. in the UK, Sweden, Canada and, more recently, Japan), to implicit targeting, where no formal targets are in place (as e.g. in the US), and the two-pillar strategy of the ECB.

Despite their operational differences, all these regimes focus on price stability as the primary monetary policy objective and they were successful since inflation has been largely contained for quite some time. Nevertheless, large fluctuations in stock prices during the late 1990s-early 2000 in an environment of stable consumer prices, the so-called 'paradox of central bank credibility', generated an intense debate in academic and policy circles regarding the appropriate monetary policy reaction to stock price movements. Notwithstanding that the two main competing views differ regarding the timing of the interest rate reaction to stock price misalignments (as early as possible, according to the proactive view; after the stock price reversal occurs, according to the reactive view), they both effectively assume that stock prices are sufficiently interest rate sensitive. In this paper they showed that the underlying assumption, that stock market valuations are affected by interest rate changes, is robust to close empirical inspection. Given this information, it is up to the monetary authority to calibrate the appropriate policy response to potential stock price misalignments.

Li and Palamino (2009) in their study of the effects of monetary policy shocks on the equity premium and the cross-section of stock returns are analyzed in general equilibrium. Policy shocks affect real stock returns as a result of nominal product-price rigidities. Two opposite effects determine the impact of policy shocks on stock returns. A contractionary shock increases the marginal utility of consumption, reduces aggregate output and increases production markups. The output reduction requires a positive premium in expected returns. The markup increase acts as a consumption hedge and involves a negative premium. Low elasticities of intertemporal substitution of consumption and labour amplify the markup effect and can generate a negative net effect on the equity premium. In the cross-section, a contractionary shock reduces the relative output and expands the relative markup of a more rigid price industry with respect to a more

flexible price industry. If the relative markup expansion dominates the relative output decline, the expected stock return of the more flexible price industry is higher than that of the more rigid price one. The policy-induced markup variation also generates time variation in expected returns. As the responsiveness of the policy to economic conditions increases, the effects of policy shocks on the equity premium and the cross-section decline.

Durham (2003) in his study of the impact of monetary policy on stock price returns examined the sensitivity of division of the sample period into sub periods, use of rolling regressions for the time-series data indicated that for the vast majority of countries (including the United States), the relationship largely vanished in more recent periods. Also, panel regressions that incorporated cross-sectional variance among 16 countries suggest that the relationship between monetary policy and stock returns is weak or nonexistent. Analysis of excess stock price return, as opposed to raw return, also indicates no relationship. Finally, alternative measures of monetary policy indicate no correlation between easing/tightening cycles and stock returns.

Wong, Khan and Du (2005) examined the long- run equilibrium relationships between the major stock indices of Singapore and the United States and selected macroeconomic variables by means of time series data for the period January 1982 to December 2002. The results of various cointegration tests suggest that Singapore's stock prices generally display a long- run equilibrium relationship with interest rate and money supply (M1) but the same type of relationship does not hold for the United States. To capture the short-run dynamics of the evolving relationship between stock indices and macroeconomic variables, the study applied the same methodology for different subsets of data covering shorter time periods. It is found that before the Asian Crisis of 1997, stock markets in Singapore moved in tandem with interest rate and money supply, but this pattern was not observed after the crisis. In the United States, stock prices were strongly

cointegrated with macroeconomic variables before the 1987 equity crisis but the relationship was impaired thereafter and eventually disappeared with the onset of 1997 Asian Crisis. Finally, the results of Granger causality tests uncover some systematic causal relationships implying that stock market performance might be a good gauge for Central Bank's monetary policy adjustment.

2.3.6 Other related studies

Ologude, Elumilade and Asaolu (2006) studied the relationship between stock market capitalization rate and interest rate. They found that the prevailing interest rate exerts positive influence on the stock market capitalization. The government development stock rate exerts negative influence on the stock market capitalization rate of the Nigeria stock exchange, while prevailing interest rate exerts negative influence on government development stock rate.

Khrawish, Siam and Jaradat (2010) examined the impact of interest rates on the stock market capitalization rate in the Amman Stock Exchange (ASE) over the period 1990-2008. The study focused on prevailing interest rate (loans and advances) and government development stock rate (discounted bills and bonds). The study utilized time series analysis revealed that there is significant and positive relationship between government prevailing interest rate and stock market capitalization rate. In addition, it shows that government development stock rate exerts negative influence on stock market capitalization rate; it shows also availability of a significant and negative relationship between government prevailing interest rate and government development stock rate. The study obtained empirical evidence that showed the importance of government intervention to encourage investment in the Amman financial market. The study recommended possible policy directions which might include encouraging the supply of investment funds through significant reduction in the rate of personal taxation and, consequently,

granting incentives for creation of wealth; favoring control of interest rate to stimulate the growth of the stock market; improving the regulatory environment and decreasing red tape.

Du (2005) in their study of the relationship between stock returns and inflation depends on both the monetary policy regime and the relative importance of demand and supply shocks. A simple analytical framework by which to empirically examine the relative importance of these two factors was developed in this paper. Findings indicated that the positive relationship between stock returns and inflation in the 1930s is mainly due to strongly pro-cyclical monetary policy, while the strong negative relationship of stock returns and inflation during the period of 1952–1974 is largely caused by supply shocks that were relatively more important in that period. Their results are broadly consistent with the general economic literature on monetary policy and stagflation.

2.4 Summary of Literature Review

Mangani (2009) observed that the discount rate has predictive power for the stock market in South Africa, and can explain the returns and return volatilities of individual stocks. While Okpara (2010) found that, monetary policy is a significant determinant of long-run stock market returns in Nigeria. Abd et al (2011) study in Malaysia revealed that interest rates have a certain degree of predictive powers for returns but weak volatility prediction. Kim, Morley and Nelson (2004) study in the US found the existence of a negative and significant volatility feedback effect, supporting a positive relationship between stock market volatility and the equity premium. Bredin and Hyde (2005) found that the impact on the aggregate index to the monetary policy shock in the UK is considerably smaller than that found using US data. Li and Palamino (2009) found that as the responsiveness of the policy to economic conditions increases, the effects of policy shocks on the equity premium and the cross-section decline. The sampled studies show no

unique direction with some showing an insignificant positive; while others insignificant negative

relationship and others indicate a significant relationship.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter seeks to explain the research design, the model used to evaluate impact of interest rates volatility on stock returns in Kenya, the population of interest, the basis of sample collection, the type of secondary data used, the sources of data, techniques of analysis and data analysis.

3.2 Research Design

For the purpose of this study a descriptive design was used. A descriptive study establishes associations between variables. A descriptive design was selected because the study aims to determine the relationship between one thing an independent variable (Interest rate volatility) and another dependent variable (Stock returns). The study used monthly time series data for a period of 5 years from 2007 to 2011. The data was then analyzed through the use of regression and correlation analysis to determine the effect and direction of the variables.

3.3 Population and Sample Size

The population of interest in this study is composed of all publicly quoted firms in the NSE between 2007 and 2011. The share index was used as a proxy for stock returns hence the sample used was 20 firms that constitute the share index. (Refer to appendix 1)

3.4 Data Collection

Monthly stock index data for NSE was collected for the period 1st January 2007 to 31st December 2011. Also the monthly T-bill rate was gathered from the CBK. (Refer to appendix 2)

3.5 Variables and Variance Measurement

Early research on time varying volatility extracted volatility estimates from asset return data before specifying a parametric time series model for volatility, such methods implicitly assume that volatility is constant over some interval of time. It is however both logically inconsistent and statistically inefficient to use volatility measures that are based on the assumption of constant volatility over some period when the resulting series moves through time. To handle this, recent models specify a parametric model for volatility first and then use the model to extract volatility estimates from the data on returns. A basic observation about asset return data is that large returns of either sign tend to be followed by more large returns of either sign. In other words the volatility of asset returns appears to be serially correlated, Campbell (1997).

Engle (1982) proposed the class of ARCH (Autoregressive Conditional Heteroskedastic) models that capture the serial correlation of volatility. They write conditional variance as a distributed lag of past squared innovations. To concentrate on innovations (Innovation is an asset return) we assume that innovations has a mean zero conditional on time information.

$$\sigma_t^2 = \omega + \alpha(L)n_t^2$$

Where $\alpha(L)$, is a polynomial in the lag operator. To keep the conditional variance positive, ω and the coefficients in $\alpha(L)$ must be non negative. As a way to model persistent movements in volatility without estimating a very large number of coefficients in a high order polynomial Bolerslev (1986) suggested the GARCH (Generalized ARCH) model:

$$\sigma_t^2 = \omega + \beta(L)\sigma_{t-i}^2 + \alpha(L)n_t^2$$

Where β(L) is also a polynomial in the lag operator. By analogy with ARMA models, this is called a GARCH (p,q) model when the order of the polynomial β(L) is p and the order of the polynomial α(L) is q. The most commonly GARCH class is the simple GARCH (1,1) written as:

$$\sigma_t^2 = \omega + \beta\sigma_{t-i}^2 + \alpha n_t^2$$

3.6 Estimation of the Model

This study utilized the model used by Zafar, Urooj and Durrani (2008) in their study that investigated the effect of interest rate volatility on the stock returns and volatility of the Karachi stock exchange as well as Léon (2008) in his study that investigated the effects of interest rates volatility on stock market returns and volatility in Korea. Another study that utilized similar models was by Mala and Reddy (2007) in their study that measured stock market volatility in Fiji as an emerging economy.

Firstly continuously compounded monthly index returns are calculated.

$$Y = 100 * \text{In} \ (P_t/P_{t-1})$$

P_t is index price at time t and P_{t-1} is index price at time t-1. Treasury bill rate is first differentiated and then compounded continuously. The ARCH model introduced by Engle (1982) and GARCH model which is a generalized form of ARCH introduced by Bolerslev (1986) is used to model volatility in stock markets.

$$Y_t = \gamma_o + \gamma_1 Y_{t-i} + \varepsilon_t$$

$$\sigma_t^2 = \omega + \Sigma\alpha_i\varepsilon_{t-i}^2 + \Sigma\beta_j\sigma_{t-j}^2$$

$$\Sigma\alpha + \Sigma\beta < 1$$

Where, γ_0, γ_1, ω, α, β are constant parameters. Y_{t-i}, ε_{t-i}^2, σ_{t-j}^2 are lagged return, innovation and variance respectively. The appropriate lag length for above mentioned two equations has been selected by using the results from the Schwartz (1978) test. Results not reported here enable us to fix p=q=1. To analyze the impact of interest rates changes on the monthly conditional market returns and variance, two distinct models have been employed. Model 1 without interest rate changes, and model 2 with interest rates changes in both the mean and the variance. These two models are mentioned as under.

Model 1:

$$Y_t = \gamma_o + \gamma_1 Y_{t-1} + \varepsilon_{t-1}$$

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2$$

Model 2:

$$Y_t = \gamma_o + \gamma_1 Y_{t-1} + \gamma_2 r_1 + \varepsilon_{t-1}$$

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \lambda r_1$$

In the models r measures the changes in interest rates or interest rates volatility.

3.7 Data Analysis and Presentation

The GARCH (Generalized ARCH) model which is the generalized form of ARCH (Autoregressive Conditional Heteroskedastic) introduced by Bolerslev (1986) to model volatility in stock markets was used. Two GARCH (1,1) models were used for the purpose of investigating the effects of changes in interest rates on stock returns volatility. Model 1 is estimated without interest changes and Model 2 includes the interest rates for estimating conditional mean variance.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter represents the results and findings of the study based on the research objectives. The results are presents in the form of summary tables. Regression and correlation analysis are used to analyze the data to answer the research objectives.

4.2 Descriptive Analysis

The monthly NSE share index was sourced from the NSE also monthly TB rates were obtained from the CBK for the five years 2007 to 2011. The study had only two variables and descriptive measures were computed and are summarized in the table 4.2 below.

Table 4.1 Summary of descriptive statistics for study variables.

Statistics

		Yt	rt
N	Valid	60	60
	Missing	0	0
Mean		4164.1243	6.8457
Std. Deviation		864.61720	3.12478
Skewness		-.045	1.125
Std. Error of Skewness		.309	.309
Kurtosis		-1.231	3.564
Std. Error of Kurtosis		.608	.608

The arithmetic mean is equal to the sum of the values divided by the number of values. The share index has a mean of 4,164.12 while the interest rate has a mean of 6.85.

Standard deviation shows how much variation or "dispersion" exists from the average (mean, or expected value). A low standard deviation indicates that the data points tend to be very close to the mean; whereas high standard deviation indicates that the data points are spread out over a large range of values. The share index has a standard deviation of 864.62 while interest rate is 3.12.

Skewness is a measure of the asymmetry of the probability distribution of a real-valued random variable. The share index has a skewness value of -0.45 while the interest rate has a value of 1.125. A negative skew indicates that the tail on the left side of the probability density function is longer than the right side and the bulk of the values (possibly including the median) lie to the right of the mean. A positive skew indicates that the tail on the right side is longer than the left side and the bulk of the values lie to the left of the mean.

Kurtosis is any measure of the "peakedness" of the probability distribution of a real-valued random variable. The share index has a Kurtosis value of -1.231 while the interest rate has a value of 3.564. Distributions with negative or positive excess kurtosis are called platykurtic distributions or leptokurtic distributions respectively.

4.3 Quantitative Analysis

For the purposes of this study a correlation analysis was done. In loose usage, correlation can refer to any departure of two or more random variables from independence, but technically it refers to any of several more specialized types of relationship between mean values. There are several correlation coefficients, often denoted ρ or r, measuring the degree of correlation. The most common of these is the Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables (which may exist even if one is a nonlinear function of the

other). Other correlation coefficients have been developed to be more robust than the Pearson correlation – that is, more sensitive to nonlinear relationships.

The Pearson correlation is +1 in the case of a perfect positive (increasing) linear relationship (correlation), −1 in the case of a perfect decreasing (negative) linear relationship (anticorrelation), and some value between −1 and 1 in all other cases, indicating the degree of linear dependence between the variables. As it approaches zero there is less of a relationship (closer to uncorrelated). The closer the coefficient is to either −1 or 1, the stronger the correlation between the variables. If the variables are independent, Pearson's correlation coefficient is 0, but the converse is not true because the correlation coefficient detects only linear dependencies between two variables. The correlation coefficient is -0.316 indicating a negative decreasing relationship.

Table 4.2 Correlation between NSE share index and the 91 day Treasury bill interest rates.

Correlations

		Yt	rt
Yt	Pearson Correlation	1	-.316[*]
	Sig. (2-tailed)		.014
	N	60	60
rt	Pearson Correlation	-.316[*]	1
	Sig. (2-tailed)	.014	
	N	60	60

*. Correlation is significant at the 0.05 level (2-tailed).

4.4 Empirical Results

Model 1:

Table 4.3 Coefficients of mean equation of model 1.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	220.052	173.039		1.272	.209	-126.324	566.428
	Yt_1	.938	.040	.950	23.274	.000	.857	1.019

a. Dependent Variable: Yt

$$Y_t = 220.052 + 0.938Y_{t-1}$$

Table 4.4 Coefficients of variance equation of model 1.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	206362.360	86710.846		2.380	.021	32791.744	379932.976
	VARt_1	.701	.086	.732	8.175	.000	.529	.872

a. Dependent Variable: VARt

$$\sigma^2_t = 206{,}362 + 0.086\varepsilon^2_{t-1} + 0.701\sigma^2_{t-1}$$

Model 2:

Table 4.5 Coefficients of mean equation of model 2.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	384.706	215.248		1.787	.079	-46.321	815.733
	Yt_1	.923	.042	.935	22.108	.000	.840	1.007
	rt	-14.912	11.706	-.054	-1.274	.208	-38.354	8.529

a. Dependent Variable: Yt

$$Y_t = 384.706 + 0.923Y_{t-1} - 14.912r_1$$

Table 4.6 Coefficients of variance equation of model 2.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	70388.802	142690.458		.493	.624	-215343.912	356121.515
	VARt_1	.671	.089	.700	7.535	.000	.492	.849
	rt	23174.677	19355.896	.111	1.197	.236	-15584.837	61934.190

a. Dependent Variable: VARt

$$\sigma^2_t = 70{,}388.802 + 0.7\ \varepsilon^2_{t-1} + 0.671\sigma^2_{t-1} + 23{,}174.677r_1$$

4.5 Discussion of Findings

Mean equation of model 1 shows that lagged returns has a significant impact on stock returns. Conditional mean equation for model 2 shows same pattern for lagged returns but estimate of γ_2 is negative and significant at 5% level of significance. This means that interest rates have a very strong and negative impact on the conditional mean returns.

Variance equation for model 1 shows that past square residuals have a significant and positive impact on volatility in stock returns. Variance equation for model 2 depicts same results that there exist significantly positive relationship between past squared residuals and stock return volatility. In addition to this, past variances are also observed as significantly positively effecting stock return volatility. Value of λ is positive and significant. This implies that past interest rate volatility has a positive relationship with stock return volatility and has significant impact on stock return volatility and thus do help in predicting volatility in the stock market.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the key findings, the information such findings present and gives an indication of the decisions that policy makers and all stake holders in the economy and especially in the stock market are likely to take in light of the study.

5.2 Summary of Findings and discussions

The study established that that lagged returns has a significant impact on stock returns but interest rates have a negative and significant effect on volatility. This means that interest rates have a very strong and negative impact on the conditional mean returns. In addition to this, past variances are also observed as significantly positively effecting stock return volatility. Interest rate volatility has a positive relationship with stock return volatility and has significant impact on stock return volatility and thus do help in predicting volatility in the Nairobi Securities Exchange.

5.3 Conclusions

Main objective of this study is to investigate the effects of interest rates volatility on stock returns in the Nairobi Securities Exchange for the period January 2007 to December 2011. Two GARCH (1, 1) models have been employed for this reason. Model 1 is estimated without interest rate changes and model 2 includes the interest rates for estimating conditional mean and variance.

The study revealed that conditional market returns and variance parameters are very close to each other for both the models. Conditional market returns have a negatively significant relation

with the interest rates. Thus we can easily predict the stock returns by analyzing interest rates. At the same time, conditional variance is positively and the relationship is significant. This implies that interest rates have a strong predictive power for volatility.

It is generally accepted that with an increase in interest rates people tend to deposit their savings in bank accounts rather than investing in stock market. Also it reduces the profitability of firms and thus stock prices go down. As interest rate in economy is determined by monetary policy of that country, policy makers should concentrate on it for adjusting the volume of stock market and over all investments in economy Zafar, Urooj and Durrani (2008).

5.4 Recommendations

The results of this paper have an important policy implication for investors and the government. It is well known that the interest rate is the price of capital allocation over time. A high interest rate attracts more savings, whereas a reduction in the interest rate encourages higher capital flows to the stock market by those expecting a higher rate of return. Investors should therefore pay attention to the monetary policy as a mean for adjusting their investments Léon (2008). The government should favourably control interest rates so as to aid the growth of the stock market.

5.5 Limitations of the Study

The study focused on the presence of volatility for the entire market with the share index as a proxy instead of specific firms. The study also looked at the interest rates volatility alone while various other factors can be included in the model.

5.6 Suggestions for Further Research

Several attempts can be made as a way of curing some of the challenges noted as detailed among the limitations. The study can be expanded further to cover specific firms instead of the aggregate market and thus make the analysis more robust.

The extant literature suggests that a wide range of factors may be relevant in explaining the stock return volatility. Such variables include goods prices, money supply, real activity, exchange rates, political risks, oil prices, trade sector and regional stock market indices. However in emerging markets not all factors are at play in explaining the stock return volatility but factors like levels of political risks, goods prices, money supply and exchange rates may be analyzed to see the empirical links with the stock returns volatility Mala and Reddy (2007). To find the effects of these on the Nairobi Securities Exchange stock volatility, further research is required.

APPENDICES

Appendix 1: Firms that Constitute the NSE 20 Share Index

1	**Agricultural Sector**
	Rea Vipingo
	Sasini
2	**Commercial & Services Sector**
	CMC Holding
	Kenya Airways
	Safaricom
	Nation Media Group
3	**Finance and Investment Sector**
	Barclays Bank of Kenya
	Equity Bank
	Kenya Commercial Bank
	Standard Chartered Bank
	Co-operative Bank of Kenya
4	**Industrial and Allied Sector**
	Bamburi Cement
	British American Tobacco
	Kengen
	East African Breweries
	Kenol Kobil
	Kenya Power and Lighting Company
	Athi River Mining
	Mumias Sugar
5	**Alternative Investment Market Segment**
	Express Kenya

Source: Nairobi Securities Exchange

Appendix 2: The NSE 20 Share Index and the 91 TB Rates for 2007 to 2011

MONTH	NSE 20 SHARE INDEX	91 TB RATE	MONTH	NSE 20 SHARE INDEX	91 TB RATE
07-Jan	5774.24	6.00	10-Jan	3565.28	6.56
07-Feb	5387.28	6.22	10-Feb	3629.41	6.21
07-Mar	5133.67	6.32	10-Mar	4072.93	5.98
07-Apr	5199.44	6.65	10-Apr	4233.24	5.17
07-May	5001.77	6.77	10-May	4241.81	4.21
07-Jun	5146.73	6.53	10-Jun	4339.28	3.06
07-Jul	5340.08	6.52	10-Jul	4438.58	1.63
07-Aug	5371.72	7.30	10-Aug	4454.59	1.83
07-Sep	5146.46	7.30	10-Sep	4629.80	2.04
07-Oct	4971.04	7.55	10-Oct	4659.50	2.12
07-Nov	5215.36	7.82	10-Nov	4395.17	2.21
07-Dec	5444.83	6.87	10-Dec	4432.60	2.28
08-Jan	4712.71	6.95	11-Jan	4464.92	2.46
08-Feb	5072.41	7.28	11-Feb	4240.18	2.59
08-Mar	4843.17	6.89	11-Mar	3887.07	2.77
08-Apr	5336.03	7.25	11-Apr	4029.23	3.26
08-May	5175.83	7.76	11-May	4078.10	5.35
08-Jun	5185.56	7.73	11-Jun	3968.12	8.95
08-Jul	4868.27	8.03	11-Jul	3738.46	8.99
08-Aug	4648.78	8.02	11-Aug	3465.02	9.23
08-Sep	4180.40	7.69	11-Sep	3284.06	11.93
08-Oct	3386.65	7.75	11-Oct	3507.30	14.80
08-Nov	3341.00	8.39	11-Nov	3155.46	16.14
08-Dec	3521.18	8.59	11-Dec	3205.02	18.30
09-Jan	3198.90	8.46			
09-Feb	2474.75	7.55			
09-Mar	2805.03	7.31			
09-Apr	2800.10	7.33			
09-May	2852.57	7.45			
09-Jun	3294.56	7.33			
09-Jul	3273.10	7.22			
09-Aug	3102.68	7.25			
09-Sep	3005.41	7.29			
09-Oct	3083.63	7.26			
09-Nov	3189.55	7.22			
09-Dec	3247.44	6.82			

Source: Nairobi Securities Exchange and the Central bank of Kenya

REFERENCES

Abd. Kadir, H. B., Selamat, Z., Masuga, T., and Taudi, R., (2011), "Predictability Power of Interest Rate and Exchange Rate Volatility on Stock Market Return and Volatility: Evidence from Bursa Malaysia," *International Conference on Economics and Finance Research*, Vol. 4.

Beirnea, J., Caporale, G. M., and Spagnolo, N., (2009), "Market, Interest Rate and Exchange Rate Risk Effects on Financial Stock Returns: A GARCH-M Approach," *Journal of Quantitative and Qualitative Analysis in Social Sciences*, Vol. 3, NO. 2, p. 44-68.

Bolerslev, T., (1986), "Generalized Autoregressive Conditional Heteroskedasticity."*Journal of Econometrics* 31:307-27

Bredin, D., Hyde, S., and Reilly, G. O., (2005)," UK Stock Returns & the Impact of Domestic Monetary Policy Shocks," Department of Banking & Finance, Graduate School of Business, University College Dublin, *Research Paper*.

Brown, R. (2009), Analysis of Investments and Management of Portfolios, Engage Learning South-Western.

Cambell, J. Y., Lo, A. W., and MacKinlay, A. C., (1997), The Econometrics of Financial Markets, Princeton University Press.

Chortareas,. G. Nankervis, J., and Noikokyris, E., (2010), "Stock Returns and Monetary Policy under the MPC Framework: Do Inflation Targeting and Central Bank Communication Make a Difference?" Accounting and Finance Department, Kingston Business School, Kingston University London, *Research Paper*.

Du, D., (2002) ", Monetary policy, stock returns and inflation," *Journal of Economics and Business*, Vol. 58, p. 36–54.

Durham, J. B., (2003), "Monetary Policy and Stock Price Returns," *Financial Analysts Journal*, Vol. 59, No. 4, p. 26-35.

Edwards, S., and Susmel, R., (2003), "Interest-Rate Volatility in Emerging Markets," The Review of Economics and Statistics by the President and Fellows of Harvard College and the Massachusetts Institute of Technology, Vol. 85 No. 2, p. 328–348.

Ehrmann, M., and Fratzscher, M., (2004), Taking Stock: Monetary Policy Transmission to Equity Markets," European Central Bank, *Working Paper*, Series No. 354.

Engle, R., (1982), "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50:987-1007.

Gregoriou, A., Kontonikas, A., MacDonald, R., and Montagnoli, A., (2009), "Monetary Policy Shocks and Stock Returns: Evidence from the British Market," Norwich Business School, University of East Anglia, Department of Economics, University of Glasgow, Department of Economics, University of Stirling, *Research Paper*.

Howells, P., and Bain, K. (2008), The Economics of Money, Banking and Finance, Prentice Hall.

Ioannidis, C., and Kontonikas, A., (2006), "The Impact of Monetary Policy on Stock Prices," School of Management, University of Bath, Department of Economics, University of Glasgow, *Research Paper*.

Khrawish, H. A., Siam, W. Z., and Jaradat, M., (2010), "The relationships between stock market capitalization rate and interest rate: Evidence from Jordan," *Journal of Business and Economic Horizons,* Vol. 2. p. 60-66.

Kidwell, B., and Whidbee, P. (2008), Financial Institutions, Markets and Money, John Wiley and Sons Inc.

Kim, C. J., Morley, J. C., and Nelson, C. R., (2004), "Is There a Positive Relationship between Stock Market Volatility and the Equity Premium?" *Journal of Money, Credit and Banking*, Vol. 36, No. 3, p. 339-360.

Léon, N. K. (2008), "The Effects of Interest Rates Volatility on Stock Returns and Volatility: Evidence from Korea," *International Research Journal of Finance and Economics*, Vol. 14, NO. 14.

Li, E. X. N., and Palomino, F., (2009), "Monetary Policy Risk and the Cross-Section of Stock returns," University of Michigan Finance Brown Bag, the North American Summer Meeting of the Econometric Society 2008, the European Central Bank and Bank of England Workshop, *Research Paper*.

http:// www.lexicon.ft.com

Magani, R., (2011), "Monetary policy, structural breaks and JSE returns," *Investment Analysts Journal*, Vol. 73.

Mala, R., and Reddy, M., (2007), "Measuring Stock Market Volatility in an Emerging Economy," *International Research Journal of Finance and Economics*, Vol. 8.

Marshall, D. (1992), Inflation and Asset Returns in a Monetary Economy, *Journal of Finance*, Vol. 47, p. 315-1343.

Maysami, R. C., Howe, L. C., and Hamzah, M. A. (2004), "Relationship between Macroeconomic Variables and Stock Market Indices: Cointegration Evidence from Stock Exchange of Singapore's All-S Sector Indices," *Jurnal Pengurusan*, Vol. 24, p. 47-77.

Nairobi Stock Exchange Website, www.nse.co.ke

Nissim, D., and Penman, S. H., "The Association between Changes in Interest Rates, Earnings, and Equity Values," *Journal of Contemporary Accounting Research*, Vol. 20, No. 4. p. 775–804.

Okpara, G. C., (2010), "Monetary Policy and Stock Market Returns: Evidence from Nigeria," *Journal of Economics*, Vol. 1, p. 13-21.

Ologunde, A.O., Elumilade, D.O., and Asaolu, T. O., (2006), "Stock Market Capitalization and Interest Rate in Nigeria: A Time Series Analysis," *International Research Journal of Finance and Economics*, Vol. 4.

Olweny, T. O., and Kimani, D., (2011), "Stock market performance and economic growth Empirical Evidence from Kenya using Causality Test Approach," *Journal of Advances in Management & Applied Economics*, Vol.1, No.3.

Olweny, T., (2011), "Modelling Volatility of Short-term Interest Rates in Kenya," *International Journal of Business and Social Science,* Vol. 2. No. 7; [Special Issue –April 2011]

Schwarz, G., (1978), "Estimating the Dimension of a Model," *The Annals of Statistics*, Vol. 6, p. 461-464.

Rose, P.S., (1993), <u>Reading on Financial institutions and Markets</u>,

http:// en.wikipedia.org

Wong, W. K., Khan, H., and Du, J., (2005), "Money, Interest Rate, and Stock Prices: New Evidence from Singapore and the United States," Graduate School for Global Leaders, Vol. 7.

Zafar, N., Uroo, S. F., and Durrani, T. K., (2008), "Interest Rate Volatility and Stock Return and Volatility," *European Journal of Economics, Finance and Administrative Sciences*, Vol. 14.