THE EFFECT OF INTEREST RATE CHANGES ON THE STOCK MARKET

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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13/11/2015

This Research Project has been submitted for examination with my approval as the Supervisor.

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ABSTRACT

The paper evaluates the existence and nature of the relationship between changes in interest rates and stock returns in Kenya with an aim to improve policy development and investment decision-making. This study uses the Central Bank Rate (CBR) as a representative of the interest rates in the Kenyan economy and stock returns are used to represent the Kenyan stock market. This relationship is examined through the use of univariate and multivariate time series to determine stationarity and the long run and short run relationships respectively. All the variables used in this study are found to be stationary. The VAR model is used to determine the short run and long run dynamics of these variables and the results suggest that on the banking and the commercial sectors are affected by changing interest rates. The evaluation of a long run equilibrium relationship between changes in interest rates and the Kenyan stock market performance is found to be insignificant.

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LIST OF ABBREVIATIONS

FOMC: Federal Open Market Committee

CBK: Central Bank of Kenya

CBR: Central Bank Rate

NSE: Nairobi Securities Exchange

KES: Kenya Shillings

OECD: Organization for Economic Co-operation and Development

US: United States of America

MPC: Monetary Policy Committee

ADF: Augmented Dickey Fuller

DSP: Difference-Stationary Process

VAR: Vector Autoregression

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

1.1.1 INTEREST RATE

Interest is a form of compensation that equals two different amounts of money which are a certain time period apart from each other. It is simply the amount of interest expressed as a percentage of the principal. Interest rate can also be viewed as a discount factor for getting the present value of a future amount. Yield to Maturity is believed to be the most accurate measure of interest rates and it captures interest rates in a time frame i.e. short term interest rates and long term interest rates. This is also referred to as the term structure of interest rates. (Frederic, 2010). Interest rates affect investments in that they influence the cost of capital such as loans, mortgages etc. and at the same time they influence returns on investments e.g. in savings, bonds, etc. The benchmark interest rate in Kenya as last set on September 2015 stood at 11.5% and is still the current Central Bank Rate (CBR) as at 11th November 2015. The CBR is the lowest rate charged to banks by the Central Bank of Kenya (CBK).[1] Interest Rate in Kenya has averaged 14.37% from 1991 - 2015, reaching an all-time high of 84.67% in July of 1993 and a record low of 0.83% in September of 2003. Generally, interest rates have been fluctuating with no clear trend although seasonal trends are observable; with expansionary periods being characterized by increasing interest rates while contractionary periods being characterized by decreasing interest rates. Interest Rate in Kenya is reported by the CBK. The level of the CBR is reviewed and announced by the Monetary Policy Committee (MPC) at least every two months and its movements, both in direction and magnitude, signals the monetary policy stance. The CBR is the base for all monetary policy operations in order to enhance clarity and certainty in monetary policy implementation.[2]

1.1.2 STOCK MARKET

Stock market is the market in which shares are issued and traded mostly through exchanges but can also be over-the-counter. It is also known as the Equity market. This market plays a key role in the economy as it gives listed companies access to capital and simultaneously giving investors a proportionate ownership of those companies. Stocks can be categorized in various ways and one common way is, by the country where the company is domiciled, although their stock may also be traded at exchanges in other countries.

The efficient markets theory is the idea that speculative asset prices always incorporate the best information about fundamental values and that prices change only because new information enters the market and investors act in an appropriate, rational manner with regards to this information. In efficient markets theory, share prices are determined by information in the market and the present value of accruing dividends to that share. (Frederic, 2010). However, volatility in the stock market is and will continue to be a reality and therefore creating room for other ideologies and theories that oppose efficient market hypothesis such as behavioural finance.

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[1] Central Bank of Kenya Act Section 36 (4)

[2] https://www.centralbank.go.ke/index.php/interest-rates/central-bank-rate?yr=2015

(Roy, 2005) A stock market crash is often defined as a sharp dip in share prices of stocks listed on the stock exchanges. In parallel with various economic factors, a reason for stock market crashes is also due to panic and loss of confidence by investing public. Often, a stock market crash ends speculative economic or asset bubbles. There have been a number of famous stock market crashes like the Wall Street Crash of 1929, the stock market crash of 1973–4, the Black Monday of 1987, the Dot-com bubble of 2000, and the Stock Market Crash of 2008. One of the most famous stock market crashes started October 24, 1929 on Black Thursday. The Dow Jones Industrial Average lost 50% during this stock market crash. It was the beginning of the Great Depression. Another famous crash took place on October 19, 1987 – Black Monday. The crash began in Hong Kong and quickly spread around the world. These real life scenarios clearly support (Christos & Alexandros, 2006) findings, of the significant co-movement that exists in international stock markets.

1.1.3 DEVELOPED ECONOMIES STOCK MARKETS

The largest market is the United States, followed by Japan and the United Kingdom. Some exchanges are physical locations where transactions are carried out on a trading floor, by a method known as open outcry. This method is used in some stock exchanges and commodity exchanges, and involves traders entering oral bids and offers simultaneously. The other type of stock exchange is a virtual kind, composed of a network of computers where trades are made electronically by traders.

The New York Stock Exchange (NYSE) is a physical exchange, with a hybrid market for placing orders both electronically and manually on the trading floor. The NASDAQ is a virtual listed exchange, where all of the trading is done over a computer network. The Paris Bourse, now part of Euronext, is an order-driven, electronic stock exchange. It was automated in the late 1980s, prior to which, it consisted of an open outcry exchange. People trading stock will prefer to trade on the most popular exchange since this gives the largest number of potential counterparties (buyers for a seller, sellers for a buyer) and probably the best price. However, there have always been alternatives such as brokers trying to bring parties together to trade outside the exchange. Some third markets that were popular are Instinet, and later Island and Archipelago. One advantage is that this avoids the commissions of the exchange. However, it also has problems such as adverse selection.

The trend towards forms of saving with a higher risk has been accentuated by new rules for most funds and insurance, permitting a higher proportion of shares to bonds. Similar tendencies are to be found in other developed countries. In all developed economic systems, such as the European Union, the United States, Japan and other developed nations, the trend has been the same: saving has moved away from traditional (government insured) "bank deposits to more risky securities of one sort or another".

1.1.4 NAIROBI SECURITIES EXCHANGE (NSE)

In Kenya, a stock exchange was first floated in 1922 at the Exchange Bar in the Stanley Hotel in Nairobi. However, the market was not formal. Rules and regulations to govern stock broking activities did not exist. In 1953 the London Stock Exchange officials recognized the setting up of the Nairobi Stock Exchange as an overseas stock exchange. Notably, on 18 February 1994 the NSE 20-Share Index recorded an all-record high of 5030 points. The NSE was rated by the International Finance Corporation as the best performing market in the world with a return of 179% in dollar terms. This was followed by the largest share issue in the history of NSE, the privatization of Kenya Airways, in 1996.

July 2002 saw the foreign investor regulations amended, providing for a 25% minimum reserve of the issued share capital for Kenyan citizens, while the balance of the 75% becomes a free float for all classes of investors. Within this 75% shareholding available to all classes of investors, there is no restriction on the amount to be held by a single foreign investor.

In July 2007 NSE reviewed the Index and announced the companies that would constitute the NSE Share Index. The review of the NSE 20-share index was aimed at ensuring it is a true barometer of the market. A wide area network (WAN) platform was implemented in 2007; this eradicated the need for brokers to send their staff (dealers) to the trading floor to conduct business. Trading is now mainly conducted from the brokers' offices through the WAN. However, brokers under certain circumstances can still conduct trading from the floor of the NSE. In 2008, the NSE All Share Index was introduced as an alternative index whose measure is an overall indicator of market performance. The Index incorporates all the traded shares of the day. Its attention is therefore on the overall market capitalization rather than the price movements of select counters.

In July 2011, the Nairobi Stock Exchange Limited changed its name to the Nairobi Securities Exchange Limited to reflect its strategic plan of evolving into a full service securities exchange which supports trading, clearing and settlement of equities, debt, derivatives and other associated instruments. In November 2011 the FTSE NSE Kenya 15 and FTSE NSE Kenya 25 Indices were launched which represented the performance of the largest 15 stocks by market capitalization and performance of 25 most liquid stocks respectively. On 27 June 2014, The Capital Markets Authority approved the listing of the NSE stock through an Initial Public Offer and subsequently self-listed its shares on the Main Investment Market Segment.[3]

The Kenyan stock market has seen a number of shocks in the recent past such as the global financial crisis, severe drought, Post-Election Violence, and more recently the re-introduction of the capital gains tax. Wrangles in some of the listed firms such as Mumias Sugar Company and Uchumi Limited, the Ponzi scheme linked to Britam's largest individual shareholder and other factors have affected the respective stock prices adversely. Did the stock market overreact?

[3] Nairobi Securities exchange https://www.nse.co.ke/nse/history-of-nse.html

1.1.5 INTEREST RATES AND THE STOCK MARKET

In theory, both bonds and equities are inversely related to interest rates, but the relationship tends to be more straightforward with bonds. Bond prices almost always fall to some degree when interest rates rise and vice versa is also true. The same may or may not be necessarily true of stock prices and that is what this study is set to find out.

Generally, the stock market reflects the overall health of an economy. The level of interest rates is one measure of that health. The Central Bank raises or lowers interest rates to fight inflation and this is followed up by most commercial lending institutions as they adjust their lending and deposit rates consequently. All of these up-and-down adjustments of the interest rates affect the credit market, money supply and this eventually, trickles down to the stock market. It is therefore, important for investors to know how these changes in the level of interest rates will affect their investments in the stock market through the impact of interest rate changes on stock returns.

In Kenya, volatility in the stock market is attributed to very many variables and one of the key variables is the level of interest rates in the economy. The main role of the Central Bank of Kenya is to maintain general price level stability i.e. low inflation and this is achieved through implementation of monetary policies which is basically the control of money supply and interest rates in the economy. This important role of Central Banks can also be seen in (Bleich, Fendel, & Rulke, 2013), where the paper provides a positive perspective and empirically analysis of how central banks account for asset price volatility. They simultaneously looked at four important central banks (Bank of England, The Federal Reserve Bank, The Bank of Japan and The European Central Bank) and their results proved that central banks use interest rates to stabilize financial markets in periods of financial market stress. Therefore, as the Central Bank of Kenya (CBK) plays its key role of setting the level of interest rates in this economy, by a certain extent, it controls or at the very least has influence on economic activities in the country. This means its roles have an effect on how investors behave with regards to a changing economic environment.

In summary, when the CBK increases the interest rate, it becomes more expensive for banks to borrow money from the CBK. This will trickle down to both individuals and businesses which in turn borrow funds from the banks. This will mean households are left with less disposable income due to increased interest expense, less credit access and low money supply. Businesses will also face increased interest expense, low revenues from low consumption of individuals, less business spending and therefore an overall slowdown the growth of a company, resulting in decreased profits and therefore, a fall in the stock prices. This has an overall decline effect on the stock market.

The stock market has proved to be efficient in reacting to new information and there is no doubt that a theoretical relationship exists between interest rates and the stock market but how exactly does the stock market react to changes in the interest rates? This research will be seeking to test this relationship and to answer one of the main research questions on how interest rates affect the stock market.

1.2 PROBLEM STATEMENT

The relationship between changes in interest rates and stock returns is an important aspect of the economy as it has a greater bearing on the overall performance of the economy and shows the level of confidence of investors in that economy. This is even more important in the current financial setup characterized by increased international trade and the integration of the global financial markets. Interest rate risk is therefore the second most important risk factor, only behind market risk as regarded by US firms. (Graham & Harvey, 2001)

Kenya, being a developing country, has a lot of potential for significant economic growth and development and this increased productivity can be easily manifested through the performance of the stock market and therefore the need for a very efficient financial system. If interest rates in the country affect stock prices, then it is possible for regulate, control or prevent crises happening in the stock market by controlling interest rates. Investors will be very concerned with the level of interest rates in the country as this will impact on their required rates of return, cost of capital etc. This means the CBK has a very important role in influencing the economic activities taking place in Kenya and it is therefore necessary to identify the relationship that exists between the interest rates and stock prices. Knowledge of this relationship between changes in interest rates and stock returns at different time scales is of undoubted interest for investors, portfolio managers, corporate managers and policy makers, as it provides critical information for risk management, asset allocation, portfolio management or policy making decisions.

The trend has been that changes in interest rates affect stock prices in the short term but by how much is something that has been left out in most studies. Although economists have noticed the importance of interest rates in predicting the movements of the stock market, only few studies have examined the relation between long-horizon stock returns and interest rates. Therefore, this study investigates the relationship between the central bank's rates and stock returns, the short term and long term effects of changes in this rate to the stock returns and also goes further to show by how much stock returns react to shocks in interest rates in Kenya.

1.3 OBJECTIVE OF THE STUDY

It is believed that a change in price of common stocks is triggered by the market's efficiency in reaction to new information.

This study will aim:

- To determine the relationship between interest rates changes and stock returns.
- To determine the long term and short term effects of interest rate changes on the Kenyan stock market.
- To determine the effect of interest rate changes on the different sectors of the Kenyan economy.

1.4 RESEARCH QUESTIONS

i. What is the relationship between changes in interest rates and stock returns?
ii. How do stock returns react to changes in interest rates in the short and long term?
iii. How do interest rates affect stock returns of firms in different industries?

1.5 JUSTIFICATION

Most studies such as Fama and Schwert (1977), Campbell (1987), Breen, Glosten, and Jagannathan (1989), and Ferson (1989), have only examined the relation between short-horizon stock returns and short-term interest rates while others such as Shiller (1981) and LeRoy and Porter (1981), have assumed constant discount rates which do not reflect reality as interest rates are always changing. This research will prove to be important for rational investors who are strategic investors i.e. long time horizon investors, and as well help speculators in deciding their buy, hold and sell strategies in the short term. These investors will be able to manage their portfolios putting into consideration the effects of changing interest rates to the value of their portfolios. This also applies to risk managers who will be looking to manage their exposure to interest rate risk. This study will also prove helpful in policy making especially in policies that aim at controlling or changing interest rates for economic stability and/or growth.

1.6 SCOPE OF THE RESEARCH

The study focuses on the short term and long term effects of changes in interest rates on stock returns. Interest rates in Kenya are represented by the Central Bank Rate (CBR) while the Kenyan stock market is represented by the Nairobi Securities Exchange (NSE). The performance of Nairobi Securities Exchange is represented by the NSE20 share index which is used as the market proxy in this study as it's the most popular and commonly used index by investors to determine the performance of the Kenyan stock market. The different sectors of the Kenyan economy as categorized in the NSE are represented by their respective sector based index. This research study is focused on monthly data of the above variables from the year 2005-2014.

CHAPTER TWO: LITERATURE REVIEW

2.1 THEORETICAL LITERATURE

It is generally believed that stock markets slump when interest rates rise because of the expectation of slowed economic growth. At the same time, as the rates rise, the return on alternative investments such as savings accounts and treasury bonds becomes more attractive. Investors tend to believe that dividends will fall and thus prompting some to shift out of stocks. This is reasonable as stocks are valued based on their "intrinsic value" which includes the present value of future dividends hence, when interest rates rise, the discount rate used to determine a stock's intrinsic value is higher, resulting in a lower intrinsic value.

The stock price is also affected by the cost of borrowing for the company (level of interest rate charged to its debt), which affects the company's profitability.[4] When a company has to pay more to borrow money, the additional interest expense reduces the company profits. If investors believe that the company cannot make up for the lost profits, its stock price may drop. On the other hand, declining interest rates signal cheaper borrowing for the company and thus can influence a rise in stock price if the investors think that the company will spend less of its profits on interest.

Capital Expenditures undertaken by a company also affect its stock price. These expenditures signal a company's growth and therefore, when a company cuts down its capital expenditure due to increased interest expense as a result of high interest rates, Investors might decide to sell those shares because of perceived lack of company growth and thus drive stock prices down. When interest rates decrease, a company may decide to purchase new assets thus increasing its income earning capacity and this could drive its stock prices higher if investors anticipate growth.

Other investors, value stocks based on a company's current and anticipated cash flows. Rising interest rates can reduce a company's cash flow in the future if more cash will be used to pay interest charges.[5] This will cause the company's stock price to fall. On the other hand, falling interest rates could leave the company with more cash flow and this seemingly growth in cash flows could make investors have more confidence in that company and therefore lead to an increase in the stock price.

It is important to note that rising interest rates do not necessarily mean a drop in stock prices, and neither does falling interest rates necessarily mean higher stock prices. If investors believe that the Central Bank will raise interest rates to keep inflation down, that may be a positive indication of expected economic growth and thus the stock prices might increase. Similarly, if investors think the Central Bank is lowering rates because of a declining economy, the stock market may seem less attractive and the stock prices could go down.

[4] Cost of capital; ACCA financial management
[5] Working capital management; ACCA financial management

2.2 EMPIRICAL LITERATURE

2.2.1 REGULATION AND INTEREST RATES

Central Bank actions such as changes in the central bank discount rate have at best an indirect effect on many macroeconomic variables and considerable lags are involved in the transmission mechanism. Broader financial markets though, for example the stock market, government and corporate bond markets, mortgage markets, foreign exchange markets, are quick to incorporate new information and therefore, a more direct and immediate effect of changes in the interest rates by the CBK may be identified using financial data.

According to the discounted cash flow model, stock prices are equal to the present value of expected future net cash flows. (Christos & Alexandros, 2006) In their paper explained that monetary policy should then play an important role in determining equity returns either by altering the discount rate used by market participants or by influencing market participants' expectations of future economic activity. These channels of influence are interlinked since more restrictive monetary policy usually implies both higher discount rates and lower future money supply. Thus, monetary policy tightening should be associated with lower stock prices given the higher discount rate and/or lower future economic activity. In contrast, an expansive monetary environment is associated with low interest rates, increases in economic activity and higher earnings for the firms in the economy i.e. increased money supply. This therefore means higher stock prices. In this study, they used data for 30 years across 13 OECD countries and they found that the monetary environment, which they measured, using interest rate variables, was an important determinant of investors' required rate of return. They also examined the contemporaneous effect of monetary policy on stock returns taking into account the non-normality typically inherent in such data as well as the significant co-movement of international stock markets. According to the Jarque-Bera test for normality, stock returns are non-normally distributed and therefore, potentially leading to problems with hypothesis testing based on reported probability statistics from regression analysis. In their paper, (Christos & Alexandros, 2006) accounted for the non-normality of stock returns through bootstrap analysis. They accounted for the significant co-movement of international stock markets by calculating the correlation coefficient of other stock returns with the US stock returns. Their results suggested that in 80% of the countries they investigated, periods of tight money are associated with contemporaneous declines in stock market value. This means that increases in interest rates were associated with lower stock prices via higher discount rates and lower future cash flows. In their research, they also acknowledged the influence the Central Bank has on stock market valuations through its role of controlling interest rates in the economy.

2.2.2 FINANCIAL CRISIS AND INTEREST RATES

Even before the financial crises 2007-2009 started there was a heated debate as to whether or not, central banks should respond to asset price developments. Proponents argue that a central bank is able to and should actively counteract excessive asset price increases while advocates of the 'cleaning-up' approach are convinced that the central bank should rather 'mop up' the negative macroeconomic effects after the burst of a bubble.

However, when studying the relation of monetary policy and financial stability one has to distinguish the aspect of asset price misalignments (or bubbles) from excessive asset price volatility (or financial market stress). It is equally important to note that it is very difficult or even impossible to identify an asset bubble until it has come to pass. (Bleich, Fendel, & Rulke, 2013) Provided a positive perspective and empirically analysed whether central banks take asset price volatility into account. They simultaneously looked at four important central banks (Bank of England, The Federal Reserve Bank, The Bank of Japan and The European Central Bank) in a unified empirical framework and their results suggested that the Bank of England, the Federal Reserve Bank and the European Central Bank systematically responded to an increase of the implicit volatility of asset prices by a decrease in the interest rate. Their results meant that central banks use interest rates to stabilize financial markets in periods of financial market stress. The main focus of their study was to establish the relationship between asset price volatility and the level of interest rates but their perspective was how asset price volatility affects the level of interest rates as set by the responsive action of the Central Bank. They also considered the effect of asset price volatility on the stock market, only in times of financial stress. The perspective of this study will be the opposite, as it will be seeking to determine how the level of interest rates in the economy affects asset prices with particular focus on the stock market.

2.2.3 INTEREST RATE AND UNCERTAINTY

(Schwert, 1989), Sought to analyse the relation of stock volatility with real and nominal macroeconomic volatility, economic activity, financial leverage and stock trading activity. Schwert was trying to figure out how volatility in stock prices was being influenced by time varying volatility of various variables.

There is no doubt that researchers believe the economic conditions prevailing at a certain period in time, will and do affect the performance of the financial markets. In his study, (Xu, 2007) believes that uncertainty of macroeconomic variables plays a more important role in explaining the time variance of volatility, than the volatility of macroeconomic variables itself. In his paper he illustrated this by exploring the relationship between stock market volatility and the Interest Uncertainty. Uncertainty of the decision of FOMC meeting was used as the uncertainty of interest rate. An asset price is a form used by people to express their beliefs about the state of the economy and therefore, when uncertainty is high, a slight change in those beliefs will cause a substantial shift in the people's holdings. Thus we expect that stock market volatility increases with increased uncertainty of interest rate. By using the Federal Fund Future to measure the uncertainty, (Xu, 2007) found out that the significance of the impact of uncertainty on stock price volatility, was different across industries and that the relationship between interest uncertainty and stock volatility was stronger for small firms than that for big firms. In addition, he investigated the possible reason for the sensitivity of interest rate uncertainty, and the empirical results confirmed that dividend yield was the factor that impacted most, as compared to the leverage ratio, which represents the capital structure. In this paper, Xu was more concerned about how uncertainty in the economy affected stock price volatility. In this study, it will be assumed that the Central Bank sets the Central Bank Rate with certainty and the only uncertain factor is the mind-sets of investors with regards to the changes in interest rates.

2.2.4 STOCK RETURNS AND INTEREST RATES

Fama and Schwert (1977) found that when monthly stock returns are regressed on monthly T-bill rates, the estimated coefficient is significantly negative. Campbell (1987) used the short-end of the yield curve to predict monthly excess stock returns and found that the spread of the two-month and six-month bill over the one month bill has predictive power.

In contrast to earlier work, (Sheridan & Arthur, 1989) examined whether stock returns provided forecasts of changes in interest rates and inflation. Earlier work had indicated that changes in expected inflation negatively affected stock returns but Sheridan and Arthur found a statistically significant positive relation between stock returns and future inflation rate changes as well as a significant positive relation between stock returns and future interest rate changes. In their paper, they focused on Real Estate Investment Trusts because they are particularly interest rate and inflation sensitive securities. They believed that this provided better forecasts than a broad market index. This study believes it would be inconclusive to generalise the effect of stock returns on inflation and interest rates based on one type of investment, in one sector of the economy. Sheridan and Arthur's research was based on a period (October 1979 to October 1982) when the Federal Reserve Board chose not to counteract interest rate changes. Their study is keen on understanding how stock returns affect interest rates while this study will be keen on studying the effect of interest rates on the stock prices and by inference on stock returns.

Fama and French (1989), Fama (1990), and Schwert (1990) documented the relation between stock returns and term spreads by OLS regressions. Among a large number of multiple regressions, they found some evidence that term spreads predict short-term stock returns with horizons of one year and less but almost no evidence that term spreads predict longer-horizon stock returns.

Campbell and Ammer (1993) used term spreads as information variables to forecast short-horizon stock returns with a linear vector-autoregressive (VAR) approach. They found that real interest rates have very little impact on stock returns.

A study that examined the effect of publicly announced changes in official interest rates on the stock returns of the major banks in Australia during the period from 1990 to 2005 was carried out. Previous studies of such effects had reported inconclusive results. US evidence suggested that banking stocks are generally negatively impacted by increases in official interest rates. In this study, (John, Mohamed, & Robert, 2008) found, somewhat unexpectedly, that Australian bank stock returns were not negatively impacted by the announced increases in official interest rates. Furthermore, those banks apparently experienced net-positive abnormal returns when cash rates were increased, and this was consistent with dividend valuation theory that suggests, if income effects dominate, then stock returns need not be negatively impacted. The explanation to their findings was the fact that Australian banks, which operate in a less competitive and concentrated banking environment compared to the US, were able to advantageously manage earnings impacts when cash rate changes were announced.

2.2.5 INTEREST RATE RISK AND STOCK RETURNS

In their paper, (Pablo, Román, & Francisco, 2013) examined the link between changes in interest rates and the Spanish stock market at the industry level across different time scales by using wavelet methods. Their analysis was based on an industry basis which they found to be appropriate because they saw thought that market aggregation may hide significant differences among industries in terms of interest rate sensitivity. Their results showed that the Spanish stock market exhibits a remarkable degree of interest rate exposure, although sizeable differences can be observed across industries and depending on the time horizon under consideration. They found that regulated industries such as Utilities, heavily indebted industries such as Real Estate, Utilities or Food and Beverages, and the Banking industry emerged as the most interest rate sensitive. On the contrary, there was a broad range of industries such as Chemicals and Paper, Financials, Construction, Health, Car and Industrials that were hardly influenced by interest rate risk. Further, the link between movements in interest rates and industry equity returns was found to be stronger at coarser scales (low frequencies), suggesting that the role of interest rates as a major determinant of stock prices may be held only in the long run for some specific industries. As expected, the interest rate exposure was predominantly negative, indicating that Spanish firms are, on average, adversely impacted by interest rate rises.

2.2.6 EFFICIENT MARKET HYPOTHESIS, MARGINAL RATE OF SUBSTITUTION AND INTEREST RATES

In efficient markets theory, share prices are determined by information in the market and the present value of accruing dividends to that share. The efficient markets model was best conveyed through an expected present value model in which the real discount rate is assumed to be constant through time. By allowing time-varying interest rates in the present value formula, this will do little to support the efficient markets model. Again, the expected present value does not reflect the prices that actualize. Note for example that the present value of stock prices was extremely high throughout the depression years of the 1930s, and not as low as was the actual stock market prices and this is because the real interest rates were at extreme lows after 1933, into the early 1950s, and the real dividends did not really fall much after 1929. After 1929, real Standard & Poor's dividends fell to around 1925 levels for just a few years, 1933-1935 and 1938, but, contrary to popular impressions, were generally higher in the 1930s than they were in the 1920s. The models of efficient financial markets from the 1970s like Merton (1973), Lucas (1978) and Breeden (1979) concluded that stock prices are the expected present value of future dividends discounted using marginal rates of substitution of consumption, and in these models the equations for stock returns were derived in the context of a model maximizing the utility of consumption. Shiller et al (1981) produced a plot of those present values since 1881, using Standard & Poor dividend data and using aggregate consumption data to compute the marginal rates of substitution as discount factors. The present value of dividends as discounted in this model had only a tenuous relation to actual stock prices, and did not appear volatile enough to justify the price movements unless the coefficient of relative risk aversion was pushed to ridiculously high levels. While the consumption discount model may show some co-movements with actual stock prices, it does not work well because it does not justify the volatility of stock prices.

(Sanford J. Grossman, 1980) Were just as convinced that future real dividends as suggested by earlier works did not move enough to justify the price index movements, and that earlier

researchers had assumed a constant discount factor. Sanford and Shiller (1980) considered the appropriate discount factor to be applied to dividends would have been the marginal rate of substitution which is provided by consumption. Assuming that dividends are received k years from now, the appropriate discount factor to be applied is the marginal rate of substitution between consumption today and consumption k years from today. They used historical data on per capita consumption to estimate the realized values of these marginal rates of substitution. Robert Hall (1978) who studied marginal rates of substitution had concluded that consumption was a random walk. Sanford and Shiller (1980) showed that if current consumption and dividends are the best predictors of future consumption and dividends in Hall's sense, then the discount factor applied to stock prices would not vary. (Sanford J. Grossman, 1980), in an improvement on a previous paper that had attributed the variability of stock prices on information regarding future dividends, considered the variability of stock prices as attributed by information on discount factors i.e. real interest rates. In this regard, they were able to further put into consideration the influence of current and future economic activity. Sanford and Shiller were also trying to decipher the exact information that was popularly being referred to as the "new information" that characterized the efficiency of markets.

(Shiller, 2003) Considered an alternative approach to the possibility of varying real discount rates and looked at the inter-temporal marginal rate of substitution for consumption.

2.2.7 TERM STRUCTURE OF INTEREST RATES

The seminal work on the volatility of the stock market by Shiller (1981) and LeRoy and Porter (1981), assumed constant discount rates. This was improved on by Chunsheng in 1996 as will be seen later.

Boudoukh, Richardson, and Whitelaw (1996) examined the relation between excess stock returns and the term spreads over the last two centuries and found that term spreads (roughly the differences between 20-year bond yield and one-year bond yield) have predictive power for one-year excess stock returns. This clearly shows a short horizon predictive power of the term spread. In this research, interest will be in finding out the long horizon effects. Instead of the term spread, the study will use the prevailing interest rates for both long term and short term bonds at that particular time.

The variations of stock prices and stock returns can be explained using the term structure of interest rates. (Chunsheng, 1996). He was able to show that interest rates have an important impact on stock returns, especially at long time horizons. The hypothesis that expected stock returns move one-for-one with ex ante interest rates, which had been rejected in other studies using short time horizon nominal asset returns, is supported by evidence from real returns and long time horizon nominal returns. (Chunsheng, 1996) Finds in his paper, that long-term interest rates explain a major part of variation in dividend-price ratios and suggests that the high volatility of the stock market is related to the high volatility of long-term bond yields and may be accounted for by changing forecasts of discount rates. They found that the correlation between stock returns and bond yields could provide a reasonable economic explanation for the predictability of long-horizon stock returns, that is, the predictability of long-horizon stock returns could be associated with predictable changes in long-term interest rates driven by movements in economic conditions such as business cycles. In summary, their

paper found that the stock market movements are closely related to shifts in the state of the term structure of interest rates.

By using a three-year rolling regressions, (Lee, 1997) found that the relationship between the stock market and the interest rate is not stable over time. Lee however, only looked at short term interest rates contrary to Chunsheng (1996). The finding of Chunsheng (1996) of the presence of a relationship between the long term interest rate and stock prices, was later supported by the study of (Harasty & Roulet, 2000) that showed stock prices were co-integrated with long term interest rates and the earnings of the sampled companies.

Short-term interest rates which were measured by 91 days, 182 days and 364 days Treasury bill rates of Sri Lanka were used to establish the impact of short term interest rates on stock prices. In this investigation, Multiple Regression Analysis was employed as the key tool and Augment Dickey-Fuller (DF) Unit Root Test, Autocorrelation, and Multicollinearity supported the regression results. This study found that there was a weak relationship between short-term interest rates and stock prices of Sri Lanka and correlation between 364 Treasury bill rate and the stock prices indicated a negative relationship. Further, Granger Causality Test revealed the existence of causality between the 364 days Treasury bill rates and stock prices. (Zhang & Emil)

2.3 LITERATURE GAP

Most of the studies conducted on the effects of interest rates on the stock market have tended to contribute to the literature on the developed markets and some on developing countries outside Africa such as India and Pakistan. Little literature exists to explain the conditions present in African countries. Furthermore, most of the research done in this area has failed to capture a long time horizon effect of interest rates. This study therefore captures, in addition, the long term effects of interest rate changes in a developing country (Kenya). It also shows how stock returns react to their own shocks over and above their reactions to the shocks of interest rates.

2.4 CONCEPTUAL FRAMEWORK

The question of the relationship between interest rates and stock prices has been theoretically and empirically explored. But how do interest rates affect stock prices and the stock market? What is the magnitude of this effect? I.e.by how much?

FIGURE 1: RELATIONSHIP BETWEEN INTEREST RATES AND THE NSE 20-SHARE INDEX

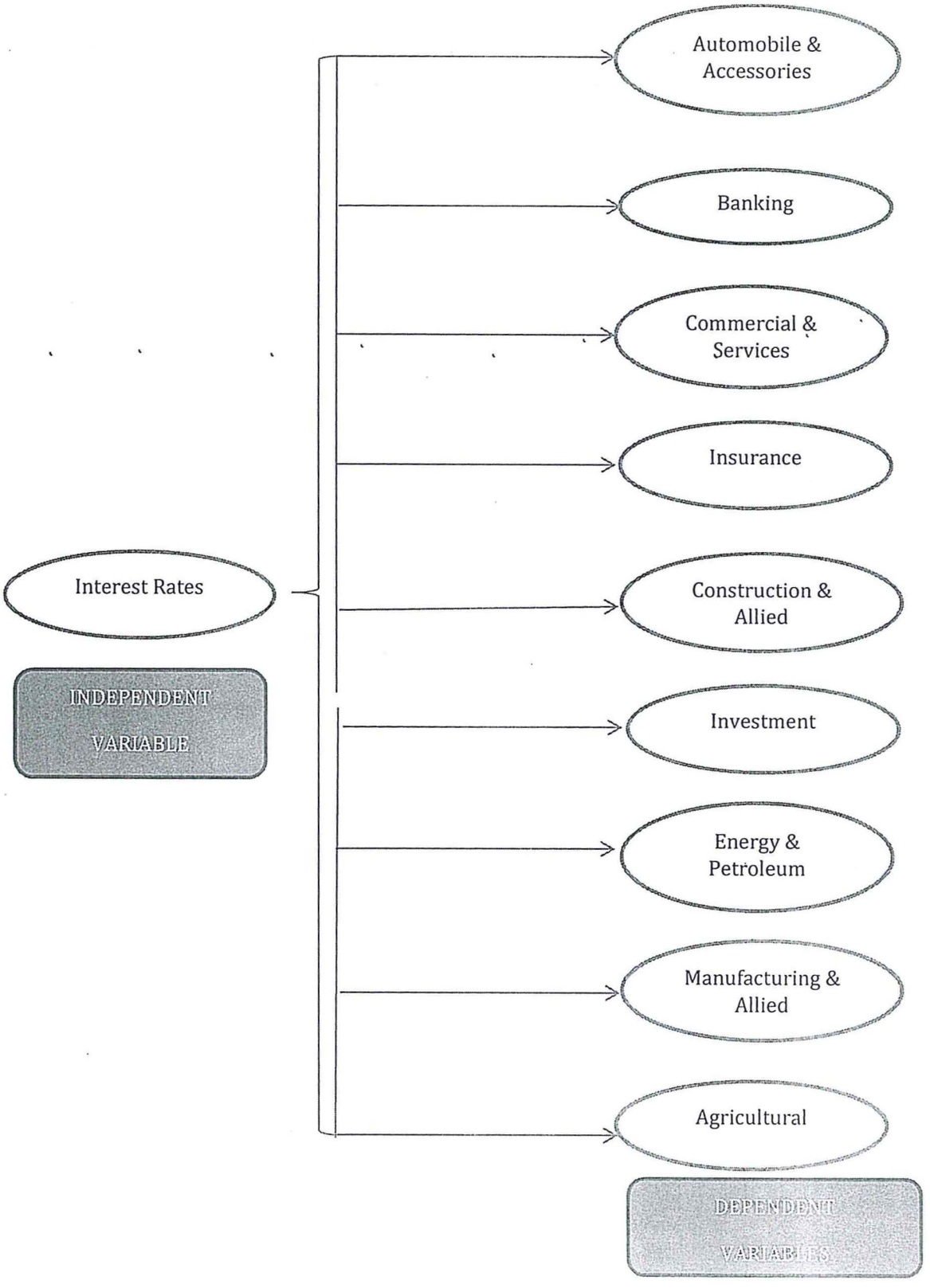

FIGURE 2: RELATIONSHIP BETWEEN INTEREST RATES AND THE KENYAN INDUSTRY SECTORS

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used in carrying out the study. It specifies the research design, the sample data used, how this data is collected and the scope of the research. This chapter provides a general insight as to how this research is conducted.

3.1 RESEARCH DESIGN

The research conducted is descriptive research which was conducted to provide a better understanding and more insight and to be able to better define the effects of interest rate changes on stock returns. This research is designed to provide statistical inferences to the population based on the sample used.

Therefore, through the study of the relationship between interest rates changes and stock returns, results are drawn on the significance of the effect of interest rate changes on stock returns in the Kenyan context.

3.2 SAMPLE AND POPULATION

This study deals with the Kenyan stock market because it is the largest stock market in the Eastern African region and it ranks 7th among other African countries.[6] The sample constitutes the monthly Central Bank's Rates (CBR) from the Central Bank of Kenya, the monthly NSE 20-share index returns and sector indexed stock returns of listed companies in the Nairobi Securities Exchange over a period of 10 years (2005-2014). The NSE 20 Share Index is a weighted price index whose members are selected based on a weighted market performance for a 12 month period. The NSE-20 index is the main index used by domestic and foreign investors and therefore serves as a good stock market performance benchmark and also because of its availability over the 10 year period. The NSE all-share indexed was only introduced in 2008 and is therefore not suitable for the 10 year study period. This is also the case for NSE and Safaricom, the only listed companies in the investment services and telecommunications sectors respectively, as Safaricom was listed in 2008 while the NSE self-listed in 2014, and therefore these two sectors are omitted from the study due to inadequate data.

3.3 DATA

The study employs secondary time series data. This is beneficial due to the availability of the data in the CBK's and NSE's databases and also because of the time constraint. Data from this stock market is also readily available from the NSE database. The study covers the period from January 2005 to December 2014. Following Campbell (1987), Kim and In (2007), Reilly et al. (2007) and Korkeamäki (2011), among others, monthly data series is employed. Monthly data is preferred to weekly or daily data for a number of reasons. Firstly, monthly data contains less noise and can therefore better capture the interactions between changes in

[6] Capital Markets Authority Report of 2008

interest rates and stock returns. Secondly, monthly data has smaller biases due to nonsynchronous trading of some individual stocks. Consequently, to find similar results to those obtained with monthly data, a very large number of decomposition levels are required when using weekly or daily data.

In line with previous research on corporate interest rate exposure (Sweeney, 1986), this study is conducted at the industry level. Thus, a sector based index is created from the 3 largest companies in each sector on the NSE, based on market capitalization as at 1st October 2015. The sectors are; Agricultural, Automobiles & Accessories, Banking, Commercial & Services, Construction & Allied, Energy & Petroleum, Insurance, Investment and Manufacturing & Allied. The NSE 20 index is used as the stock market index (market proxy). Various reasons have been put forward to justify an industry-based approach. First, the formation of industry portfolios provides an efficient way of condensing a sizable amount of information regarding stock price behaviour. Second, the use of portfolios helps to smooth the noise in the data produced by transitory shocks in individual stocks, thereby yielding more reliable results. It should also be noted that the analysis on a sector basis allows identifying differences among industries in terms of interest rate sensitivity, which may have relevant implications for risk management, asset allocation, monetary policy or asset pricing. This is because market aggregation may hide these significant differences among industries in terms of interest rate sensitivity (Bartram, 2002).

3.4 MODEL SPECIFICATIONS

It is clear that most empirical studies have utilized methods such as cointegration analysis, Granger causality tests, Vector Autoregressive (VAR) models or Generalized Autoregressive Conditional Heteroskedasticity (GARCH) specifications. These approaches are suitable because they could consider two time scales, i.e. the short run and the long run. Financial security markets are complex systems consisting of thousands of heterogeneous traders and investors making decisions over different time horizons (from minutes to years), which collectively determine the aggregate market behaviour. Therefore, it is likely that the extent of connection between interest rates changes and stock returns varies across time scales according to the investment horizon of investors and therefore, use of the VAR model will be able to capture both the short run and long run effects.

3.4.1 SIMPLE REGRESSION

A simple uni-variate regression may be used to test the effects of interest rate changes on stock returns.

$$S_t = \alpha + \beta_1 \, \mathrm{INT}_t + \mu_t \qquad (1)$$

Where S_t is the stock return at time t (represented by the stock returns of the sector indices and the NSE 20 index return), and INT_t is the interest rate change at time t (represented by the change in CBR), $\propto$ is the intercept, β is the coefficient and μ is the residual of regression.

From the literature review of empirical evidence, the following hypothesis is investigated.
Null Hypotheses (H0): There is no significant relationship between interest rate change and the stock return.

Hypothesis (H1): There is significant relationship between interest rate change and the stock return.
From the above mentioned test, the R Square value is used to determine how much proportion of the variation in stock returns is explained by changes in interest rates while the coefficient shows the change in stock returns due to a 1 unit change in the interest rates. If the significance F is less than or equal to 0.05 then the effect is significant and if it is greater than 0.05 then it is insignificant.

3.4.2 UNIT ROOT TEST

It is however, important to note that a regression model might not be the best model because of stationarity issues of time series data. Since standard regression analysis requires that data series be stationary so as to avoid getting spurious results, it is necessary to test for stationarity before drawing any meaningful conclusions from the regression. The study performs Augmented Dickey-Fuller (ADF) Unit Root Test to decide whether the time series data is stationary or non-stationary.

This regression tests the hypotheses separately on existence or non-existence of unit root where; H0: Unit root exists and H1: unit root does not exist.

Rejection of the null hypothesis denotes stationarity in the series. In case of non-stationarity, the study will test for cointegration using the Johansen approach.

3.4.3 VECTOR AUTOREGRESSIVE MODEL

The Vector Autoregression (VAR) model is a natural extension of the univariate autoregressive model to dynamic multivariate time series. It often provides superior forecasts to those from univariate time series models and these forecasts are quite flexible because they can be made conditional on the potential future paths of specified variables in the model.

In addition to data description and forecasting, the VAR model is also used for structural inference and policy analysis. In structural analysis, certain assumptions about the causal structure of the data under investigation are imposed, and the resulting causal impacts of unexpected shocks or innovations to specified variables on the variables in the model, are summarized. These causal impacts are summarized with impulse response functions and forecast error variance decompositions.

3.4.4 CAUSALITY TEST

To determine whether changes in interest rates (X) cause changes in stock returns (Y), the study carries out the (Granger and Sims's 1969) causality test. To conclude that "X" causes "Y", this study tests for two conditions;

i. X should help to predict Y
ii. Y should not help to predict X,

Accordingly, to satisfy these two conditions, hypotheses are tested separately based on the unrestricted and restricted regressions models (Zhang & Emil).

Condition 1: H0: Interest rates do not cause stock returns;

$$\text{Unrestricted Regression: } Y = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \sum_{i=1}^{m} \beta_i X_{t-1} + \mu_t \quad (5)$$

$$\text{Restricted Regression: } Y = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \mu_t \quad (6)$$

Condition 2: H0: Stock returns do not cause interest rates;

$$\text{Unrestricted Regression: } X = \sum_{i=1}^{m} \alpha_i X_{t-i} + \sum_{i=1}^{m} \beta_i Y_{t-1} + \mu_t \quad (7)$$

$$\text{Restricted Regression: } X = \sum_{i=1}^{m} \alpha_i X_{t-i} + \mu_t \quad (8)$$

Granger causality test is a technique for determining whether one time series is significant in forecasting another. The standard Granger causality test seeks to determine whether past values of a variable help to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Yt add no information to explanation of movements of Xt beyond that provided by lagged values of Xt itself.

3.4.5 IMPULSE RESPONSE AND VARIANCE DECOMPOSITION

An examination of causality suggests which of the variables in the model has statistically significant impact on the future value of the other variable in the system. The results however, do not reveal whether changes in the value of that given variable have a positive or negative effect on the other variable in the system, or how long it would take for the effects of that variable to work through the system. Such information is given by an examination of the VAR's impulse responses and variance decompositions (Brooks, 2008).

Inclusion of lags makes it difficult to understand and interpret the significance and direction of causality of the variables. Impulse response and variance decomposition therefore play a very vital role in calculating how one variable affects the other.

Impulse response traces out the responsiveness of the stock returns in the VAR to shocks of the interest rates. On the other hand, variance decompositions offer a slightly different method for examining VAR system dynamics. These decompositions give the proportion of the movements in stock returns that are due to their 'own' shocks, versus those movements that are due to shocks in interest rates.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 INTRODUCTION

The acceptance or rejection of test results is based on 5% level of significance and this is assumed throughout the research. The results are divided into two sections: the first details the univariate tests carried out on the variables while the second part details the multivariate tests.

4.2 UNIVARIATE TESTS

4.2.1 UNIT ROOT TEST

This study subjects all the variables being considered, to the ADF tests to check for stationarity.

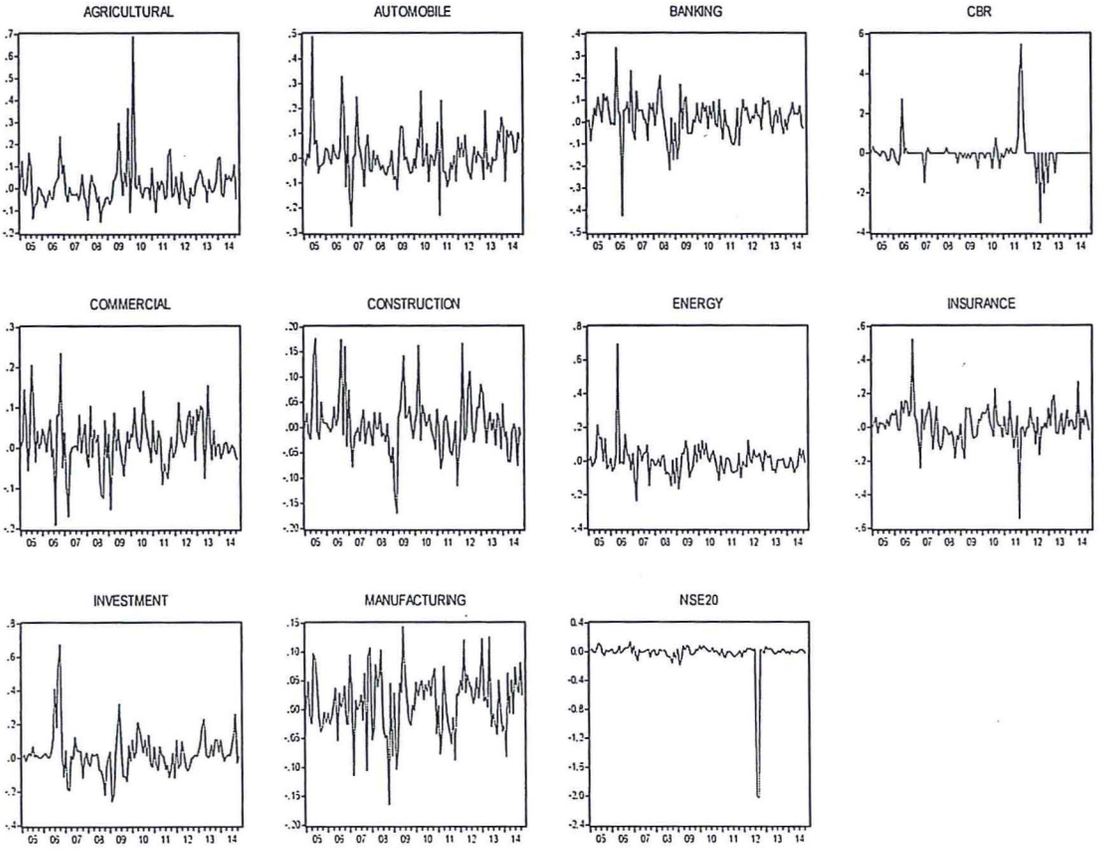

FIGURE 3: SECTOR INDICES AND THE NSE 20 SHARE INDEX

Null Hypothesis: AGRICULTURAL has a unit root
Exogenous: None
Lag Length: 2 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.446777	0.0000
Test critical values:	1% level	-2.585050	
	5% level	-1.943612	
	10% level	-1.614897	

*MacKinnon (1996) one-sided p-values.

TABLE 1: ADF TEST ON AGRICULTURAL INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: AUTOMOBILE has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.375034	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 2: ADF TEST ON AUTOMOBILE AND ACCESSORIES INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: BANKING has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.051365	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 3: ADF TEST ON BANKING INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: COMMERCIAL has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.761424	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 4: ADF TEST ON COMMERCIAL & SERVICES INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: CONSTRUCTION has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.034780	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 5: ADF TEST ON CONSTRUCTION & ALLIED INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: ENERGY has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.541939	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 6: ADF TEST ON ENERGY & PETROLEUM INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: INSURANCE has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.135092	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 7: ADF TEST ON INSURANCE INDEX

The p value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: INVESTMENT has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.133787	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 8: ADF TEST ON INVESTMENT INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: MANUFACTURING has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.146860	0.0000
Test critical values:	1% level	-2.584707	
	5% level	-1.943563	
	10% level	-1.614927	

*MacKinnon (1996) one-sided p-values.

TABLE 9: ADF TEST ON MANUFACTURING & ALLIED INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: NSE20 has a unit root
Exogenous: None
Lag Length: 3 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.484046	0.0000
Test critical values:	1% level	-2.585226	
	5% level	-1.943637	
	10% level	-1.614882	

*MacKinnon (1996) one-sided p-values.

TABLE 10: ADF TEST ON NSE 20 INDEX

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

Null Hypothesis: CBR has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.136451	0.0000
Test critical values:	1% level	-2.584539	
	5% level	-1.943540	
	10% level	-1.614941	

*MacKinnon (1996) one-sided p-values.

TABLE 11: ADF TEST ON CBR

The P value is 0% and therefore the null hypothesis is rejected indicating there is no unit root.

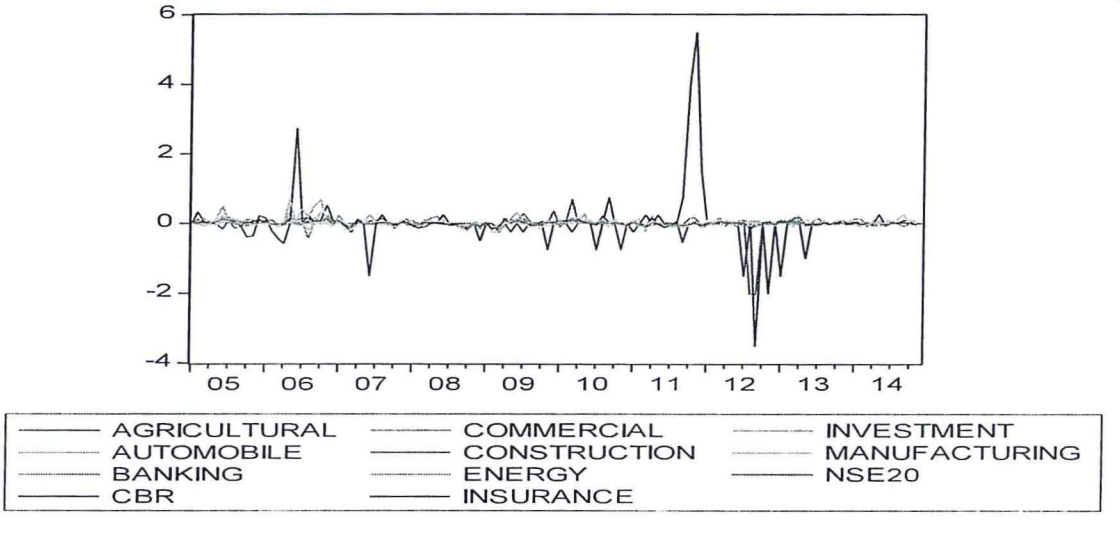

FIGURE 4: SUMMARY GRAPH OF ALL THE SECTOR INDICES AND THE MARKET INDEX

The ADF tests show that all the variables are stationary. This is also supported by the group summary of the unit root test that shows there is no unit root in any of the variables.

Group unit root test: Summary

Sample: 2005M01 2014M12
Series: AGRICULTURAL, AUTOMOBILE, BANKING, CBR, COMMERCIAL, CONSTRUCTION, ENERGY, INSURANCE, INVESTMENT, MANUFACTURING, NSE20
Exogenous variables: None
Automatic selection of maximum lags
Automatic selection of lags based on SIC: 0 to 3
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-25.9956	0.0000	11	1294
Breitung t-stat	-24.1069	0.0000	11	1283
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	1162.49	0.0000	11	1294
PP - Fisher Chi-square	1337.06	0.0000	11	1299

** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.

TABLE 12: GROUP ADF TEST SUMMARY

As the variables are all stationary, the study concludes that there are no much fluctuations in the variables as they tend to move around their means (mean reverting) with finite variances that do not depend on time.

Stationary data is integrated of order 0 and thus all the variables in this study are I (0) and as such are not cointegrated. The study therefore does not carry out cointegration tests.

4.3 MULTIVARIATE TESTS

4.3.1 VECTOR AUTOREGRESSIVE MODELS (VAR)

The study considers 12 periods in showing the short term and long term effects.

4.3.1.1 GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:34
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause AGRICULTURAL	117	0.02108	0.97915
AGRICULTURAL does not Granger Cause CBR		0.40259	0.66955

TABLE 13: GRANGER CAUSALITY TEST AGRICULTURAL

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios and therefore none of the variables Granger causes the other.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:35
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause AUTOMOBILE	117	0.37995	0.68478
AUTOMOBILE does not Granger Cause CBR		0.27459	0.76039

TABLE 14: GRANGER CAUSALITY TEST AUTOMOBILE & ACCESSORIES

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios. This means none of the variables Granger causes the other.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:35
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause BANKING	117	3.50930	0.03325
BANKING does not Granger Cause CBR		2.34998	0.10006

TABLE 15: GRANGER CAUSALITY TEST BANKING

With a P value of 3.33%, the null is rejected in the first case but fails to be rejected in the second case with a P value of 10.01%. This means that CBR granger causes BANKING. There exists a significant relationship between changes in interest rates and stock returns from the banking sector. This can be attributed to the fact that bank's lending rates and deposit rates are guided by the CBR.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:36
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause COMMERCIAL	117	3.73420	0.02692
COMMERCIAL does not Granger Cause CBR		1.17784	0.31173

TABLE 16: GRANGER CAUSALITY TEST COMMERCIAL & SERVICES

With a P value of 2.69%, the null is rejected in the first case but fails to be rejected in the second case with a P value of 31.17%. This means that CBR granger causes COMMERCIAL. There exists a significant relationship between changes in interest rates and stock returns from the commercial sector.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:36
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause CONSTRUCTION	117	1.09013	0.33971
CONSTRUCTION does not Granger Cause CBR		0.98374	0.37712

TABLE 17: GRANGER CAUSALITY TEST CONSTRUCTION & ALLIED

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios. This means that none of the variables Granger causes the other.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:37
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause ENERGY	117	0.93031	0.39746
ENERGY does not Granger Cause CBR		4.25788	0.01651

TABLE 18: GRANGER CAUSALITY TEST ENERGY & PETROLEUM

With a P value of 39.75%, the null is not rejected in the first case but is rejected in the second case with a P value of 1.65%. This means that ENERGY granger causes CBR. There exists a significant relationship between energy returns and changes in interest rates. This means that the CBR is caused by shocks in the energy sector.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:37
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause INSURANCE	117	0.48350	0.61790
INSURANCE does not Granger Cause CBR		5.94383	0.00352

TABLE 19: GRANGER CAUSALITY TEST INSURANCE

With a P value of 61.79%, the null is not rejected in the first case but is rejected in the second case with a P value of 0.35%. This means that INSURANCE granger causes CBR. There exists a significant relationship between insurance returns and changes in interest rates. This means that the CBR is caused by shocks in the insurance sector.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:38
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause INVESTMENT	117	0.52520	0.59289
INVESTMENT does not Granger Cause CBR		0.19302	0.82474

TABLE 20: GRANGER CAUSALITY TEST INVESTMENT

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios. This means that none of the variables Granger causes the other.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:38
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause MANUFACTURING	117	0.10261	0.90256
MANUFACTURING does not Granger Cause CBR		0.65185	0.52305

TABLE 21: GRANGER CAUSALITY TEST MANUFACTURING & ALLIED

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios. This means that none of the variables Granger causes the other.

Pairwise Granger Causality Tests
Date: 10/10/15 Time: 10:39
Sample: 2005M01 2014M12
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
CBR does not Granger Cause NSE20	117	1.35304	0.26264
NSE20 does not Granger Cause CBR		2.41729	0.09380

TABLE 22: GRANGER CAUSALITY TEST NSE20

The P value is greater than 5% and therefore the null hypothesis for "no Granger Causality" is not rejected in both scenarios. This means that none of the variables Granger causes the other.

4.3.1.2 IMPULSE RESPONSE

Impulse response traces out the responsiveness of the stock returns in each sector, in the VAR, to shocks of the interest rates. This helps to show the direction of the effect of changes in interest rates to stock returns.

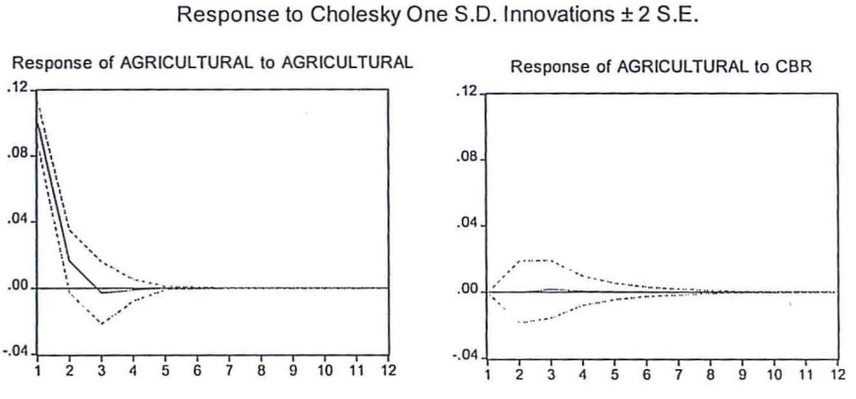

FIGURE 5: IMPULSE RESPONSE FOR THE AGRICULTURAL INDEX

As seen earlier, there exists no causality between the two variables; the impulse response function shows that the agricultural sector does not respond to shocks in interest rates. If any, the response is positive but very minimal or insignificant and only in the short term.

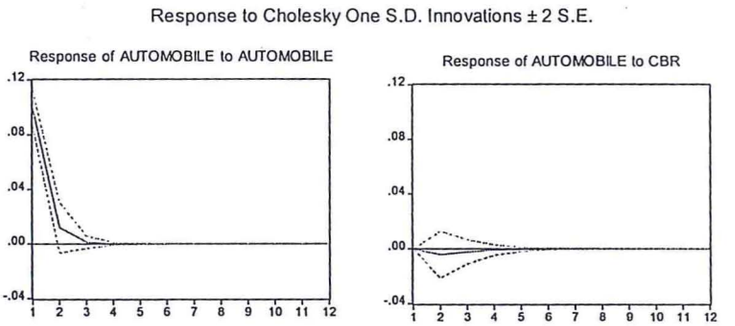

FIGURE 6: IMPULSE RESPONSE FOR THE AUTOMOBILE & ACCESSORIES INDEX

As there is no causality between the two variables; the impulse response function shows that the Automobile & Accessories sector does not respond to shocks in interest rates in the long term but reacts negatively in the short term although this reaction is insignificant.

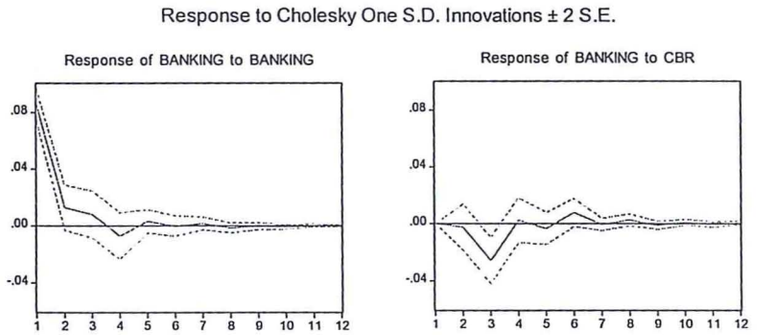

FIGURE 7: IMPULSE RESPONSE FOR THE BANKING INDEX

There exists a significant relationship between interest rate changes and banking sector returns and therefore shocks in interest rates affect the banking sector. These shocks have a significantly negative impact on banking sector returns in the short term which weakens in the medium term and then levels out in the long term.

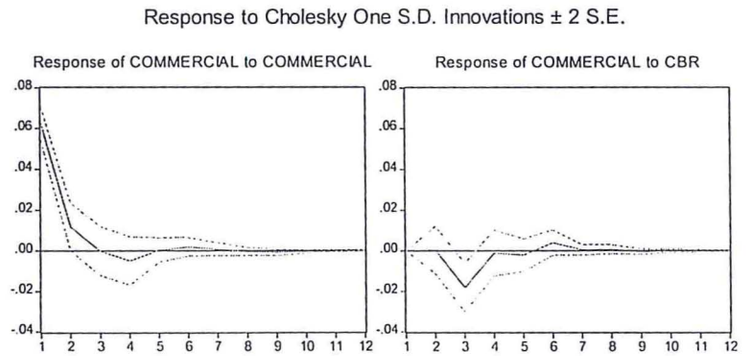

FIGURE 8: IMPULSE RESPONSE FOR THE COMMERCIAL & SERVICES INDEX

There exists a significant relationship between interest rate changes and the commercial & services sector returns. Shocks in interest rates have a significantly negative impact on commercial sector returns in the short and medium term but this impact levels out in the long term.

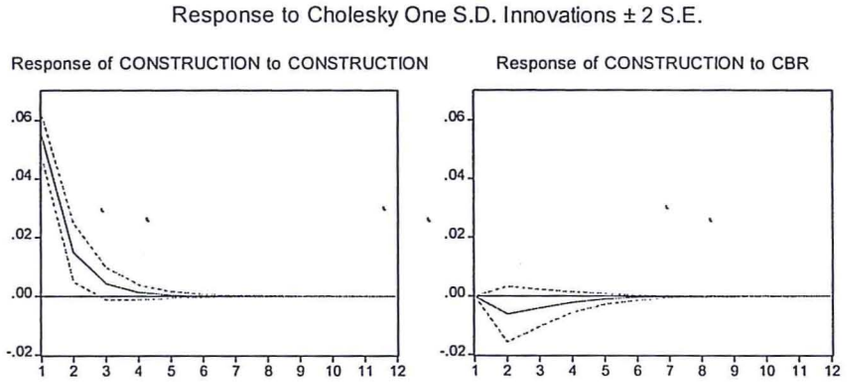

FIGURE 9: IMPULSE RESPONSE FOR THE CONSTRUCTION & ALLIED INDEX

Despite having no causality relationship between these two variables, the impulse response function shows that shocks in interest rates have a negative effect on returns of the construction & allied sector which is however only in the short term.

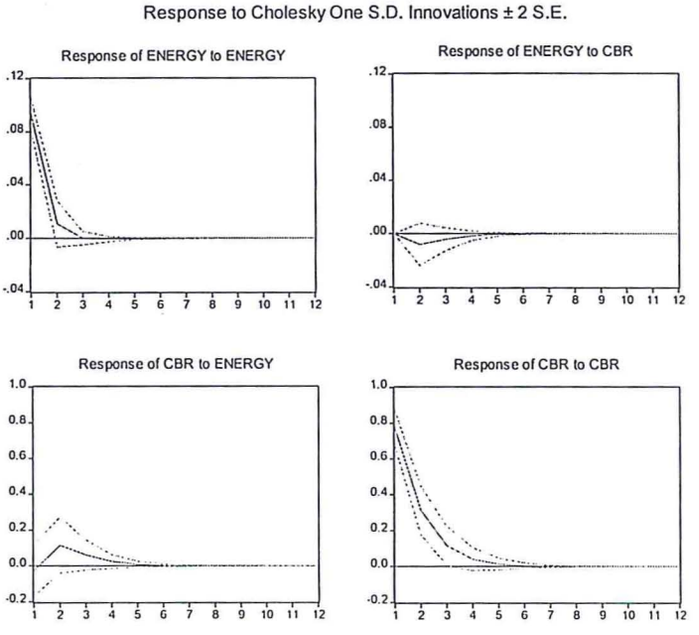

FIGURE 10: IMPULSE RESPONSE FOR THE ENERGY & PETROLEUM INDEX

There exists a significant relationship between energy sector returns and interest rate changes. Shocks in interest rates have a minimal negative impact on energy sector returns only in the short term and this impact levels out in the medium term. It is also important to note that shocks in the energy sector have a more significant positive effect on the interest rates but

only in the short term and this also levels out in the medium term. This relationship is seen in the causality tests done above.

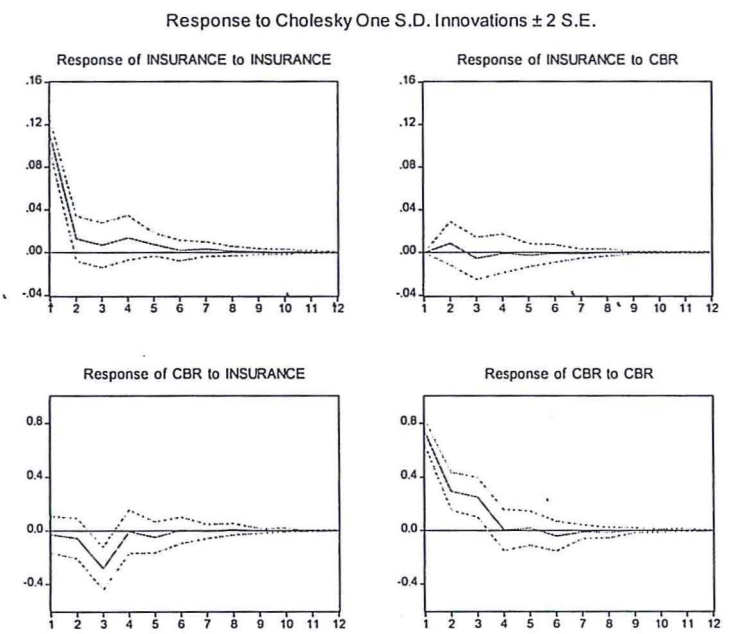

FIGURE 11: IMPULSE RESPONSE FOR THE INSURANCE INDEX

The effects of shocks in interest rates on insurance sector returns and vice versa are the same as those of the energy sector only that they persist insignificantly in the medium term and level out in the long term.

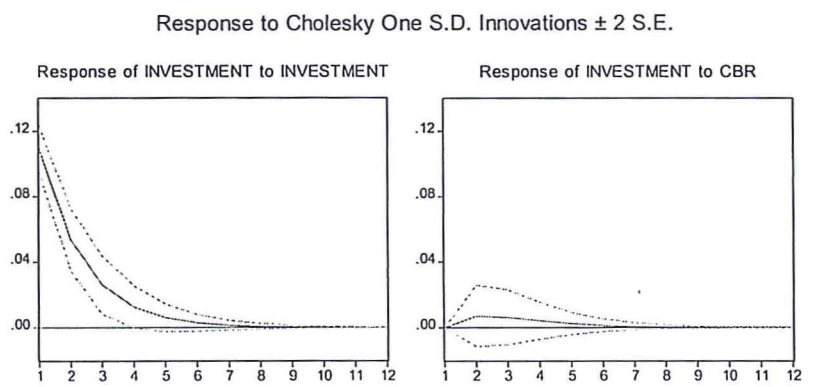

FIGURE 12: IMPULSE RESPONSE FOR THE INVESTMENT INDEX

Despite having no causality relationship between these two variables, the impulse response function shows that shocks in interest rates have a positive effect on returns of the construction & allied sector which is however only in the short term and very insignificant in the medium term.

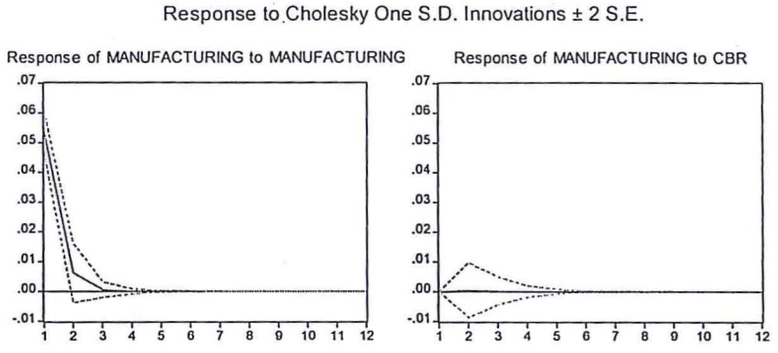

FIGURE 13: IMPULSE RESPONSE FOR THE MANUFACTURING & ALLIED INDEX

There exists no causality relationship between the two variables and the impulse response function also shows that the manufacturing & allied sector does not respond to shocks in interest rates. If any, the response is positive but very minimal or insignificant and only in the short term and medium term.

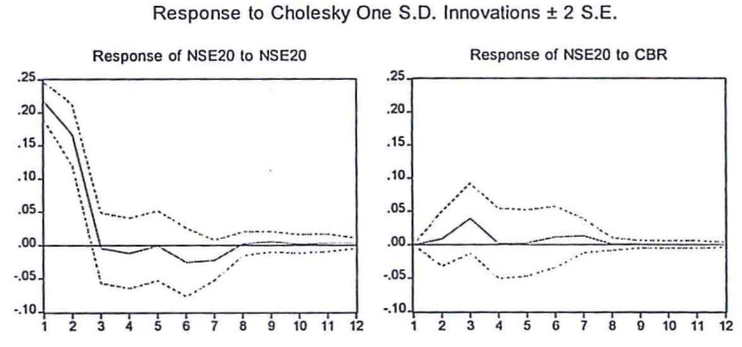

FIGURE 14: IMPULSE RESPONSE FOR THE NSE 20 SHARE INDEX

The effect on shocks in interest rates seems to have a very significant and positive effect on the overall stock market return and this effect persists on to the medium term until it becomes minimal in the long term.

4.3.1.3 VARIANCE DECOMPOSITION

These decompositions give the proportion of the movements in stock returns that are due to their 'own' shocks, versus those movements that are due to shocks in interest rates.

Variance Decomposition of AGRICULTURAL:			
Period	S.E.	AGRICULTURAL	CBR
1	0.100007	100.0000	0.000000
2	0.101196	99.99814	0.001856
3	0.101225	99.99760	0.002402
4	0.101226	99.99750	0.002505
5	0.101226	99.99748	0.002522
6	0.101226	99.99748	0.002525
7	0.101226	99.99748	0.002525
8	0.101226	99.99748	0.002525
9	0.101226	99.99748	0.002525
10	0.101226	99.99748	0.002525
11	0.101226	99.99748	0.002525
12	0.101226	99.99748	0.002525

TABLE 23: VARIANCE DECOMPOSITION FOR THE AGRICULTURAL INDEX

The agricultural sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only 0.0025% of its movements being caused by shocks in interest rates in the long term.

Variance Decomposition of AUTOMOBILE:			
Period	S.E.	AUTOMOBILE	CBR
1	0.099634	100.0000	0.000000
2	0.100436	99.83144	0.168562
3	0.100468	99.78653	0.213469
4	0.100472	99.77848	0.221519
5	0.100473	99.77718	0.222824
6	0.100473	99.77697	0.223030
7	0.100473	99.77694	0.223062
8	0.100473	99.77693	0.223067
9	0.100473	99.77693	0.223068
10	0.100473	99.77693	0.223068
11	0.100473	99.77693	0.223068
12	0.100473	99.77693	0.223068

TABLE 24: VARIANCE DECOMPOSITION FOR THE AUTOMOBILE & ACCESSORIES INDEX

The automobile sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only 0.22% of its movements being caused by shocks in interest rates in the long term.

Variance Decomposition of BANKING:			
Period	S.E.	BANKING	CBR
1	0.085605	100.0000	0.000000
2	0.086624	99.93002	0.069978
3	0.090730	91.89394	8.106063
4	0.091043	91.87743	8.122571
5	0.091163	91.76179	8.238210
6	0.091499	91.08887	8.911130
7	0.091516	91.08847	8.911525
8	0.091565	91.01653	8.983468
9	0.091573	91.00179	8.998208
10	0.091581	90.99296	9.007040
11	0.091583	90.98950	9.010495
12	0.091584	90.98792	9.012078

TABLE 25: VARIANCE DECOMPOSITION FOR THE BANKING INDEX

The banking sector responds 100% to its own shocks in the first month after which shocks in interest rates begin to impact the movements of stock returns in this sector significantly. In the long term, the banking industry's movements are influenced up to 9.01% by shocks in interest rates.

Variance Decomposition of COMMERCIAL:			
Period	S.E.	COMMERCIAL	CBR
1	0.062747	100.0000	0.000000
2	0.063858	99.99352	0.006483
3	0.066369	92.57148	7.428525
4	0.066556	92.58975	7.410251
5	0.066590	92.49954	7.500464
6	0.066743	92.15942	7.840576
7	0.066750	92.15638	7.843623
8	0.066756	92.14295	7.857054
9	0.066761	92.13994	7.860064
10	0.066762	92.13979	7.860210
11	0.066762	92.13975	7.860249
12	0.066762	92.13961	7.860391

TABLE 26: VARIANCE DECOMPOSITION FOR THE COMMERCIAL & SERVICES INDEX

The commercial sector responds 100% to its own shocks in the first month after which shocks in interest rates begin to impact the movements of stock returns in this sector rather significantly. In the long term, this sector's movements are influenced by up to 7.86%, by shocks in interest rates.

Variance Decomposition of CONSTRUCTION:

Period	S.E.	CONSTRUCTION	CBR
1	0.054921	100.0000	0.000000
2	0.057220	98.85600	1.144004
3	0.057523	98.37541	1.624587
4	0.057576	98.25136	1.748640
5	0.057586	98.22472	1.775283
6	0.057588	98.21946	1.780539
7	0.057588	98.21847	1.781532
8	0.057588	98.21828	1.781716
9	0.057588	98.21825	1.781749
10	0.057588	98.21824	1.781756
11	0.057588	98.21824	1.781757
12	0.057588	98.21824	1.781757

TABLE 27: VARIANCE DECOMPOSITION FOR THE CONSTRUCTION & ALLIED INDEX

The construction sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only a slightly significant 1.78% of its movements being caused by shocks in interest rates in the long term.

Variance Decomposition of ENERGY:

Period	S.E.	ENERGY	CBR
1	0.093624	100.0000	0.000000
2	0.094602	99.27048	0.729520
3	0.094695	99.07630	0.923704
4	0.094712	99.04493	0.955070
5	0.094715	99.04066	0.959342
6	0.094715	99.04012	0.959883
7	0.094715	99.04005	0.959949
8	0.094715	99.04004	0.959957
9	0.094715	99.04004	0.959958
10	0.094715	99.04004	0.959958
11	0.094715	99.04004	0.959958
12	0.094715	99.04004	0.959958

TABLE 28: VARIANCE DECOMPOSITION FOR THE ENERGY & PETROLEUM INDEX

The energy sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only an insignificant 0.96% of its movements being caused by shocks in interest rates in the long term. It is however important to note that the granger causality test showed a unidirectional causality between these two variables with energy sector returns being the cause of interest rates and therefore the shocks in the energy sector have a significant effect on the movements of interest rates in the long term.

Variance Decomposition of INSURANCE:			
Period	S.E.	INSURANCE	CBR
1	0.110057	100.0000	0.000000
2	0.111223	99.37378	0.626225
3	0.111583	99.14374	0.856262
4	0.112481	99.15168	0.848318
5	0.112773	99.11131	0.888686
6	0.112794	99.10679	0.893212
7	0.112848	99.09829	0.901712
8	0.112857	99.09842	0.901583
9	0.112861	99.09795	0.902046
10	0.112862	99.09796	0.902041
11	0.112862	99.09794	0.902060
12	0.112862	99.09794	0.902062

TABLE 29: VARIANCE DECOMPOSITION FOR THE INSURANCE INDEX

The insurance sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only 0.90% of its movements being caused by shocks in interest rates in the long term. However, just like the energy sector, there exists a unidirectional causality between these two variables with insurance sector returns being the cause of interest rates. This means the shocks in the insurance sector have a significant effect on the movements of interest rates in the long term.

Variance Decomposition of INVESTMENT:			
Period	S.E.	INVESTMENT	CBR
1	0.109614	100.0000	0.000000
2	0.122214	99.67014	0.329862
3	0.125104	99.43741	0.562587
4	0.125799	99.33502	0.664985
5	0.125966	99.29883	0.701170
6	0.126006	99.28759	0.712415
7	0.126016	99.28437	0.715631
8	0.126018	99.28350	0.716499
9	0.126019	99.28328	0.716724
10	0.126019	99.28322	0.716781
11	0.126019	99.28321	0.716794
12	0.126019	99.28320	0.716798

TABLE 30: VARIANCE DECOMPOSITION FOR THE INVESTMENT INDEX

The investment sector responds 100% to its own shocks in the first month and this trend persists in the long term with only 0.90% of its movements being caused by shocks in interest rates in the long term.

Variance Decomposition of MANUFACTURING:			
Period	S.E.	MANUFACTURING	CBR
1	0.053957	100.0000	0.000000
2	0.054328	99.98999	0.010010
3	0.054333	99.98745	0.012551
4	0.054333	99.98702	0.012981
5	0.054333	99.98695	0.013047
6	0.054333	99.98694	0.013057
7	0.054333	99.98694	0.013058
8	0.054333	99.98694	0.013058
9	0.054333	99.98694	0.013059
10	0.054333	99.98694	0.013059
11	0.054333	99.98694	0.013059
12	0.054333	99.98694	0.013059

TABLE 31: VARIANCE DECOMPOSITION FOR THE MANUFACTURING & ALLIED INDEX

The manufacturing sector responds 100% to its own shocks in the first month and this trend persists even in the long term with only 0.01% of its movements being caused by shocks in interest rates in the long term.

Variance Decomposition of NSE20:			
Period	S.E.	NSE20	CBR
1	0.217575	100.0000	0.000000
2	0.274180	99.89607	0.103934
3	0.277041	97.86199	2.138011
4	0.277292	97.86167	2.138325
5	0.277305	97.85291	2.147092
6	0.278687	97.69775	2.302252
7	0.279905	97.48195	2.518052
8	0.279918	97.48092	2.519082
9	0.279973	97.48091	2.519092
10	0.279982	97.48107	2.518932
11	0.280008	97.48134	2.518660
12	0.280026	97.48167	2.518327

TABLE 32: VARIANCE DECOMPOSITION FOR THE NSE20 SHARE INDEX

The overall stock market responds 100% to its own shocks in the first month after which shocks in interest rates begin to impact the movements of the stock market slightly significantly. In the long term, the stock market's movements are influenced up to 2.52% by shocks in interest rates.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This study was aimed at analysing the impact of interest rate changes on the Kenyan stock market with attention being drawn to how these changes affect the market's performance and the performance of the different sectors in the Kenyan economy.

The study employed a VAR model to analyse this impact focusing on the CBR as the representative interest rate and sector indices and the NSE20 share index as the market representative.

The study conducted a unit root test to ensure that the variables were all fit to be used in the VAR model and the results showed that all variable lacked a unit root. This means that all the variables used in this study were stationary.

The VAR models of Granger Causality, Impulse Response and Variance Decomposition were used to evaluate the short run and long run relationship between the variables.

The Granger Causality tests showed that a relationship was only present between four sectors and the CBR. The CBR was seen as a cause to the banking and commercial sectors while the energy and insurance sectors were seen as the causes of CBR.

Impulse response was then used to evaluate the direction of the responses of all the variables with regards to shocks in the CBR where a positive relationship was established for the insurance and investment sectors, while a negative relationship was established for banking, commercial, construction and energy sectors. The agricultural, automobile and manufacturing sectors did not seem to be affected by shocks in the CBR. The market index however, showed that the stock market had a positive response to shocks in CBR

Variance decompositions on the other hand, gave both long run and short run proportions of the movements in the sectors and the market that were as a result of shocks in the CBR and those individual sectors and the market. The banking and commercial sectors were significantly influenced by shocks in the CBR in the long run while the agricultural, automobile, energy, insurance, investment and the manufacturing sectors seemed unaffected by the shocks in CBR in both the short and long run. The construction sector is slightly affected by the shocks in CBR in the long run and so is the market index. The results obtained suggest that the proportion of movements in the Kenyan stock market caused by shocks to the CBR is not very significant.

(Chirchir, 2012) Found that there exists no relationship between lending rates and asset prices in Kenya. This study comes to a similar conclusion that is no significant relationship between changes in CBR and stock returns and the Kenyan stock market performance. The study finds that only two sectors are significantly affected by changes in interest rates and these are the banking and the commercial & services sectors. The results show that this relationship persists even in the long run. The difference between these two studies is the use of different rates as a representative of Kenyan interest rates.

5.2 RECOMMENDATIONS

For policy makers, the study provides some insights as to how the CBR as a policy tool can affect the stock market performance. As seen from the results, the CBR has no significant impact on the Kenyan stock market therefore use of the CBR may only be effective in regulating the banking and commercial sectors of the economy. Other tools such as the Open Market Operations and reserve requirements may prove to be better and more efficient instruments in achieving monetary goals and impacting the stock market performance. Policy makers should also bear in mind that all the variables used were stationary and there do not contain persistent shocks and therefore do not need very strong policy actions to adjust for any deviations in the market because the market tends to correct itself (the variables are mean reverting).

For investors and portfolio managers, the study provides insights as to which sectors would be better investments during periods of changing interest rates. The study concludes that the banking and the commercial sectors are the most prone to shocks in interest rates. However, a market portfolio would not be much affected by any shocks in interest rates. Investors should however be aware that increasing interest rates in the bond market or money market would make the stock market less desirable.

5.3 LIMITATIONS OF THE STUDY AND FURTHER RESEARCH

This study used monthly data and therefore the use of daily data would maybe be able to explain the effect of changes in interest rates on the stock market's performance.

A longer period of time would also help to draw more comprehensive conclusions as compared to the study period of 10 years.

This study only used the CBR as a representative of the interest rates in Kenya. Additional rates such as banks' lending rates and deposit rates, interbank rates etc. can be used to make the research more holistic and dynamic.

This study only used the VAR model and therefore a different approach could also be used such as the Vector Error Correction Model or even the use of panel data techniques.

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