

**THE EFFECT OF INTEREST RATES CHANGES ON  
PERFORMANCE OF THE NAIROBI SECURITIES EXCHANGE  
20 SHARE INDEX**

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## DECLARATION

This Research Project is my original work and has not been submitted for examination in any other university.

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D61/64353 /2013

Research Project has been submitted for examination with my approval as the  
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## **DEDICATION**

This project is dedicated to my family members for the prayers and encouragement.

May the Good Lord bless them abundantly

## **ABSTRACT**

The Central Bank interest rate encountered various changes between 2010 and 2012. These changes were attributed to efforts by the Monetary policy committee (MPC) to strengthen the Kenya shilling currency which was getting weaker against major currencies in the world. The study therefore sought to examine if Interest rate changes had an effect on the performance of the Nairobi securities Exchange 20 share Index. The NSE 20 share index is a market-capitalization weighted index for the Nairobi Securities Exchange which was used to represent the entire NSE population.

Event-study methodology was used to measure the magnitude of interest rates changes on performance of the NSE 20 share index. The study was motivated by the need to establish how fiscal tools used by the central bank affect the performance of the NSE while trying to control other aspects of the economy like foreign Exchange rates and inflation rates. Historical data on interest rates and NSE 20 Share Index was obtained from the CBK weekly bulletin and NSE reports respectively for the period January 2010 – Dec 2012. Abnormal returns and Cumulative abnormal returns were calculated for 21 days event windows, 10 days before the event and 10 days after the event. T-statistical test were also conducted to test significance of the abnormal Returns (AR) and Cumulative abnormal returns (CAR).

The findings of the study indicate that interest rates changes had an effect on performance of the NSE 20 share index. Interest rate hikes resulted to a decline in the NSE 20 share index while Interest rate cuts resulted to a rise in the NSE 20 share index.

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## **LIST OF ABBREVIATIONS**

NSE	-	Nairobi Securities Exchange
CBR	-	Central Bank Rate
CBK	-	Central Bank of Kenya
MPC	-	Monitory Policy Committee

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the study

The stock Exchange market and interest rates are two crucial factors of economic growth of a country. The impacts of interest rate on Securities Exchange markets provide important implications for monetary policy, risk management practices, financial securities valuation and government policy towards financial markets. Interest rate also known as the Central Bank Rate in Kenya is the lowest acceptable rate set by the monetary policy committee (MPC). This is reviewed at least every two month while the NSE 20 share index is the weighted index for the Nairobi Securities Exchange (Alam, 2009).

The relationship between interest rates movements and stock markets has been the focus of a considerable amount of research in recent years worldwide. Empirical research has found that inclusion of an interest rate factor adds substantial explanatory power to the simple single-factor market model where the return on an index of common stocks is used as a proxy for the market portfolio (Flannery and James, 1984).

Nduati (2012) argued that the rationale behind the need to control interest rates of financial instrument is based on the need to control economic patterns that has great effects to the society. Holding all factors constant, controlling and setting of rates has big economic implication to the economic growth hence creating for a need of a

rational decision making process within the industry. Poor decisions on the rates can directly affect the economic performance in all industry.

### **1.1.1 Interest Rate**

Interest rate is considered as one of the most important macroeconomic variables in relation to economic growth of a country. It is the cost of capital, meaning the price paid for the use of money for a period of time. From the point of view of a borrower, interest rate is the cost of borrowing money. From a lender's point of view, interest rate is the fee charged for lending money (Hualan, 1992).

Crowley (2007) defined Interest rate as the rate at which interest is paid by the borrower for the use of money that they borrow from the lenders. This is usually a percentage of principle paid a certain number of times per period for all periods during the total term of the loan or credit. Interest rates are normally expressed as a percentage of the principal for a period of one year.

According to Graham and Harvey (2001) Interest rate changes are broadly recognized as a major source of uncertainty for corporations by U.S. firm managers and they are considered to be the second most important risk factor, only behind market risk. Financial theory states that movements in interest rates affect both the firm's expectations about future corporate cash flows and the discount rate employed to value these cash flows and, hence, the value of the firm.

For purposes of this study, interest rates in Kenya are determined by the central bank and these are the interests it charges on loans to banks and other financial institutions. The rate is known as central bank rate (CBR).

### **1.1.2 NSE 20 Share Index Performance**

The NSE 20 Share index is a market-capitalization weighted index for the Nairobi Securities Exchange. It was established in 1966 by Nairobi Securities Exchange Ltd (then Nairobi Stock Exchange) to reflect daily prices of the 20 blue-chips (superior profitability and dividend record) companies (NSE, 2010). These companies are drawn from the three sectors of market namely the Main Investments Market Segment (MIMS), Alternative Investments Market Segment (AIMS) and Fixed Income Securities Market Segment (FISMS) and account for 70% of the capitalization of the Nairobi Securities Exchange.

According to NSE (2013), market capitalization is the underlying criteria for inclusion in the index if companies fulfill all other inclusion requirements. Periodic review of constituents companies of the NSE 20 share index is done on a quarterly basis by the index management sub-committee. The reviews is based on data collected for a period of one year as at the end of each quarter, and details of the outcome of the review are published after recommendations of the Index Management Sub-Committee have been endorsed by the Trading Committee and ratified by the Board. However, the change for the constituent companies are initiated and implemented as soon and when need arises (NSE, 2012).

Furthermore, in the event of new issue and if the new issue is so large that the effectiveness of the index as a market indicator would be significantly and adversely affected by its omission, the sub-committee may recommend to the trading and compliance committee for its inclusion before the lapse of the one year clause.

### **1.1.3 Effect of Interest Rates on NSE 20 Share Index**

When the central bank increases the Central bank rate, it becomes more expensive for banks to borrow money from the central bank as a result the banks will also increase interest it charges its customers who are individuals and businesses. When the banks make borrowing more expensive, companies might not borrow as much and will pay higher rates of interest on their loans. Less business spending therefore slows down the growth of a company, resulting in decreases in profit (Ngahu, 2006).

According to Zadora (2010) interest rates changes should be given much attention because they can affect a both financial and non-financial company share price and consequently the NSE 20 share index. Where there is a steep increase in interest rates companies that need to expand will rather retain earnings in the company and use them for expanding rather than leverage. As a result, less dividends or no dividend will be issued to shareholders leading to lower stock prices.

Studies have shown evidence of nonlinear and inverse relationship between the share prices and interest rate. Alam (2009) who attempted to explore the empirical relationship between interest rate and stock prices of fifteen developed and developing countries found that in most countries change in interest rates had a negative relationship with change of share price.

#### **1.1.4 The Nairobi Securities Exchange**

The stock market in Kenya is known as the Nairobi Securities Exchange (NSE) constituting of voluntary association of stockbrokers. The NSE was formed in 1954 and it has had a remarkable development to become amongst the most vibrant stock markets in Africa (Wabwire, 2013).

The NSE has been known to react to changes in the interest rates regime. When the Central Bank of Kenya (CBK) increases the benchmark Central Bank Rate (CBR), it does not have an immediate impact on the stock market. Instead, the increased CBR has a single direct effect - it becomes more expensive for banks to borrow money from the CBK. Increases in the CBR also cause a ripple effect, however, and factors that influence both individuals and businesses are affected (Olweny and Kimani, 2011).

With a new government coming in the year 2003, there were new and different strategies adopted. The government reduced the interests given to the banks on the amount given to it as loan. This forced the banks to come up with new strategies on how to reach out to other interested stakeholders. This was the time small banks or micro finance institution expanded due to the good business environment that was prevailing. They extended their interest all over the country and outside the country making it difficult for the main banks to continue operating with strict banking structures ( Ndung`u, 2000).



Currently, there are 64 companies listed in the NSE, out of which 51 are actively traded. Of the 64 stocks, 53 are non-financial companies. This represents 82% of all the companies listed in the stock Exchange. Non financial companies also comprise of 16 of 20 companies listed under the NSE 20 share index. This statistics clearly show the dominance on non-financial companies in the NSE.

## **1.2 Research Problem**

Alam (2009) argued that interest rate and Securities Exchange market are crucial to economic growth of a country and that the impacts of interest rate on stock Exchange provide important implications for monetary policy. Flannery and James (1984) found out that interest rate risk is perceived by firm managers as the second most important risk factor, only behind market risk. It affects both the firm's expectations about future corporate cash flows and the discount rate employed to value these cash flows and, hence, the value of the firm.

The impact of interest rate fluctuations on the market value of companies has received a great deal of attention in the literature, although much of the empirical research has focused on performance of financial institutions because of the particularly interest rate sensitive nature of the banking business. Over the last five years, the central bank rates have ranged between 5% and 18%. In the year 2015 the CBR has been on the rise currently at 11.50%. The rise has been due to efforts by the central bank to strengthen the Kenya shilling against major currency. In the year 2011 there was also a steep rise in the interest rates (Wambua, 2013).

There have been various studies done on the topics of interest rates and stock markets all over the world. A study by Moya and Lapena (2013) who studied the relationship between interest rate changes and stock returns in Spain found that the Spanish industries showed, in general, a significant interest rate sensitivity, although the extent of interest rate exposure varied greatly across industries and depending on the time horizon under consideration. In another study by Alam (2009) who studied the relationship between Interest Rate and Stock Price: Empirical Evidence from Developed and Developing Countries found out that individual country results were mixed e.g. in Malaysia he found out that there was a negative relationship between changes of interest rates and change of share prices while in countries such as Italy and South Africa there was a positive relationship between changes of interest rates and changes of share price.

Most of the local studies in Kenya have focused on the relationships between interest rates and share prices of financial institutions and performance of financial institutions. This is because of the sensitivity nature of interest rates to these financial institutions. In a study done by Irungu (2013) found that interest rate spread was the most significant factor influencing financial performance of commercial banks in Kenya. Very little effort has focused on effect of interest rates changes on the performance of the NSE 20 Share index. This study therefore answered the following question: Does interest rate changes have an effect on performance of the Nairobi Securities Exchange 20 share index?

### **1.3 Research Objective**

The research objective was to determine the effect interest rates changes on performance of the Nairobi Securities Exchange 20 share index.

### **1.4 Value of the Study**

The study findings will add to the body of knowledge that exist on central bank rates and performance of NSE and therefore form the basis of further study by identifying the knowledge gap that will arise from the findings. The study may create a forum for further discussions and debate on how the interest rates changes affect other sectors of the economy.

The study will help Investors understand how interest rate changes will affect the expected stock returns of a company therefore enabling them to caution their trades and profit from the NSE. The study will provide guidance to companies quoted in the NSE on the extent to which change in interest rates changes will affect shares prices.

With the CBR being one of its tools used to control the macroeconomic environment in the country, the study will help the institution understand how adversely changes interest rates will affect share prices. The study also gives a good insight to academicians who want to do further research in this area.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter provides an overview of financial theories, previous studies, related data and studies that are related to interest rates and share prices. The Importance of this section is to provide support to the study being undertaken. It also provides the main reference point that is necessary to write this research paper. The source of the literature is mostly from related journal, articles, textbooks and the internet.

#### **2.2 Theoretical Review**

This section discusses the theories that help determine interest rates. They are classified into three theories, the classical theory which explains interest as determined by the demand and supply of capital, Loanable Funds Theory or Neo-classical Theory, which explains interest as determined by demand for and supply of loan-able funds and the rational expectations theory.

##### **2.2.1 The Classical Theory of Interest**

According to the classical theory, the interest rate is determined by the intersection of the investment demand-schedule and the saving-schedule level. In real terms, it is the reward for the productive use of capital, which is equal to the marginal productivity of physical capital (Palley 1995).

The theory holds the proposition based on the general equilibrium theory that the rate of interest is determined by the intersection of the demand for and supply of capital. Thus, an equilibrium rate of interest is determined at a point at which the demand for capital equals its supply. Demand for capital stems from investment decisions of the entrepreneur class. Investment demand schedule, thus, reflects the demand for capital, while the supply of capital results from savings in the community. Savings schedule, thus, represents the supply of capital. It follows that savings and investment are the two real factors determining the rate of interest (Palley 1995).

Technically, the rate of interest is determined by the intersection of investment demand schedule and the savings schedule. At the equilibrium rate of interest, total investment and total savings are equal. It should be noted that the theory assumes real savings and real investment. Real savings refer to those parts of real incomes which are left unconsumed to provide resources for investment purposes. Reinvestment implies use of resources in producing new capital assets like machines, factory plants, tools and equipment, etc. It means investment in capital goods industries, in real terms (Foster 1999).

The limitation to this theory is that, factors other than savings and investment that affect interest rates are ignored. For example, many financial institutions can “create” money today by making loans to the public.

### **2.2.2 Loanable Fund Theory**

Loanable Funds Theory assumes that interest rates are determined by supply of loanable funds and demand for credit. The loanable funds theory is an attempt to improve upon the classical theory of interest. It recognizes that money can play a disturbing role in the saving and investment processes and thereby causes variations in the level of income. Thus, it is a monetary approach to the theory of interest, as distinguished from that of the classical economists. The loanable funds theory synthesizes both the monetary and non-monetary aspects of the problem (Wensheng, Wung and Shu, 2002).

According to the loanable funds theory, the rate of interest is the price that equates the demand for and supply of loanable funds. At the equilibrium level where demand = supply of loanable funds savers and investors are the happiest possible. Fluctuations in the rate of interest arise from variations either in the demand for loans or in the supply of loans or credit funds available for lending.

Turnovsky, (1985) argued that interest is the price that equates the demand for loanable funds with the supply of loanable funds. Loanable funds are "the sums of money supplied and demanded at any time in the money market."The supply of 'credit' or funds available for lending would be influenced by the savings of the people and the additions to the money supply (usually through credit creation by banks) during that period. The demand side of the loanable funds, on the other hand, would be determined by the demand for investment plus the demand for hoarding money.

Loanable fund theory has implication on banks savers and borrowers according to this theory these two groups should well compensate at equilibrium. According to this theory interest rate spread should not be very wide where one party feel exploited. Interest rate should be structured in a way every party feel comfortable (Emmanuelle, 2003)

### **2.2.3 The Rational Expectations Theory of Interest Rates**

Rational expectation theory holds that the best estimation for future interest rates is the current spot rate and that changes in interest rates are primarily due to unexpected information or changes in economic factors. The rational expectations theory can be incorporated with the loanable funds theory in order to better consider the available information within the economy. The limiting factors of rational expectation theory are mostly related to the difficulty in gathering information and understanding how the public uses its information to form its expectations (Bekaert, 1998).

Caplan (2000) argued that if expectation of the people is that interest will rise many people will avoid borrowing this in return will affect bank performance due to reduced earning on interest rate, but people expect interest rate to drop people would be willing to borrow and this will improve banks performance due to increase in interest rate earning. In summary this sections helps to understand more on how interest rates are determined. By understanding how these three different theories will help us appreciate interest rates and consequently have a better understanding on how it will affect share prices.

## **2.3 Determinants of performance of the Nairobi Securities Exchange**

### **20 Share Index**

According Graham and Harvey (2001) one of the major factors that affect share prices is the interest Rate. When interest rate increases, investors will move their money from the capital market to the money market. During the increase in interest rates, stock prices move downward due to movement of money to the money market. Demand and Supply is also another important factor that will help determine the share price of a stock according to Al-Shubiri (2010). The law of demand and supply affects the prices and availability of stocks on the floor of the stock Exchange. If the demand for a stock is higher than supply, the stock is on bid and the price of the stock may continue to go up for days. Likewise if the supply of a stock is higher than the demand, the stock is on offer and the price of the stock will fall. A number of factors are responsible for the demand and supply of a stock.

The financial performance of companies quoted on the stock Exchange is also one of the factors responsible for movement of share prices. Quoted companies are expected to submit quarterly financial result to the stock Exchange and are also expected to publish the result in the financial press. If a company declares an impressive result, investors will take position in such stocks in order to partake in the bounty returns. The reverse is the case if a company has an unimpressive performance; investors will dump the stock making the price to fall (Al-Shubiri 2010).



Companies that have consistently produced a good return on investment will always have large patronage on their stocks. Foreign investors, pension fund managers, mutual fund managers, insurance companies and other institutional investors will want to have stocks with consistent good return on investment in their portfolio. Inflation is also a huge driver from a technical perspective. Historically, low inflation has had a strong inverse correlation with valuations (low inflation drives high multiples and high inflation drives low multiples). Deflation, on the other hand, is generally bad for stocks because it signifies a loss in pricing power for companies.

Liquidity is an important and sometimes under-appreciated factor. It refers to how much investor interest and attention a specific stock has. Trading volume is not only a proxy for liquidity, but it is also a function of corporate communications i.e. the degree to which a company is getting attention from the investor community. Large-cap stocks have high liquidity and they are well followed and heavily transacted. Many small-cap stocks suffer from an almost permanent "liquidity discount" because they simply are not on investors' radar screens. Political Instability will make both local and foreign investors have confidence in the economy and invest their money. Instability will create fears in the mind of investors. With political stability comes demand for shares which forces the share price to go up (Al-Shubiri 2010).

In summary various factors have been evidenced to affect the share prices of a company. Interest rates changes in one of the major factor that affects the share price. This research paper will therefore focus on how the interest rates will affect the share prices of non-financial companies listed in Kenya's Securities Exchange.

## **2.4 Empirical Literature Review**

The relationship between stock prices and interest rates has received considerable attention in the literature. Zhou (1996) who studied the relationship between interest rates and stock prices using regression analysis in the United States found that interest rates have an important impact on stock returns on long horizons.

In a different research done by Carbello (1994) which looked at the relationship between the 10-year Treasury yield and the Standard & Poor's 500 index over the past 50 years, a positive relationship in was established in certain situations. When the 10-year Treasury yield was below 5 percent, rising interest rates were generally associated with rising stock prices. When the economy slowed down and the Federal Reserve took steps to try to revive it, they lowered interest rates but once the Federal Reserve saw signs of a recovery, they reversed their course and raised interest rates, which signaled investors that the problems plaguing the economy was starting to ease.

In a study by Alam (2009), he examined the market efficiency of fifteen countries and also looked about the effect of interest rate on share price and changes of interest rate on changes of share price. The theoretical argument of negative relationship between stock price and prevailing interest rate was not rejected. Individual country result was mixed for both developed and developing countries. In Malaysia it was found that changes of Interest Rate had a negative relationship with Changes of Share Price. In case of Japan, it was found that Interest Rate had positive relationship with Share price but change of Interest Rate has negative relationship with change of Share Price.

Four countries like Bangladesh, Colombia, Italy, and S. Africa showed negative relationship for both Interest Rates with Share price and Changes of Interest Rate with Changes of Share Price. Eight countries, Australia, Canada, Chile, Germany, Jamaica, Mexico, Spain, and Venezuela has significant negative relationship between Interest Rates and Share price but no relationship between change of Interest Rate and change of Share Price.

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

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

Another study examined the relationship between stock return, interest rate and Exchange rates in Pakistani economy over the period of 1998-2009. A multiple regression model was applied to test the significance of change in interest rate and Exchange on stock returns. The results indicated that both the change in interest rate and change in Exchange rate have a significant impact on stock returns over the sample period. (Hamdan, 2014).

In a local study by Irungu (2013) who studied the effect on interest rates spreads on financial performance of commercial banks in Kenya showed that interest rate had a significance influence on financial performance of banks. This was indicated by positive and strong Pearson correlation coefficients. This suggested that the interest rate spreads are relied upon to make conclusions about the financial performance of commercial banks as shown by their strong and positive correlation coefficients.

Were and Wambua (2013) studied the determinants of interest rate spread of Kenya commercial banks found that bank-specific factors play a significant role in the determination of interest rate spreads. These include bank size based on bank assets, credit risk as measured by non-performing loans to total loans ratio, liquidity risk, return on average assets and operating costs. The impact of macroeconomic factors such as real economic growth and inflation is not significant. Similarly, the impact of policy rate as an indicator of monetary policy is found to be positive but weak. On average, big banks have higher spreads compared to small banks.

Njoroge (2013) in his study of the relationship between interest rates and financial performance of the firms listed at the NSE. The study covered five years from 2008 to 2012. The research was based on secondary data obtained from the published financial statements and central bank of Kenya. He employed regression analysis to assess the causal relationship. His findings were that there was an insignificant positive relationship between interest rates and financial performance of firms listed at the stock Exchange.

Several studies have been done in this area giving mixed findings. From the empirical studies mentioned above, the results have been inconsistent. The results range from negative relationship to positive relationship between interest rates and share prices. The study done by Hsing (2004), found a negative relationship between interest rates and share prices. However, Lee (1997) found the relationship changing gradually from a significantly negative to no relationship, or even a positive although insignificant relationship. Therefore, there is still no unanimity in the study of the relationship between interest rate and share prices.

## **2.5 Summary of Literature Review**

The theoretical literature review in summary has shown that interest rates are either determined by intersection of the investment demand-schedule and the saving-schedule level (The classical theory), determined by supply of loanable funds and demand of credit (Loanable Fund theory and finally combination of current spot rate and changes in interest rates that are due to unexpected information.

Empirical Literature studied have shown that interest rates relationship to share prices differ from negative relationship to positive relationship. The study done by Hsing (2004), found a negative relationship between interest rates and share prices. However, Lee (1997) found the relationship changing gradually from a significantly negative to no relationship, or even a positive although insignificant relationship. Therefore, there is still no unanimity in the study of the relationship between interest rate and share prices.

Also it is also important to note that there are other factors that will affect and consequently determine the share prices of company. Besides Interest rates other factors identified include demand and supply, financial performance, Return on investment, inflation and deflation, liquidity of shares and political instability.

Local studies have focused on the relationship between interest rates and share prices of financial companies listed in the stock Exchange. Irungu (2013) found that there was a significant influence of interest rates on financial performance of banks however Njoroge (2013) found out that there was an insignificant positive relationship.

In summary local studies have focused on the effect of interest rates on financial companies and less emphasis non-financial companies. This study will try and analyze the effect of central bank interest rate changes on share prices of non-financial companies.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter outlines the research methodology by giving a description about the source data, method that will be used to conduct the research, the population, technique of collecting the data and technique of analyzing the data.

#### **3.2 Research Design**

A Research design refers to the way in which the study is designed, that is, the method used to carry out a research. Since the study focuses on the effect of events being interest rate changes, the event study methodology was used. When implementing this methodology, a test was conducted on the hypothesis regarding the abnormality of market's returns due to specific events. This methodology was based on the efficient market hypothesis which states that stock prices adjust to new information according to previous studies by Fama, Fisher and Jensen (1969) and MacKinlay (1997).

#### **3.3 Population of Study**

Population is the entire group of individuals, events or objects having common characteristics (Mugenda and Mugenda, 1999). Cooper and Schindler, (2006) call it a 31 population of interest from which the individual participants or object from which the measurement is taken. The population of the study was all the listed companies at

the Nairobi Securities Exchange for the period 2011 to 2012 as represented by the NSE 20 share index.

### **3.4 Data Collection**

The study was based on secondary data obtained from the NSE and Central Bank of Kenya. The data was compiled and analyzed in Excel format and then transferred to Statistical Package for Social Sciences (SPSS) for further statistical data analysis. Parametric t-test was used to establish the statistical significance of the abnormal returns (AR) and the cumulative abnormal returns (CAR) over the event window period. The event period was determined relative to the date of the CBR announcement date and cover 21 days consisting of 10 days before the event and day 0 being the event day and 10 days after the event. The event period is considered reasonable for the purposes of examining the effect of interest rate changes on performance of the NSE 20 share index.

### **3.5 Data Analysis**

Event-study methodology was used to measure the magnitude of interest rates changes on performance of the NSE 20 share index. To examine whether an event had any impact on the market, the event-daily abnormal returns (ARs) and the cumulative abnormal returns (CARs) were measured and their statistical significance tested accordingly. An abnormal return (AR) is defined as the actual return (determined using arithmetic percentages) less the expected market return. The abnormal return represents the part of the return that is not predicted and is, therefore, an estimate of the change in share index value on a day, which was caused by the interest rate changes events. An investigation was conducted on whether there are abnormal



returns after the CBK announces a change in interest rate. Interest rate change effect will exist only if the abnormal returns are significant.

The abnormal or excess return from the stock index was calculated by the following equations.

$$\text{Arithmetic returns (R}_i\text{)} = (P_1 - P_0) / P_0 \dots\dots\dots (1)$$

Where: P1 = current day's closing NSE 20 share index and P0 = previous day's closing NSE 20 share index points.

$$\text{Expected Return} = \text{Average (R}_m\text{)} \dots\dots\dots (II)$$

Where: R<sub>m</sub> is the expected return on the NSE 20 share index

The Abnormal return (AR)

$$\text{Abnormal Return} = \text{the Actual Return (R)} - \text{Expected Return E(R)} \dots (III)$$

$$\text{Cumulative Abnormal Return (CAR)} = \sum \text{AR} \dots\dots\dots (IV)$$

## **CHAPTER FOUR**

### **DATA ANALYSIS, PRESENTATION AND INTERPRETATION**

#### **4.1 Introduction**

This chapter presents the results of the analysis and findings of the study with reference to the study objectives. The section gives a summary of the data analysis method used, the findings of the study which includes relevant tables and figures that help to explain the results of the data analysis and summary of findings and interpretation of the results.

#### **4.2 Data Analysis**

The objective of the research study was to establish the effect of Interest rate changes on the performance of the Nairobi Securities Exchange 20 share index. To achieve this objective, event study methodology was used. The study analyzes the performance of the securities market before and after the Interest rate change event.

Secondary data obtained from the NSE was compiled and analyzed in Excel format and then transferred to Statistical Package for Social Sciences (SPSS) for further statistical data analysis. Parametric t-test was used to establish the statistical significance of the abnormal returns (AR) and the cumulative abnormal returns (CAR) over the event window period. The event period was determined relative to the date of the Interest change event and covered 21 days consisting of 10 days before the event and day 0 being the event day and 10 days after the event.

### **4.2.1 Abnormal returns (AR) and Cumulative Abnormal Returns (CAR)**

In this study, measurement was done for event-day abnormal returns (AR) and cumulative abnormal returns (CAR) for each of the events and statistical significance tests done for each of the events.

The hypothesis test was conducted as follows:

**Null Hypothesis:** Interest rate change has no effect on the performance of the NSE 20 share Index.

**Alternate Hypothesis:** Interest rate change has an effect on the performance of the NSE 20 share Index

## 4.2.2 Statistical Test at 5% Level of significance

### 4.2.2.1 T-Test for the abnormal returns (AR)

**Table 4.1: One Sample Statistics**

	<b>CRB Change</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Mar-10	-0.25	21	0.03272	0.17610	0.03843
Jul-10	-0.75	21	0.00471	0.30934	0.06750
Jan-11	-0.25	21	-0.02180	0.07213	0.01574
Mar-11	0.25	21	0.00277	0.19870	0.04336
Jun-11	0.25	21	-0.00871	0.05232	0.01142
Aug-11	0.75	21	-0.08024	0.18836	0.04110
Oct-11	4	21	-0.05660	0.12595	0.02749
Nov-11	5.5	21	0.03918	0.14011	0.03057
Dec-11	1.5	21	-0.05457	0.12534	0.02735
Jul-12	-1.5	21	0.04127	0.15582	0.03400
Sep-12	-3.5	21	0.05941	0.17250	0.03764

The descriptive statistics for the variables have been provided as the number of observations (N), the mean and the standard deviation for the Interest rate change events abnormal returns (AR). The standard error is the estimated deviation of the mean of the sample used for the statistical test. For all the events abnormal returns (AR), the standard error of the sample mean range from 0.01 to 0.06 which is relatively small. Therefore, there is a high likelihood that the sample mean is close to the population mean.

**Table 4.2: T-Test for Abnormal Return (AR)**

	CRB Change	T	df	P Value	Mean Difference	95% confidence Interval of the difference	
						Lower	Upper
Mar-10	-0.25	-0.44967	20	0.65779	0.00272	-0.04744	0.11288
Jul-10	-0.75	-0.67097	20	0.50992	-0.02529	-0.13610	0.14552
Jan-11	-0.25	-4.56151	20	0.00019	-0.05180	-0.05464	0.01103
Mar-11	0.25	-1.08924	20	0.28900	-0.02723	-0.08768	0.09322
Jun-11	0.25	-5.14186	20	0.00005	-0.03871	-0.03253	0.01511
Aug-11	0.75	-3.16857	20	0.00483	-0.11024	-0.16598	0.00550
Oct-11	4	-3.87855	20	0.00093	-0.08660	-0.11394	0.00073
Nov-11	5.5	-0.35402	20	0.72703	0.00918	-0.02460	0.10295
Dec-11	1.5	-3.82289	20	0.00106	-0.08457	-0.11162	0.00249
Jul-12	-1.5	-0.2567	20	0.80003	0.01127	-0.02966	0.11220
Sep-12	-3.5	-0.2567	20	0.80003	0.02941	-0.02966	0.11220

This output gives the t-test value, the degrees of freedom and the two-tailed significance. The null hypothesis is rejected for the months of Jan 11, June 11, August 11, Oct 11 and Dec 11 since the P value is less than 0.05. However, for the months March 2010, July 2010, March 2011, November 2011, July 2012 and September 2012 the p value is greater than 0.05 and therefore, the null hypothesis cannot be rejected.

The t-statistical test at 5% level of significance indicates that all event -day abnormal returns (AR) were significant Interest rate change event during the event window period.

#### 4.2.2.2 T-Test for the Cumulative Abnormal returns (CAR)

**Table 4.3: One-Sample Statistics**

	<b>CRB Change</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Mar-10	-0.25	21	0.61652	0.18678	0.04076
Jul-10	-0.75	21	0.38290	0.64456	0.14065
Jan-11	-0.25	21	-0.19031	0.21731	0.04742
Mar-11	0.25	21	-0.51840	0.26201	0.05717
Jun-11	0.25	21	0.01471	0.09800	0.02139
Aug-11	0.75	21	-0.90704	0.60416	0.13184
Oct-11	4	21	-0.98485	0.46403	0.10126
Nov-11	5.5	21	0.61616	0.51575	0.11255
Dec-11	1.5	21	-0.89594	0.56630	0.12358
Jul-12	-1.5	21	0.31406	0.27961	0.06102
Sep-12	-3.5	21	0.71236	0.44592	0.09731

The descriptive statistics for the variables have been provided as the number of observations (N), the mean and the standard deviation for the Interest rate change events abnormal returns (AR). The standard error is the estimated deviation of the mean of the sample used for the statistical test. For all the events abnormal returns

(CAR), the standard error of the sample mean range from 0.04 to 0.14 which is relatively small. Therefore, there is a high likelihood that the sample mean is close to the population mean.

**Table 4.4: T-Test for Cumulative Abnormal Return (CAR)**

	CRB Change	T	Df	P Value	Mean Difference	95% confidence Interval of the difference	
						Lower	Upper
Mar-10	-0.25	13.89952	20	0.00000	0.56652	0.53150	0.70154
Jul-10	-0.75	2.366826	20	0.02814	0.09065	0.08950	0.67630
Jan-11	-0.25	-5.06753	20	0.00006	-0.00258	-0.28923	-0.09139
Mar-11	0.25	-9.94156	20	0.00000	0.00717	-0.63767	-0.39914
Jun-11	0.25	-1.65034	20	0.11449	-0.02861	-0.02990	0.05932
Aug-11	0.75	-7.25915	20	0.00000	0.08184	-1.18205	-0.63203
Oct-11	4	-10.2198	20	0.00000	0.05126	-1.19607	-0.77363
Nov-11	5.5	5.030513	20	0.00006	0.06255	0.38140	0.85093
Dec-11	1.5	-7.6546	20	0.00000	0.07358	-1.15371	-0.63816
Jul-12	-1.5	4.327755	20	0.00033	0.01102	0.18679	0.44134
Sep-12	-3.5	6.806915	20	0.00000	0.04731	0.50938	0.91534

The p values for July 2010 and June 2011 cumulative abnormal returns are 0.02814 and 0.11449 respectively which are more than 0.05, the null hypothesis is cannot be rejected. However, for the rest of the events, cumulative abnormal returns (CAR), and the p values are greater than 0.05 and therefore, the null hypothesis is rejected.

As per the t-statistical test for the cumulative abnormal returns (CAR), only the July 2010 and June 2011 Interest rate change event was found to be insignificant while the rest of events were found to be significant at 5% level of significance. This means that the NSE 20 share index deviated significantly from their means while those for the July 2010 and June 2011 event showed no significant deviation from their means meaning the stock market may have viewed the event as inconsequential.

#### 4.2.2 Linear Plots for Negative Changes on Interest rates

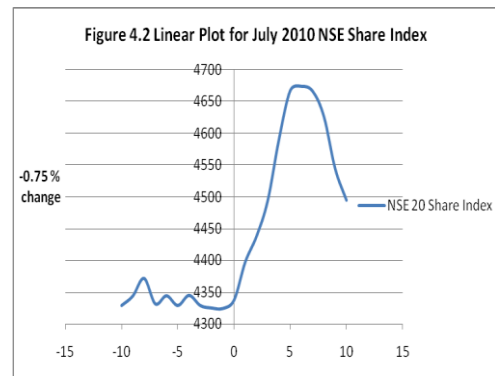
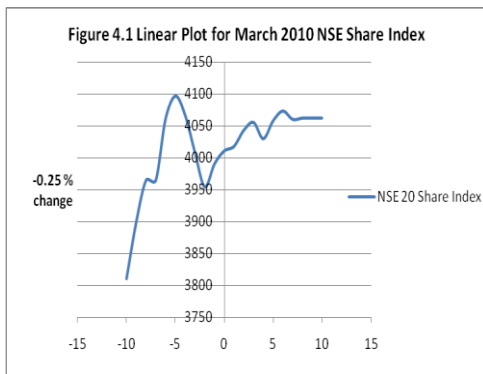


Figure 4.1 demonstrate that the NSE 20-Share index slightly increased 1 day before the event day followed by a further slight incline after the event. However in Figure 4.2 representing July 2010 there was a steep incline immediately after the event day until the 6<sup>th</sup> day after the event when the NSE slipped back.

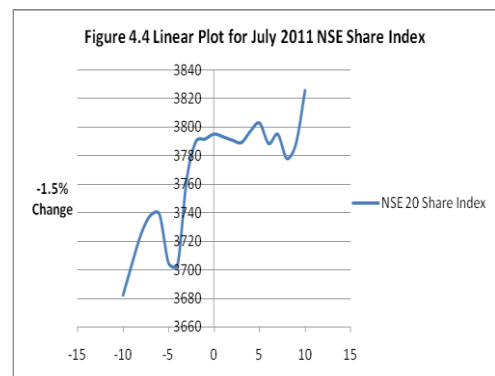
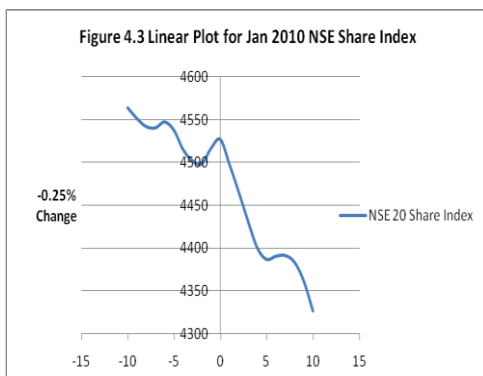




Figure 4.3 representing January 2011 demonstrates decline of the NSE 20 share index after the event day but in figure 4.4 the NSE stabilizes after the event day.

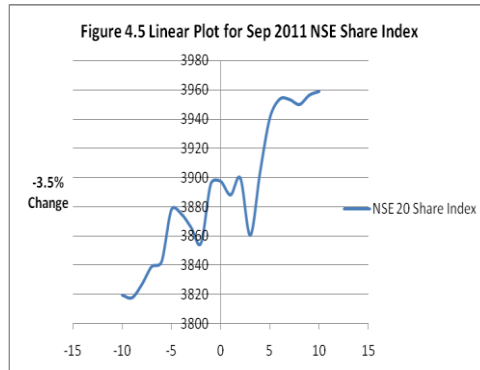


Figure 4.5 representing September 2011 shows the NSE 20 share index on a rise before the event day and the rise was also followed after the event day.

From the above charts it can be concluded that the interest rate change event had an effect on the NSE 20 share index but the direction of change was not consistent. This could mean that investors interpreted the negative change of interest rate differently for each event.

### 4.2.3 Linear Plots for Positive Change on Interest rates

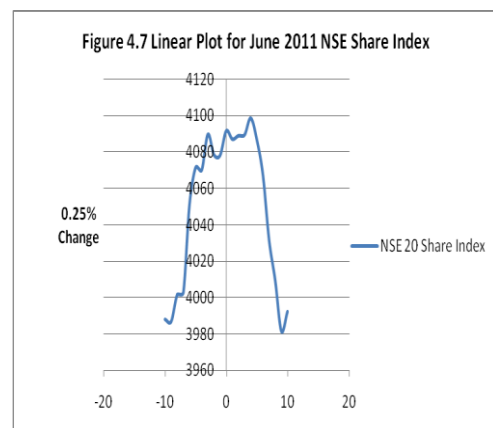
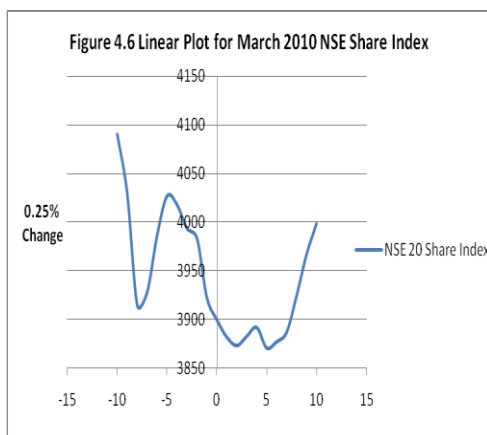
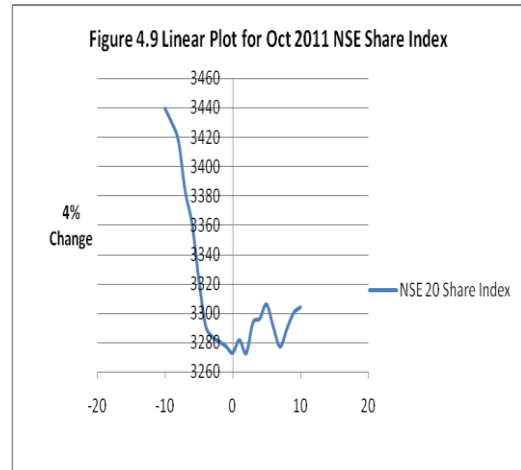
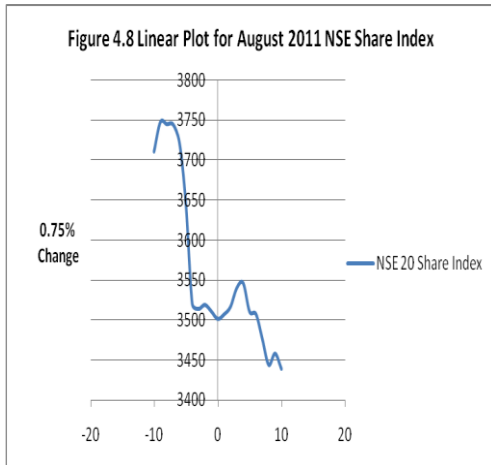


Figure 4.6 representing March 2010 changes show the NSE 20 share index declining 2 days before the event day however it recovered 5 days after the event day. Figure 4.7 representing June 2011 changes demonstrates a steep decline after day one of the event day.



Both figure 4.8 and 4.9 show a decline of the NSE 20 share index before the vent day. In Figure 4.8 the decline continued after the event day however in figure 4.9 representing October 2011 interest rate changes the NSE 20 share index stablized after the event.

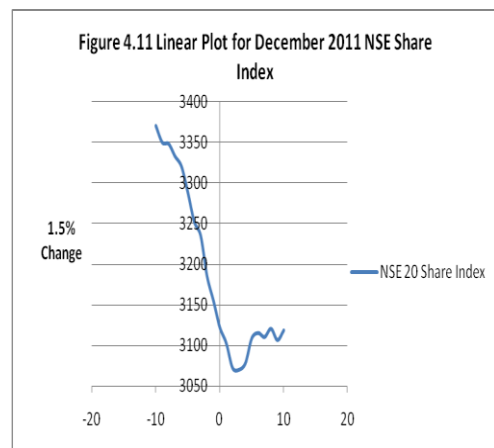
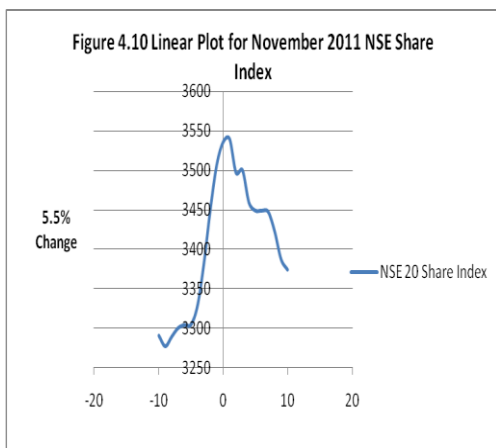


Figure 4.10 demonstrate a rise in the NSE 20 share index before the event day but immediately after the event day there was a decline. Figure 4.11 also demonstrates a decline before the event day then the index stabilizes after the event day.

From the above figures, it can be observed that a negative change in interest rate had an effect on the performance of the NSE 20 share index. In all the events above apart from January 2010 the NSE 20 share index gained more points after the event day.

### 4.2.3 Linear Plots for the Abnormal Returns (AR) and Cumulative Abnormal Returns CAR (%): Negative Change of Interest rate

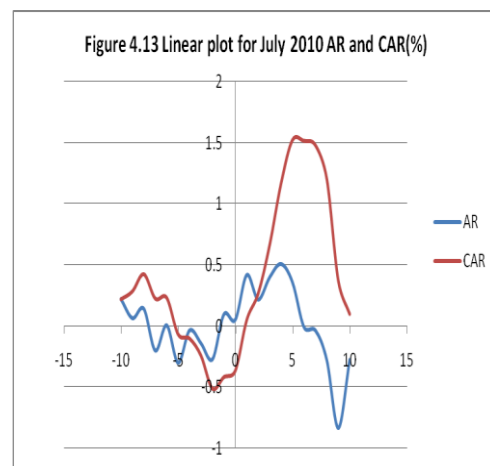
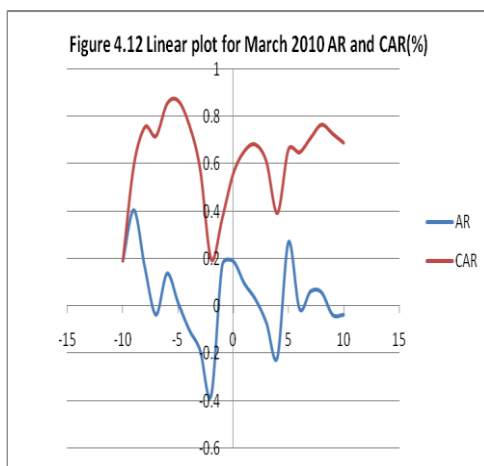


Figure 4.12 shows linear graph for abnormal return and cumulative abnormal returns when the central Bank of Kenya announced a reduction in interest rates. Both the AR and CAR stabilized within the event period. A CAR high of 0.8% was recorded before the event day and after the event. Figure 4.13 demonstrates a rise in CAR of 1.5% on the 5<sup>th</sup> day after the event day.

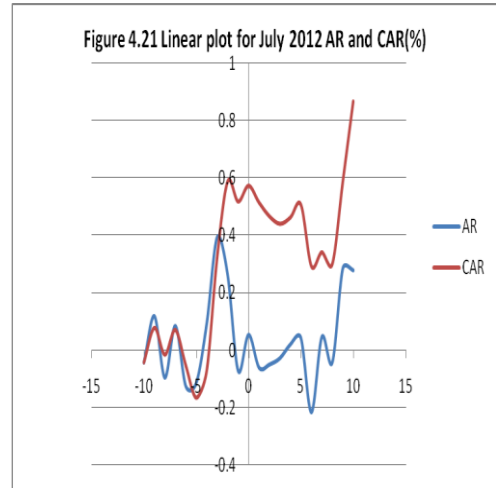
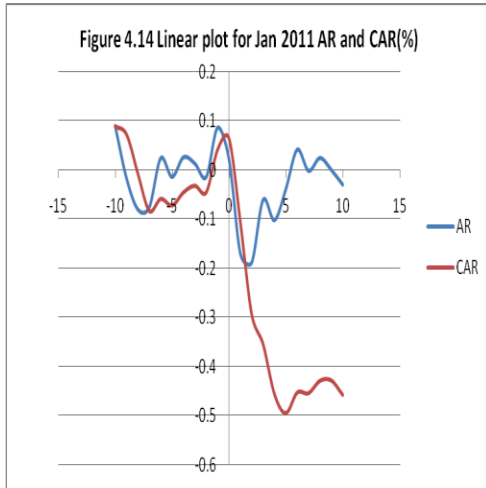


Figure 4.14 demonstrates a steep decline in CAR after the event day to record a low of -0.5%. However in Figure 4.21 the AR and CAR stabilizes after the event day but there was a steep rise in CAR on the 9<sup>th</sup> day.

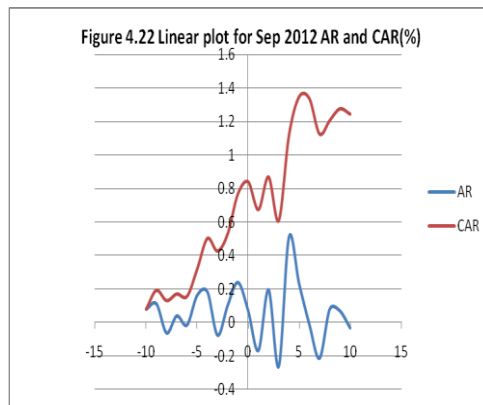


Figure 4.22 demonstrates a rise in CAR before the event day and after the event day to reach a peak of 1.4% on the 6<sup>th</sup> day. However the AR evened out during the event period.

## 4.2.4 Linear Plots for the Abnormal Returns (AR) and Cumulative Abnormal Returns CAR (%): Positive Change of Interest rate

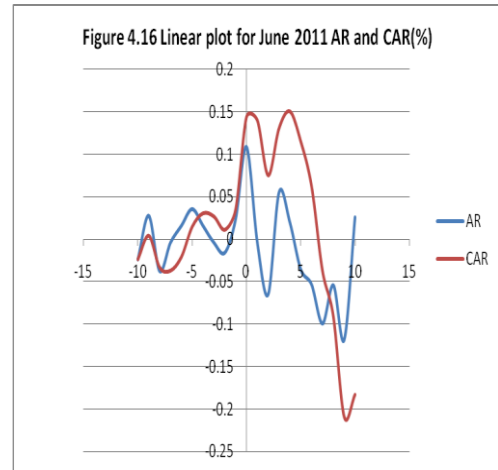
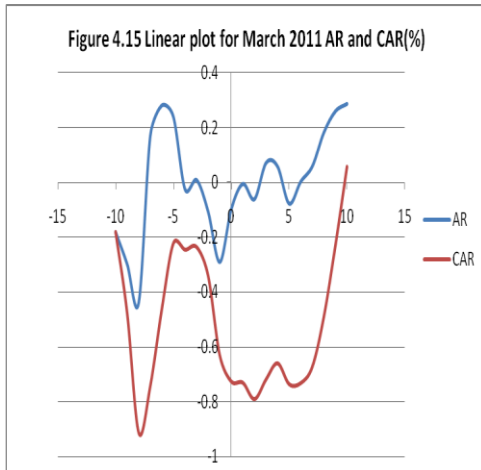
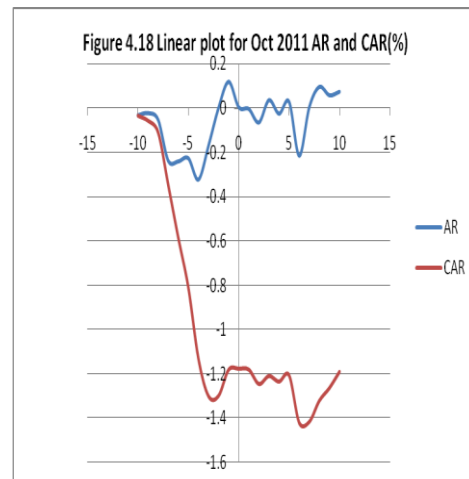
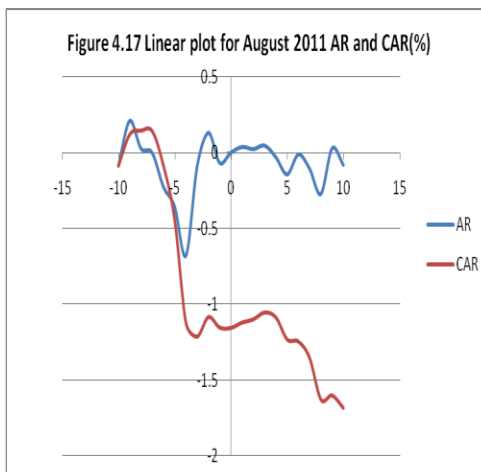
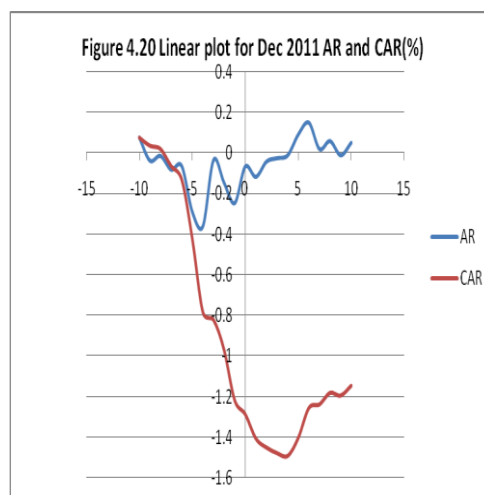
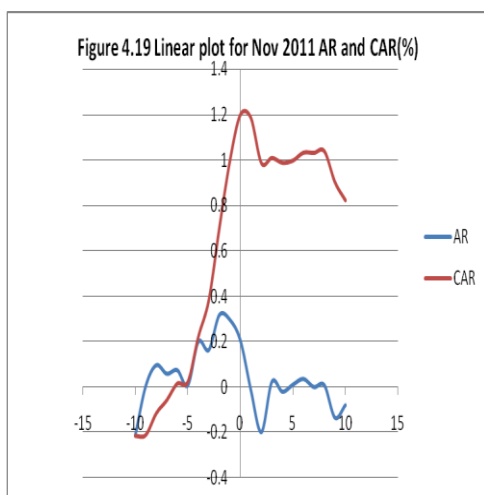


Figure 4.15 demonstrates a negative return of the CAR within the event period an low -0.9% was recorded on the 6<sup>th</sup> day before the event day. However the CAR recovered after the 6<sup>th</sup> day. Figure 4.16 demostartes a steep fall in CAR 3 days after the event.





From the graphs above, when the central bank announced a rise in interest rate, the abnormal return and cumulative abnormal return recorded a drop in almost all the events. The changes were found to be significant. Figure 4.15 shows that the AR and CAR rising just after the event day.

Figure 4.16 shows the CAR fall after the 5<sup>th</sup> day after the event to a low of -0.2%. Figure 4.17 and 4.18 show the CAR on a free fall before the event and after the event however figure 4.19 which represents November 2011 event demonstrate the CAR on a rise before the event up to 1.2% but the rise stabilizes after the event.

### 4.3 Summary and Interpretations of Findings

From the analysis, interest rate change has a significant effect on the performance of the Nairobi Stock Exchange 20 share index. Therefore, the null hypothesis is rejected and the alternate hypothesis accepted. The t-statistical test at 5% level of significance indicates that event-day abnormal returns (AR) were significantly negative for the months of Jan 11, June 11, August 11, Oct 11 and Dec 11 interest rate change events.

and insignificant for the months March 2010, July 2010, March 2011, November 2011, July 2012 and September 2012 Interest rate change event. As for the cumulative abnormal returns (CAR), all the events were found to be statistically significant at 5% level of significance.

According to the abnormal return (AR) and cumulative abnormal returns (CAR) linear plots, there was a significant rise in abnormal return and cumulative abnormal returns (CAR) of the market returns around the interest rate change dates when a negative change was announced by the MPC.

Figure 4.22 for the September 2012 interest rate change event registered the largest rise of the NSE 20 share index when the Central bank announced a 3.5% drop in interest rate. The Cumulative abnormal returns (CAR) registered a high of 1.35% after the event.

Figure 4.15 to 4.20 demonstrate that the abnormal return AR and cumulative abnormal return CAR registered a decline just before and after the interest rate change event when an increase of interest rate change was announced. August 2011 and December 2011 events registered the largest decline of cumulative abnormal return with a low of -1.68% and -1.47% respectively after the event day.

From the summary above, Interest rate changes had a significant influence on the performance of the NSE 20 share index. Investors reacted differently to interest rate changes announced by the central bank. The reason to this reaction can be attributed to how increase or decrease in interest rates will affect an investor's portfolio of shares. A reduction of interest rates was interpreted by investors as a sign of economy

recovery hence more shares were bought in the Nairobi Securities Exchange. However a rise in interest rates was interpreted as a sign of economic slowdown there by discouraging investors from buying share in the Nairobi Securities Exchange



## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter presents the summary of the research study and the implications of the findings, limitations encountered in the course of the study as well as suggestions for further research. This research study sought to establish whether Interest rate changes have an effect on the Nairobi Securities Exchange 20 share Index.

#### **5.2 Summary of Findings**

The study sought to examine the effect of Interest rate changes on the performance of the Nairobi securities Exchange 20 share index. The NSE 20 share index which is a market-capitalization weighted index for the Nairobi Securities Exchange was used to represent the entire NSE population. Event-study methodology was used to measure the magnitude of interest rates changes on NSE 20 share index. The study was motivated by the need to establish how fiscal tools used by the central bank affect the performance of the NSE while at the same time trying to control other aspects of the economy like foreign Exchange rates and inflation rates. Historical data on interest rates and NSE 20 Share Index was obtained from the CBK weekly bulletin and NSE daily reports respectively for the period January 2010 – Dec 2012.

The study showed that when the central bank announced a drop in interest rates, the NSE 20 share index registered a rise just before the announcement and after the announcement. September 2012 interest rate change event registered the highest

return of 1.35% on Cumulative abnormal returns (CAR) within the event window when the Central bank announced a 3.5% drop in interest rate. However, when the central bank announced an increase in interest rate change the NSE 20 share index recorded a decline as demonstrated by figure 4.6 to 4.9. Figure 4.10 shows how the NSE was on a rise just before the event day but immediately the central bank announced a 5.5% increase in interest change the NSE immediately experienced a steep decline after the event day.

T-statistical tests show that all event-day abnormal returns (AR) were significant Interest rate change event during the event window period. The p values for the months of July 2010 and June 2011 cumulative abnormal returns were 0.02814 and 0.11449 respectively which are more than 0.05 meaning the null hypothesis could not be rejected. However, for the rest of the events, cumulative abnormal returns (CAR), the p values are greater than 0.05 and therefore, the null hypothesis was rejected.

### **5.3 Conclusion**

From the result above the researcher concluded that interest rate changes have an effect on performance of the Nairobi Securities Exchange 20 share index in the short run. Interest rate cuts were followed by rise in the NSE 20 share index in most of the occasions while interest rates rise were followed by a decline in the NSE 20 share index. However there were certain situations where interest cuts were followed by decline of the NSE 20 share index and also there were instances when Interest rate rises were followed by rise of the Nse 20 share index.

These results mean that interest rates are one of the factors that influence performance of the Nairobi Securities Exchange 20 share index. The results agree with Akpan (2014) who studied Impact of Interest Rates on Stock Prices: An Analysis of the All Share Index in Nigeria. The finding from the paper revealed that the historical relationship between Central Bank of Nigeria's interest rate and the ASI of the Nigeria Securities Exchange was an inverse one. However, interest rate was not an important determinant when considering the changes in stock prices.

The findings were also consistent with the finding of the study by Alam (2009) who established that there was a negative relationship between stock prices and interest rate changes. This relationship was established in most developing countries in his study. In summary the findings of this study were consistent with most the studies done on the relationship between interest rates and stock prices.

#### **5.4 Recommendations**

From the study, it can be observed that Interest rate changes affect the performance of the stock market and hence shareholders and other stakeholders should not overlook these announcements. Interest rates changes influence transaction processing in the market place and impedes the buying and selling of securities by creating uncertainties. Retail and corporate investors are advised to diversify their portfolio as a strategy against interest rate changes uncertainties. This would enable investors maximize returns while minimizing losses relating to these changes.

Investors are also advised to note the dates the Central Bank's monetary policy committee meeting dates. The dates are usually updated in the central Banks website. This will enable investors prepare and cautions themselves against adverse risks especially for day traders. The central banks should also try and sensitive investors on the importance of the outcomes of these meetings. They can use other media other than just their website to publicize the MPC meetings.

To enable more research on the Nairobi Securities Exchanges data should be made more available to researchers. Currently this data is sold to researchers which may demoralize people in doing research in this field considering the NSE will be the biggest beneficiaries. The NSE and CMA should emulate their counterparts in developed countries where this data is always available and for free thus encouraging more research.

## **5.5 Limitations to the Study**

The study concentrated on the relationship between two variables; Central Banks Interest rates and market performance determined by the NSE 20 share index. As such, secondary data was used therefore accuracy and reliability of the historical data used to generate results for the study was only correct as captured in the data sources as any rounding off is known to greatly affect the outcome of the indices.

The data used was only for the period January 2010 to Dec 2012. It is possible that data for the two variables for different time periods may give slightly differing results from the period under study.

Other factors other than interest rate change may have affected the performance of the stock market during the period of study and consequently the results of the study may have been affected. Such factors include bonus share announcements, profit warning announcements, new regulations announcements by the CMA e.g. the introduction of withholding taxes, foreign Exchange rates. All these may have an effect on the performance of the NSE 20 share index.

Due to limited time factor the researcher only covered interest rate changes for a period on 3 years. A larger sample would have been more appropriate and would have affected the results on the findings.

Event study methodology was used in this research. The methodology did not take into account other control variables which may have affected the dependent variable i.e. the NSE 20 Share index. As a result other factors other than interest changes would have affected the findings of the study.

## **5.6 Suggestions for Further Research**

Based on the findings and limitations above the study recommends that further research need to be undertaken and focus more on both primary and secondary data. The researcher will need to confirm accuracy of the data through other primary sources. For instance oral interviews with the central Bank staff members and also NSE Staff members.

Further research studies should also be undertaken to establish the effect of interest rate changes on performance of the Nairobi Securities Exchange in the long run.

Further studies should be done to find out if the continues rise of interest rate had an effect on performance of the Nairobi Securities Exchange 20 share index in the long run.

Further research should also be done on the effect of interest rate changes on other indices in the market for instance the NSE all share index. The NSE all share index is market cap index consisting of all the securities on the NSE which measures the overall market capitalization rather than price movement of a few counters. Research on this will also add value to investors and shareholders of companies listed in the NSE.

The researcher also recommends that other research design models be undertaken other than event study to determine if interest rate changes have an effect on performance on the NSE 20 share Index. The researcher recommends other research methodologies that will hold other variables that may affect the dependent variables constant.

Further resources should be availed for the same study. Limited time was one of the limiting factors the researcher encountered while undertaking this study. More funds should also be availed so that all information that would affect the findings of the research is made available.

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## APPENDICES

### Appendix 1: Data Collection Sheet

APPENDIX I:AR & CAR FOR THE MARCH 2010				
EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR %
-10	3810.74	0.5506	0.1902	0.1902
-9	3900.12	1.0301	0.4039	0.5941
-8	3964.86	0.4811	0.1593	0.7534
-7	3964.86	0.0381	-0.0381	0.7153
-6	4061.1	0.4285	0.1358	0.8512
-5	4096.45	0.1537	0.0134	0.8646
-4	4066.29	-0.1021	-0.1005	0.7641
-3	4008.17	-0.3007	-0.1890	0.5751
-2	3954.4	-0.7258	-0.3784	0.1968
-1	3990.22	0.5082	0.1714	0.3682
0	4010.56	0.5468	0.1885	0.5567
1	4017.81	0.3361	0.0947	0.6514
2	4042.87	0.1864	0.0280	0.6794
3	4055.16	-0.0360	-0.0710	0.6084
4	4029.73	-0.3654	-0.2178	0.3906
5	4057.63	0.7255	0.2682	0.6587
6	4072.93	0.0955	-0.0125	0.6462
7	4060.03	0.2593	0.0605	0.7067
8	4061.93	0.2504	0.0565	0.7633
9	4061.93	0.0381	-0.0381	0.7252
10	4061.93	0.0381	-0.0381	0.6871

APPENDIX II:AR & CAR FOR THE JULY 2010				
EVENT				
Days	NSE 20 Share Index	Expected Return %	AR%	CAR%
-10	4329.95	0.6183	0.2204	0.2204
-9	4344.84	0.2682	0.0645	0.2849
-8	4372.53	0.4395	0.1408	0.4257
-7	4332.52	-0.3254	-0.2000	0.2257
-6	4345.3	0.1384	0.0066	0.2323
-5	4329.95	-0.5486	-0.2994	-0.0671
-4	4345.86	0.0453	-0.0349	-0.1020
-3	4329.92	-0.1928	-0.1409	-0.2429
-2	4326.01	-0.4832	-0.2703	-0.5132
-1	4325.2	0.3371	0.0952	-0.4180
0	4338.25	0.2414	0.0525	-0.3655
1	4398.32	1.0592	0.4168	0.0513
2	4438.58	0.6090	0.2163	0.2676
3	4494.78	1.0148	0.3971	0.6646
4	4591.04	1.2595	0.5060	1.1707
5	4667.47	0.9228	0.3561	1.5267
6	4674.31	0.1058	-0.0079	1.5188
7	4666.36	0.0448	-0.0351	1.4838
8	4626.41	-0.5031	-0.2791	1.2046
9	4544.52	-1.7414	-0.8308	0.3739
10	4495.27	-0.4938	-0.2750	0.0989

APPENDIX III:AR & CAR FOR THE JANUARY 2011 EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR %
10	4563.65	0.3336	0.0901	0.0901
-9	4551.07	-0.1400	-0.0170	0.0731
-8	4541.7	-0.4208	-0.0804	-0.0073
-7	4540.31	-0.3987	-0.0754	-0.0827
-6	4547.14	0.0447	0.0248	-0.0579
-5	4537.3	-0.1252	-0.0136	-0.0715
-4	4514.59	0.0528	0.0266	-0.0449
-3	4501.88	-0.0039	0.0138	-0.0311
-2	4498.29	-0.1253	-0.0136	-0.0447
-1	4516.4	0.3203	0.0871	0.0424
0	4526.78	0.0364	0.0229	0.0653
1	4497.14	-0.8187	-0.1703	-0.1050
2	4464.92	-0.9001	-0.1887	-0.2938
3	4431.04	-0.3332	-0.0606	-0.3544
4	4399.99	-0.5164	-0.1020	-0.4564
5	4386.69	-0.2367	-0.0388	-0.4952
6	4390.46	0.1215	0.0422	-0.4530
7	4391.29	-0.0703	-0.0012	-0.4542
8	4383.57	0.0464	0.0252	-0.4291
9	4361.82	-0.0620	0.0007	-0.4284
10	4326.57	-0.1954	-0.0295	-0.4578

APPENDIX IV:AR & CAR FOR THE MARCH 2011 EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR %
-10	4090.07	-0.8623	-0.1802	0.18018
-9	4028.88	-1.3798	-0.2971	-0.4773
-8	3915.01	-2.0005	-0.4374	0.91471
-7	3928.25	0.6918	0.1710	0.74368
-6	3986.59	1.1842	0.2823	0.46137
-5	4026.78	0.9972	0.2401	0.22132
-4	4017.8	-0.1708	-0.0239	0.24523
-3	3993.53	-0.0208	0.0100	0.23524
-2	3983.49	-0.5335	-0.1059	0.34113
-1	3922.24	-1.3465	-0.2896	0.63074
0	3899.85	-0.4914	-0.0964	0.72709
1	3881.89	-0.0848	-0.0045	0.73156
2	3873.45	-0.3307	-0.0600	0.79161
3	3882.96	0.2531	0.0719	0.71971
4	3891.97	0.1976	0.0593	0.66037
5	3870.97	-0.4028	-0.0763	0.73671
6	3877.32	-0.0485	0.0037	0.73298
7	3887.07	0.1982	0.0595	0.67351
8	3924.55	0.7444	0.1829	0.49058
9	3966.89	1.0897	0.2609	0.22964
10	3998.38	1.2086	0.2878	0.05819

APPENDIX V:AR & CAR FOR THE JUNE 2011				
EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR %
-10	3988.01	-0.1688	-0.0235	-0.0235
-9	3986.78	0.0578	0.0278	0.0043
-8	4001.64	-0.2300	-0.0373	-0.0330
-7	4002.83	-0.0819	-0.0038	-0.0368
-6	4051.05	0.0055	0.0159	-0.0209
-5	4071.37	0.0930	0.0357	0.0148
-4	4070.05	0.0055	0.0159	0.0308
-3	4089.61	-0.0819	-0.0038	0.0270
-2	4078.32	-0.1344	-0.0157	0.0113
-1	4078.1	0.0406	0.0239	0.0351
0	4091.55	0.4168	0.1089	0.1440
1	4086.96	-0.0816	-0.0038	0.1403
2	4088.9	-0.3518	-0.0648	0.0755
3	4089.38	0.1805	0.0555	0.1309
4	4098.52	0.0229	0.0199	0.1508
5	4086.62	-0.2214	-0.0353	0.1155
6	4066.9	-0.3006	-0.0533	0.0622
7	4031.37	-0.5036	-0.0991	-0.0369
8	4009.31	-0.3034	-0.0539	-0.0908
9	3981.53	-0.5881	-0.1182	-0.2090
10	3992.3	0.0505	0.0261	-0.1829

APPENDIX VI:AR & CAR FOR THE AUGUST 2011				
EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR%
-10	3710.8	-0.4473	-0.0864	-0.0864
-9	3747.83	0.8536	0.2076	0.1212
-8	3745.07	0.0458	0.0250	0.1462
-7	3744.59	-0.0793	-0.0032	0.1430
-6	3721.53	-1.0707	-0.2273	-0.0843
-5	3645.12	-1.6501	-0.3582	-0.4425
-4	3520.47	-3.0768	-0.6806	-1.1232
-3	3514.21	-0.4669	-0.0908	-1.2140
-2	3519.28	0.5079	0.1295	-1.0845
-1	3511.1	-0.3736	-0.0697	-1.1542
0	3501.64	-0.0742	-0.0021	-1.1563
1	3507.34	0.0919	0.0355	-1.1209
2	3516.75	0.0295	0.0214	-1.0995
3	3540.42	0.1332	0.0448	-1.0547
4	3546.33	-0.2086	-0.0325	-1.0872
5	3510.65	-0.7070	-0.1451	-1.2323
6	3507.75	-0.1271	-0.0140	-1.2463
7	3476.61	-0.5463	-0.1088	-1.3551
8	3444.28	-1.2776	-0.2740	-1.6291
9	3458.39	0.0523	0.0265	-1.6026
10	3439.21	-0.4294	-0.0824	-1.6850

<b>APPENDIX VII:AR &amp; CAR FOR THE OCTOBER 2011</b>				
<b>EVENT</b>				
<b>Days</b>	<b>NSE 20 Share Index</b>	<b>Expected Return %</b>	<b>AR %</b>	<b>CAR%</b>
-10	3710.8	-0.4473	-0.0864	-0.0864
-9	3747.83	0.8536	0.2076	0.1212
-8	3745.07	0.0458	0.0250	0.1462
-7	3744.59	-0.0793	-0.0032	0.1430
-6	3721.53	-1.0707	-0.2273	-0.0843
-5	3645.12	-1.6501	-0.3582	-0.4425
-4	3520.47	-3.0768	-0.6806	-1.1232
-3	3514.21	-0.4669	-0.0908	-1.2140
-2	3519.28	0.5079	0.1295	-1.0845
-1	3511.1	-0.3736	-0.0697	-1.1542
0	3501.64	-0.0742	-0.0021	-1.1563
1	3507.34	0.0919	0.0355	-1.1209
2	3516.75	0.0295	0.0214	-1.0995
3	3540.42	0.1332	0.0448	-1.0547
4	3546.33	-0.2086	-0.0325	-1.0872
5	3510.65	-0.7070	-0.1451	-1.2323
6	3507.75	-0.1271	-0.0140	-1.2463
7	3476.61	-0.5463	-0.1088	-1.3551
8	3444.28	-1.2776	-0.2740	-1.6291
9	3458.39	0.0523	0.0265	-1.6026
10	3439.21	-0.4294	-0.0824	-1.6850

<b>APPENDIX VIII:AR &amp; CAR FOR THE NOVEMBER 2011</b>				
<b>EVENT</b>				
<b>Days</b>	<b>NSE 20 Share Index</b>	<b>Expected Return %</b>	<b>AR %</b>	<b>CAR%</b>
-10	3439.86	-0.2081	-0.0323	-0.0323
-9	3430.27	-0.1649	-0.0226	-0.0549
-8	3417.6	-0.2965	-0.0523	-0.1072
-7	3383.27	-1.1099	-0.2361	-0.3434
-6	3361.51	-1.1249	-0.2395	-0.5829
-5	3323.44	-1.0613	-0.2252	-0.8080
-4	3291.79	-1.4865	-0.3212	-1.1293
-3	3284.06	-0.8152	-0.1695	-1.2988
-2	3280.96	-0.0590	0.0014	-1.2975
-1	3277.79	0.4585	0.1183	-1.1792
0	3273.33	-0.0471	0.0041	-1.1751
1	3281.96	-0.0822	-0.0039	-1.1790
2	3273.05	-0.3516	-0.0648	-1.2438
3	3293.95	0.0939	0.0359	-1.2079
4	3296.55	-0.1764	-0.0252	-1.2330
5	3306.34	0.0586	0.0279	-1.2051
6	3290.9	-1.0114	-0.2139	-1.4190
7	3277.5	-0.0477	0.0039	-1.4151
8	3289.51	0.3572	0.0954	-1.3197
9	3300.48	0.1896	0.0575	-1.2621
10	3304.39	0.2600	0.0735	-1.1887

APPENDIX IX:AR & CAR FOR THE DECEMBER 2011				
EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR%
-10	3290.9	-1.0114	-0.2139	-0.2139
-9	3277.5	-0.0477	0.0039	-0.2100
-8	3289.51	0.3572	0.0954	-0.1146
-7	3300.48	0.1896	0.0575	-0.0570
-6	3304.39	0.2600	0.0735	0.0164
-5	3304.85	-0.0356	0.0067	0.0231
-4	3328.57	0.8134	0.1985	0.2216
-3	3381.9	0.6533	0.1623	0.3839
-2	3450.33	1.3311	0.3155	0.6994
-1	3507.34	1.2410	0.2951	0.9946
0	3536.25	0.8406	0.2047	1.1992
1	3540.03	-0.1230	-0.0131	1.1861
2	3497.1	-0.9458	-0.1991	0.9870
3	3500.55	0.0330	0.0221	1.0092
4	3459.51	-0.1581	-0.0210	0.9881
5	3449.31	-0.0232	0.0094	0.9976
6	3449.24	0.0894	0.0349	1.0325
7	3447.66	-0.0682	-0.0007	1.0317
8	3422.82	-0.0345	0.0069	1.0386
9	3387.51	-0.6650	-0.1356	0.9031
10	3374.37	-0.4206	-0.0804	0.8227

APPENDIX X:AR & CAR FOR THE DECEMBER 2011 EVENT				
Days	NSE 20 Share Index	Expected Return %	AR %	CAR%
-10	3370.72	0.2623	0.0740	0.0740
-9	3350.29	-0.2398	-0.0395	0.0345
-8	3348.44	-0.1376	-0.0164	0.0181
-7	3333.09	-0.4353	-0.0837	-0.0656
-6	3320.77	-0.3570	-0.0660	-0.1316
-5	3288.7	-1.3518	-0.2908	-0.4224
-4	3252.59	-1.6677	-0.3622	-0.7846
-3	3235.54	-0.2277	-0.0368	-0.8214
-2	3185.71	-0.7210	-0.1483	-0.9697
-1	3155.46	-1.1637	-0.2483	-1.2180
0	3122.5	-0.3686	-0.0686	-1.2866
1	3103.04	-0.5925	-0.1192	-1.4058
2	3072.38	-0.2608	-0.0442	-1.4500
3	3070.36	-0.1867	-0.0275	-1.4775
4	3078.49	-0.1245	-0.0135	-1.4910
5	3109.25	0.3261	0.0884	-1.4026
6	3115.64	0.5866	0.1473	-1.2553
7	3110.64	0.0128	0.0176	-1.2378
8	3120.88	0.1860	0.0567	-1.1810
9	3106.9	-0.1231	-0.0131	-1.1942
10	3118.92	0.1487	0.0483	-1.1459

<b>APPENDIX XI:AR &amp; CAR FOR THE JULY 2012 EVENT</b>				
<b>Days</b>	<b>NSE 20</b>		<b>AR%</b>	<b>CAR%</b>
	<b>Share Index</b>	<b>Expected Return%</b>		
-10	3682.24	-0.0946	-0.0413	-0.0413
-9	3704.7	0.2757	0.1202	0.0789
-8	3725.55	-0.2145	-0.0936	-0.0146
-7	3738.15	0.1980	0.0863	0.0717
-6	3739	-0.2832	-0.1235	-0.0518
-5	3704.7	-0.2585	-0.1127	-0.1645
-4	3703.94	0.2163	0.0943	-0.0702
-3	3763.91	0.9055	0.3949	0.3246
-2	3790.07	0.6044	0.2636	0.5882
-1	3791.79	-0.1603	-0.0699	0.5183
0	3795.32	0.1269	0.0553	0.5736
1	3793.32	-0.1351	-0.0589	0.5147
2	3791.06	-0.1100	-0.0480	0.4667
3	3789.33	-0.0593	-0.0259	0.4409
4	3797.4	0.0509	0.0222	0.4631
5	3802.96	0.1017	0.0443	0.5074
6	3788.64	-0.4908	-0.2140	0.2934
7	3795.1	0.1108	0.0483	0.3417
8	3778.1	-0.0936	-0.0408	0.3009
9	3788.52	0.6560	0.2861	0.5870
10	3825.93	0.6415	0.2797	0.8667

<b>APPENDIX XII:AR &amp; CAR FOR THE SEPTEMBER 2012 EVENT</b>				
<b>Days</b>	<b>NSE 20</b>		<b>AR %</b>	<b>CAR %</b>
	<b>Share Index</b>	<b>Expected Return %</b>		
-10	3819.45	0.1835	0.0800	0.0800
-9	3817.7	0.2579	0.1125	0.1925
-8	3826.89	-0.1409	-0.0614	0.1310
-7	3839.12	0.0914	0.0398	0.1709
-6	3842.38	-0.0332	-0.0145	0.1564
-5	3878.13	0.3734	0.1629	0.3193
-4	3875.11	0.4210	0.1836	0.5029
-3	3865.76	-0.1723	-0.0751	0.4277
-2	3855.14	0.2385	0.1040	0.5317
-1	3895.86	0.5492	0.2395	0.7712
0	3897.45	0.1627	0.0709	0.8422
1	3888.14	-0.3814	-0.1663	0.6759
2	3899.62	0.4487	0.1957	0.8715
3	3860.41	-0.5999	-0.2616	0.6099
4	3903.72	1.1693	0.5099	1.1199
5	3941.1	0.5308	0.2315	1.3513
6	3953.84	-0.0239	-0.0104	1.3409
7	3953.53	-0.4870	-0.2124	1.1285
8	3950.18	0.1849	0.0806	1.2091
9	3956.54	0.1604	0.0699	1.2791
10	3959.1	-0.0720	-0.0314	1.2477