THE EFFECT OF PRICE LIMITS ON STOCK MARKET VOLATILITY: EVIDENCE FROM THE NAIROBI STOCK EXCHANGE

RESEARCH PROJECT BY:

KAMAU K.M.

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION TO THE FACULTY OF COMMERCE, THE UNIVERSITY OF NAIROBI

DECEMBER 2004

DECLARATION

I, **Kenneth Mwangi Kamau,** hereby declare that this research project is my original work and has not been presented for a degree or any other academic award in any other University.

Signature: ..... **Date:** 25/01/2005

This research project report has been submitted for examination with my approval as the University Supervisor.

Signature: ..... **Date:** 25/01/05

Carol Jebet Kigen (Mrs.)
Lecturer, Department of Accounting
Faculty of Commerce
The University of Nairobi

DEDICATION

I dedicate this work to my beloved parents. Mum and Dad, your selfless love, dedication, sacrifices and encouragement has made me what I' am today. I thank the Lord Jesus for such wonderful parents He gave me. God Bless you both.

ACKNOWLEDGEMENT

I would like to honour very important people whose contribution has largely contributed to the quality of this paper.

First, my tribute goes to my supervisor: Mrs. C.J. Kigen whose intellectual and professional input, advice and guidance are highly appreciated.

Secondly, I recognise the input by members of the academic staff of the faculty of commerce during my presentation seminar.

I cannot forget to recognise the staff of the Nairobi Stock Exchange. I single out Susan Kibui (M/S) for her exceptional service and assistance, which deserve commendation.

I' am also grateful to my colleagues in the MBA class for their contribution, however small or great.

Lastly, and most importantly, I give thanks to the Lord Jesus for His Mercies and Blessings. For without Him I would not have achieved anything, glory be to His Name.

TABLE OF CONTENTS

DECLARATION i

DEDICATION ii

ACKNOWLEDGEMENT iii

LIST OF TABLES v

ABSTRACT vi

CHAPTER ONE 1

1.0 INTRODUCTION 1

1.1 Background 1

1.2 Statement of the Problem 8

1.3 Objectives of the Study 10

1.4 Hypotheses of the Study 10

1.5 Importance of the Study 11

CHAPTER TWO 12

2.0 LITERATURE REVIEW 12

2.1 Efficient Markets 12

2.2 A Brief Review on Stock Market Volatility 14

2.3 Price Limits and Stock Market Volatility 20

2.4 Empirical Studies Review on Price Limits and Stock Volatility 23

2.5 Conclusions on the Literature Review 27

CHAPTER THREE 28

3.0 RESEARCH METHODOLOGY 28

3.1 Research Design 28

3.2 Population 31

3.3 Sampling 31

3.4 Data Description 31

3.5 Data Analysis 32

CHAPTER FOUR 34

4.0 FINDINGS AND INTERPRETATION 34

4.1 Statistical Properties of the NSE Weekly Returns 34

4.2 Time Varying Risk-Return Behaviour of the NSE Returns 37

CHAPTER FIVE 42

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 42

5.1 Summary 42

5.2 Conclusion 43

5.3 Limitations of the Study 43

5.4 Recommendations and Suggestions for Further Research 43

Bibliography 45

Appendix I 50

Appendix II 53

LIST OF TABLES

Page:

Table 1: Unconditional Distribution Statistics for the NSE Weekly Market Returns 36

Table 2: Estimates for AR (1) GARCH (1,1) Model for the NSE Weekly Returns..... 38

Table 3: Data Collection Table..... 53

ABSTRACT

This study empirically examines the effects of price limits on stock market volatility at the Nairobi Stock Exchange (NSE). The study's data set is comprised of a series of daily market indices and weekly returns of the market for the period between 1986 to 2003. Whereby, from this period two sub-periods were identified: 1986 to 1990 being the pre-limit period, and from 1991 to 2003 being the post-limit period. Given that equity stock price limits were introduced in Kenya in the year 1991. These limits were set at 10% up or down of the closing prices of each equity stock as recorded in the most recent trading session ended. Their main objective is to reduce the volatility of equity stock prices, a characteristic of a majority of emerging stock markets in the world.

The research findings display positive skewness, excess kurtosis and deviation from normality in the return distributions; an effect of the heteroscedastic nature of stock returns distribution. The returns also show significant serial independence, implying stock market efficiency. Moreover, the results show a significant relationship between conditional volatility and stock market returns. The risk-return parameter is positive, consistent with the portfolio theory where investors are compensated for additional risks assumed in an investment. Most importantly however, the daily price limits did have a marginal impact on stock price volatility, as the findings indicate a marginal decrease in volatility resulting from the uniform imposition of daily price limits on all equity securities at the NSE. These results therefore, convey strong support for the overreaction hypothesis, which advocates the tendency of investors to overreact to new information. The advent of price limits then gives them time to re-assess this new information resulting in a reduction of stock price volatility.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

1.1.1 Capital Markets

The principle behind capital markets entails the creation of an enabling forum where users of capital can obtain the required capital financing from owners of such capital for an agreeable return while considering the risks of their investments. Sharpe, Alexander and Bailey (2003) define a security market or a financial market, as a mechanism for bringing together buyers and sellers of financial assets in order to facilitate trading. In addition, capital markets are the conduits where capital is channelled to the place where it will do the most good. Moreover, Stijn (1995) and Munga (1974) also describe stock markets as vehicles for raising capital for firms. In sum, the goal of capital markets is to be allocationally efficient markets, where firms with the most promising opportunities have access to the available required funds.

Further, in the spirit of fairness to all market players, capital markets allow for the all-important function of price discovery—that is the ability of security prices to reflect their true value with respect to all currently available information in the market. The more quickly and accurately price discovery is achieved, the more efficiently financial markets will direct capital to their most productive opportunities, thereby leading to greater improvement in public welfare (Sharpe et al. 2003). These markets play a major role in developing countries where privatisation of state corporations is taking place. Most companies and governments of developing countries have turned to the stock markets as an avenue for raising capital to finance various projects. In recent years, developing

countries have resolved to use the stock markets as conduits for accessing foreign funds (International Finance Corporation, 2000). Moreover, stock markets promote high standards of accounting, resource management and transparency in corporate governance (Nairobi Stock Exchange, 2000). The other definite roles of capital markets include: playing a complimentary role to other financial institutions leading to the efficiency of the financial sector (Feldman and Kumar, 1995; Stijn, 1995); it enables investors to diversify their wealth across a variety of assets (Feldman and Kumar, 1995); stock markets also enhance the liquidity of assets traded in them, that is the ability to convert the securities into cash through sale (NSE, 2000 and Kumar, 1995); stock markets also encourage domestic savings (Engberg, 1975); governments exercise market based fiscal and monetary policies through selling and liquidating treasury bonds and bills (Pardy, 1992).

Capital markets have also been distinguished into three broad classifications: developed, emerging and developing stock markets. The focus of this study has been on the Nairobi Stock Exchange, classified as one of the emerging markets described in detail hereafter.

1.1.2 Emerging Markets

An emerging market is defined as a stock market that is in transition, increasing in size, activity or level of sophistication (IFC, 2000). For a stock market to be classified as such, it must have met the following criteria: it is either located in a low or middle income economy as defined by the world bank or its market capitalization is low relative to the most recent Gross National Product (GNP) figures, or it introduces investment restrictions like foreign ownership limit, capital controls, extensive government involvement in listed companies and other legislated restraints on activity particularly on foreign investors.

Following Buckberg (1995) emerging markets exhibit the following characteristics, which distinguish them from the developed stock markets:

I. First, price and return patterns for many markets in the developing economies reveal high yields far in excess of industrial market returns, and low to negative correlation with the world markets. In addition, they exhibit high autocorrelation—identical return movement patterns amongst stocks—in returns, volatile stock prices and rapidly rising earnings ratio suggesting inefficiency.

II. Secondly, a lot of informational imperfections exist resulting in noisy or speculative trading.

III. Many of them impose capital controls in which neither foreign nor local capital can freely cross borders; consequently they are populated by investors who cannot diversify internationally.

While empirical tests of return-volatility behaviour are plentiful for the developed stock markets, the focus on developing and emerging stock markets has begun in recent years. The interest in these emerging markets has arisen from the increased globalisation and integration of the world economies in general and that of the financial markets in particular. This has created enormous opportunities for domestic and international investors to diversify their portfolios across the global economic arena.

1.1.3 Overview of the NSE

The NSE (2003) depicts the history about the NSE as highlighted below:

Dealing in shares and stocks in Kenya started in the 1920s when the country was still a British colony. There was, however, no formal market, no rules and no regulations to govern stock broking activities. Trading took place on gentlemen's agreement in which standard commissions were charged while clients were obligated to honour their

contractual commitments by making good delivery and settling relevant costs. At that time, stock broking was a sideline business conducted by accountants, auctioneers, estate agents and lawyers who met to exchange stock prices over a cup of coffee. Because these firms were engaged in other areas of specialization, the need for association did not arise.

In 1951, an estate agent by the name of Francis Drummond established the first professional stock broking firm. He also approached the then finance minister of Kenya Sir Ernest Vasey and impressed upon him the idea of setting up a stock exchange in East Africa. The two approached the London Stock Exchange (LSE) officials in July 1953, and the LSE officials accepted to recognise the setting up of the Nairobi Stock Exchange as an overseas stock exchange. Consequently, the Nairobi Stock Exchange was constituted as a voluntary association of stockbrokers registered under the Societies Act in 1954. The business of dealing in shares was then confined to the resident European community, since Africans and Asians were not permitted to trade in securities until after the attainment of independence in 1963.

In 1980, the Kenyan Government realized the need to design and implement policy reforms to foster sustainable economic development with an efficient and stable financial system. In particular, it set out to enhance the role of the private sector in the economy, reduce the demands of public enterprises on the exchequer, rationalize the operations of the public enterprise sector to broaden the base of ownership and enhance capital market development. The study by IFC and the Central Bank of Kenya, "Development of Money and Capital Markets in Kenya" released in 1984 became a blueprint for structural reforms in the financial markets. This culminated in the formation of a regulatory body 'The Capital Markets Authority' (CMA) in 1989, to assist in the creation of a conducive environment for growth and development of the country's capital markets.

The year 1988 saw the first successful privatisation through the NSE, with the government selling its 20% stake in Kenya Commercial Bank. Further, in 1991, the NSE was registered under the Companies Act and phased out the "Call Over" trading system in favour of the floor based "Open Outcry" System alongside other structural changes such as the introduction of price limits to control stock price volatility in the market.

On February 18, 1994, the NSE 20-Share Index attained an all-record high of 5030 points. In the same period, 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. In addition, the largest share issue: the privatisation of Kenya Airways, in the history of NSE took place in 1996. The stock exchange enabled more than 110,000 shareholders to acquire a stake in the airline. In recognition, the Kenya Airways Privatisation team was awarded the World Bank Award for Excellence for 1996 for being a model success story in divestiture of state-owned enterprises.

During the year 2001, a fundamental re-organization of Kenya's capital markets into four independent market segments: the Main Investments Market Segment (MIMS), the Alternative Investments Market Segment (AIMS), the Fixed Income Securities Market Segment (FISMS) and at a later stage a Futures and Options Market Segment (FOMS) took place. Further, new foreign investor regulations were effected restricting 25% of issued share capital to locals and the remaining 75% becoming a free float to all classes of investors.

1.1.4 Stock Market Volatility

Being an emerging market, the NSE has been known to experience significant stock market volatility over the years. Stock market volatility refers to the degree to which the price of a security, commodity, or market rises or falls within a short-term period

(Mullins, 2000). Glen (1994) refers to volatility as the frequency and magnitude of price movements.

I. Recent Volatility Cases at the NSE: A Brief Overview

In Kenya recently, investors were counting their losses after a deepening bear run on the Nairobi stock exchange that affected some Kshs. 25 Billion in shareholder wealth since the year 2004 started. (Daily Nation, Wednesday April 7, 2004). The volatility of returns at the NSE indicates symptoms of structural problems at the local bourse. Small deal hunters mainly classified in terms of frequency of transactions dominate the Kenyan stock market. They were responsible for the bullish run that was experienced largely in the year 2003. Yet in 2004, they were stampeding out of their investment positions in droves. Whereas, their institutional peers endeavoured to weather out the volatility pressures as they held onto their long positions. It has been noted that two-digit price falls resulting from transactions as small as 100 shares—in itself a serious case of volatility—have taken place at the NSE.

II. Controlling Stock Market Volatility

Pardy (1992) contends that there are two basic building blocks necessary for a thriving stock market: macroeconomic and fiscal environment, and market infrastructure. With only the former being largely beyond the stock exchange's control, market infrastructure determines how fair, stable and efficient the stock market would be. For instance, the manipulation or restriction of trading activities results in the efficient pricing and can significantly align the relationship between price movements and the underlying fundamentals. The major stock and commodities exchanges like in the United States (U.S.) have instituted procedures to limit mass or panic selling in times of serious market volatility. Some of these mechanisms are Circuit Breakers, the Collar Rule, Trading halts, Specialists and Price Limits (U.S. Securities and Exchange Commission, 2003). Whereas,

a majority of emerging markets have opted for the use of stock price limits in controlling stock market volatility. An in-depth discussion on this is documented in chapter two of this paper.

1.2 Statement of the Problem

The Nairobi Stock Exchange continues to exude the perception of a very volatile stock market. Efforts to improve this situation albeit disjointed in approach have been implemented at a slow pace by the regulatory authority and the NSE. Meanwhile, investors and specifically institutional investors; both local and foreign are left with limited investment opportunities as they regard investment in equity stocks as very risky. This is as a result of the deep-seated volatile pendulum-like ways of the local bourse. Prevailing symptoms indicated the presence of structural problems at the micro-level, which required more comprehensive approaches in finding lasting solutions.

Scenarios of small deal-hunters, who have dominated the trading activities at the bourse, fuelled the bullish and bear runs; precipitating pressures on the stock prices. Two digit price falls have been witnessed from transactions of as little as 100 shares. Clearly, for the NSE to become more predictable and stable, more inclusive structural reforms are required.

Bildik and Elekdag (2002) state that increasing volatility in returns of stocks following the crashes in financial markets around the world in the last two decades has attracted the regulators, investors and academics attention. Many discussions in policy circles to control volatility by using the price limits on financial markets have been made (Ibid).

Price limits are boundaries established by market regulators to confine daily movements of security prices within predetermined price ranges. Daily price limits have two attributes: first, to control volatility by establishing price constraints; second, they provide time for rational reassessment during times of panic trading. In Kenya, price limits were introduced in 1991 alongside major structural changes that appertained to the prevailing trading systems at that time. The limits were set uniformly for all equity

securities constraining their movement within 10% up or down of their closing prices in the most recent trading session ended.

In spite of the strong existence of price limits worldwide, there has been little information regarding the effects of price limits on volatility and price discovery, which has important implications for the market regulators who implement such policies.

The study, therefore, sought to establish answers to the following question:

Do price limits at the NSE control the volatility of security prices?

1.3 Objectives of the Study

1. To determine the effect of price limits on stock market volatility at the NSE.
2. To determine the presence of serial correlation in stock returns at the NSE

1.4 Hypotheses of the Study

The following sets of hypotheses were tested in this study:

1) **H_0:** Stock price limits do not reduce stock market volatility.

   H_1: Stock price limits reduce stock market volatility.

2) **H_0:** The NSE does not display serial dependence in stock returns.

   H_1: The NSE displays serial dependence in stock returns.

1.5 Importance of the Study

This study will be useful for a number reasons. First, to the best of my knowledge this is the first known study of its kind done on the Nairobi Stock Exchange. Secondly, the results of this study will be of great interest to:

Academicians: They will appreciate the efforts taken by the NSE to curb stock price volatility and how successful their efforts have been with respect to the price limits mechanism. Further, it will provide a framework for further studies in this field, as there are several variants that can be explored to ameliorate knowledge in this area.

Policy makers: Mainly the CMA and the NSE will be able to get a feedback from their policies already implemented in endeavouring to control stock price volatility. As a result boost investor confidence in the bourse and/or advance their efforts in this field should the results be unsatisfactory. Similarly, since the NSE is an emerging market it is envisaged, though not necessarily, to evolve and develop along the paths that developed stock markets have gone through. Thus the need to implement world best practices or continuously improve on them in this area locally.

Investors: Both at home and abroad will be reassured that the levels of volatility at the NSE aren't as high as they would have been were the limits not present. This would lead to increased investor confidence with the bourse resulting into heightened trading activities and investments.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Efficient Markets

A market is efficient with respect to a particular set of information, as it is impossible to make abnormal profits, other than by chance, if this set of information is used to formulate buying and selling decisions (Sharpe et al. 2003).

This information can either be classified as fundamental or noise. Fundamental information is information that can be used to explicitly estimate the value of the securities associated with it. That is, there is a direct relationship between the information with the projected value of the asset. Whereas, noise refers to information that has no explicit relationship to the value of a security, and cannot therefore be used to estimate the security's value. Noise can neither be substantiated nor quantified, for it to qualify as fundamental information. Black (1986) describes noise as a diversified array of unrelated causal elements that attempt to explain what happens in the world.

While Fama (1970) maintains that an efficient market immediately reflects fully a set of new information in its market prices. Hence in an efficient market, investors will incorporate any new information immediately and fully in security prices. New information is just that: new, meaning a surprise. Anything that is not a surprise is predictable and should have been anticipated before the fact (Sharpe et al. 2003).

Fama (1970) distinguished three forms of efficient markets under the Efficient Markets Hypotheses (EMH): the weak form, the semi-strong form and the strong-form efficient markets. Describing each: in the strong-form EMH, security prices reflect all available information including private information. The semi-strong form EMH describes a

market that reflects all publicly available information. Whereas the weak-form EMH supposes that current prices reflect past information.

The paradox of EMH is that if every investor believed a market were efficient, then the market would not be efficient because no one would bother to analyze securities. In effect, the efficiency of the markets largely depends on the belief of inefficiency of the market, by market participants who trade in securities in an attempt to outperform the market.

Due to the reaction of stock prices to the arrival of various forms of information, they are deemed to be rational. Being rational means, the prices react as expected under the circumstances. However, distinguishing noise from fundamental information at the instant they arrive in the market requires great skill and at times luck. But as time dissipates, then this becomes possible for a large number of investors and analysts.

Hence with reference to the Random Walk theory, security price changes are said to follow a trend-less random walk. This means, there are no predictable variations in equity returns in the absence of new information, and if there were any, they would be statistically insignificant. Samuelson (1965) argues that price changes are random in perfectly efficient markets. Because information arrives randomly, changes in prices that occur as a consequence of that information will appear to be random, sometimes being positive and sometimes being negative. However, these price changes are simply the consequences of investors' re-assessment of a security's prospect and adjusting their buying and selling appropriately with respect to the available information. The same sentiments are shared by Umstead (1974) who says stock prices are determined by expectations, which if rational, must be derived from existing measures of the economy. In sum, price changes are as a result of fundamental information or noise. These changes

are random but rational with respect to their ability to react to new information at all times (Ibid).

Consequently, the arrival of new information triggers stock price volatility. Hence all forms of information induce stock price volatility, some of which is desirable or normal and the other undesirable. Noise trading has the effect of putting noise into the securities' prices, making them not true reflectors of value of these securities. This increases stock market volatility; undesirable to any investor as this induces panic trading in equities, normally dominated by speculative and/or small investors.

Interestingly, investors are usually most concerned about volatility during periods when securities' prices decrease. On the contrary, in periods when securities' prices are going up, no one with the possible exception of investors with short positions seems to care that the markets are exhibiting volatility.

One of the ways of measuring volatility in a market is done by looking at the movement of the daily or monthly indices of securities within the market. Whereas, the volatility for each individual security, can be measured by looking at the security's returns variances or standard deviation.

2.2 A Brief Review on Stock Market Volatility

Volatility is often considered excessive if it cannot be explained by the uncertainty of the future real dividend. Understanding the causes of market volatility has important policy implications on the imposition of price limits on financial assets. There are a number of things that cause volatility, for instance, arbitrage causes volatility. Arbitrage is the simultaneous or almost simultaneous buying and selling of an asset, to profit from price discrepancies. This causes markets to adjust prices and above all, has the effect of causing information to be more quickly assimilated onto market prices. This is a peculiar

result because arbitrage requires no more information than the mere existence of a price discrepancy.

Another source of stock market volatility is technology. This comprises of more timely information dissemination, improved technology to make trades, and the variety of financial instruments. The faster information is disseminated, the quicker markets can react to both negative and positive news. Improved trading technology makes it easier to take advantage of arbitrage opportunities, and the resulting price alignment arbitrage causes. Finally, the array of financial instruments available provides investors with more opportunities to move their money into more kinds of investment positions as investment conditions change.

Other causes identified locally in a study by Nyamute (1998) who analyzed the effect of selected macro-economic variables on the performance of the NSE, identified them as: inflation, money supply, interest rates and the exchange rates. Her findings indicated that these macroeconomic variables do impact on the performance of stock prices at the NSE thus affecting stock market volatility.

2.2.1 Impacts of Volatility

There are two primary disadvantages of volatility: first, it delays Initial Public offerings (IPO's) and secondly, it decreases value. On the contrary, it has been seen that volatility actually increases the value of financial assets. This is because volatility increases the option value of waiting to invest. That is, during times of high volatility, there is value in being able to "time" your investment, as shown in the following illustration, which simulates two countries: Safe and Risky.

In Safe, the government strictly limits all returns on investment (ROI's) to 10 percent. If an investment pays more than 10 percent, the government taxes away all "excess"

returns. If an investment pays less than 10 percent, the government subsidizes "substandard" returns. Suppose a firm in this country wishes to issue its preferred stock with an annual dividend of Kshs. 3 per share. The value of such an issue would be Kshs. 30, if the preferred stock were issued in Safe: that is, Kshs. 3/10% equals Kshs. 30, using the Gordon's dividend valuation model.

Whereas in Risky, the government guarantees that while the average ROI will be 10 percent, it will be allowed to vary. It could go as high as 15% or as low as 5% with equal probability (50 percent). Hence for Risky, the expected value of our preferred stock offering would be Kshs. 40, that is, Kshs. 3/5% equals Kshs. 60 if rates are at the lowest limit, and Kshs. 3/15% equals Kshs. 20 when highest. The expected value is calculated by multiplying the probabilities of each outcome times the value of that outcome:

Expected Preferred Stock Value = (Kshs. 60 × 0.5) + (Kshs. 20 × 0.5) = Kshs. 40

Therefore, all other things being equal, increasing volatility increases value. In Safe, there is no value for waiting for times to be good, but in Risky, timing your investment properly increases the value of your outcome. This view is the long-term investor's perspective (Mullins, 2000).

2.2.2 Limits on Volatility

There have been suggestions that there should be limits on volatility. The suggestions propose that trading should be suspended if markets change "too much"—a subjective judgement—over a certain period of time. Such limits on trading already exist in commodity markets. For instance, the Kenyan government enforces floor price limits for essential commodities like maize and milk through its institutions albeit not mandatory in legal statutes. It does this by acting as an alternate buyer to the market, offering a

guaranteed minimum price during periods of price declines but only for specific essential commodities.

Nevertheless, most analysts are unsure whether limits are a good or bad thing. Reasonable people may disagree over whether it is better to get a swift severe beating, or to get beaten less severely each day for a longer period of time (Ibid). The major stock and commodities exchanges in the United States have instituted procedures to limit mass or panic selling in times of serious market declines and volatility. Some of these mechanisms are: Trading Halts, Circuit Breakers, the Collar Rule, Specialists and Dealers, and Price Limits. These are explained in detail below.

I. Trading halts

This is a temporary suspension of trading in a firm's shares. This action is triggered when rumours or a recent news announcement for instance, a rumour such as, a takeover attempt or an announcement of unexpected low quarterly earnings affects trading in a stock. Similarly, the opening of trading activities can be delayed for similar reasons, or if a large imbalance of orders has accumulated since the previous close (Sharpe et al. 2003). There are no specific price limits defined for this mechanism. The arrival of news triggers a temporary halt on trading for information to be appreciated by all investors before trading resumes. Whereas, the duration of the halt is at the discretion of the stock exchange where it is enforced.

II. Circuit Breakers

Circuit Breakers on the other hand, establish whether trading will be halted temporarily or stopped entirely. At the New York Stock Exchange (NYSE) in the U.S. a temporary halt can be effected simultaneously for all its listed stocks or a large number of them. This is done when circumstances indicate that there is need to reduce market volatility

and to promote investor confidence (Ibid). The securities and futures markets have circuit breakers that provide for brief, coordinated, cross-market trading halts during severe market declines (U.S. Exchange Commission, 2003). Circuit breakers operate under defined percentage levels and interval durations such that were prices to go beyond such limits within specified trading sessions, enforcement is triggered automatically.

III. Collar Rule

Under NYSE Rule 80A, if the Dow Jones Industrial Average (DJIA) moves up or down two percent (2%) from the previous closing value the market is deemed volatile. In this case, the rule states that any orders that are received to buy or sell any of the Standard and Poor's (S&P) 500 stocks are only processed if by doing so, they are able to stabilize stock prices. Whereas, if by doing so the shares prices are not stabilized, then such trades are not effected until normalcy resumes. The collar restrictions are lifted if the DJIA returns to or is within one percent (1%) of its previous closing value (Ibid).

IV. Specialists and Dealers

These people often act as dealers or market makers in certain stocks, in particular for the same stocks in which they act as brokers. This means that the specialist buys and sells certain stocks for his or her own account and is allowed to seek a profit in doing so. At the NYSE, the specialist is required to maintain a "fair and orderly market" in those stocks in which he or she is a registered as a specialist. This is so especially when there is a temporary imbalance or inequality between the numbers of buy and sell orders. Since such scenarios eventually lead to unwarranted price fluctuations not based on the arrival of new pieces of fundamental information. This however, becomes difficult to enforce since no structures have been identified to trigger the volatility restoration mechanisms when such disequilibria in orders occur. (Sharpe et al. 2003).

V. Price Limits

Whereas, price limits are essentially price boundaries, that is, the floor bound or limit (lowest price) and ceiling bound (highest price) onto which trading in securities are allowed to fluctuate during a specified duration or trading session. The aim is to lessen sharp security price swings within the specified trading session in the stock market. The aforementioned Circuit breakers and Collar rules operate like price limits with little variations on how they are triggered and the resulting remedial actions prescribed distinguishing them from each other. In some stock markets price limits operate as daily limits, pegged on the daily closing prices of the previous trading sessions. Whereas in others, the limits are enforceable depending on the number of trading sessions within a day. Such that the most recent trading session ended, defines the point where limits begin to be enforced for the succeeding session. Similarly, these limits could be applied uniformly for all stocks, or uniquely to a single stock, or a group of stocks with similarities commonly with respect to their price levels or ranges.

In Kenya, the Nairobi Stock Exchange (NSE) rules has set the daily price limits at 10% of the closing prices for all equity securities of the previous day's trading session. Meaning, the securities' prices cannot be higher or lower than their closing prices by more than 10%. This rule became effective in 1991 at the onset of the open outcry trading system. In the U.S., price limits have been set only for the futures exchanges, such as the stock index futures. Daily price limits remain in effect for the entire trading session. However, each stock index futures contract has specific price limits set by the exchanges. Interestingly, there are no price limits for U.S. stock index options, equity options, or stocks but only for futures (U.S. Securities and Exchange Commission, 2003).

2.3 Price Limits and Stock Market Volatility

Following Bildik and Elekdag (2002) price limits inevitably affect price movement and the magnitude of such impacts would depend on the level of price limits. The larger the limits, the less interference there would be on price movement. Hence the debate on the effects of price limits on volatility where the level of price limits is of great interest to the market participants and policymakers. However, the appropriate range of price limits is yet to be established by researchers.

There are different reasons for imposition of daily price limits, the most popular one being the overreaction hypothesis. The meaning of overreaction hypothesis is that security price changes tend to move up or down by a larger than required magnitude as a result of new information processing. Therefore, in accordance with the overreaction hypothesis, price limits can be used to prevent short-term overreaction. Ma, Rao, and Sears (1989a) find evidence of price reversals after limits are reached, indicating overreaction and subsequent correction reducing stock price volatility. One of the arguments brought by Telser (1981) is that price limits can give traders time to consult their principles during a big price swing. If price limits are effective in preventing overreaction, there should be price reversals after limit prices are hit.

Secondly, Brennan (1986) presents a model that price limits can be used to substitute for margin requirements. With respect to short selling, traders are required to deposit a percentage of the value of the stocks borrowed from a stockbroker as collateral and subsequently sell them at their discretion. Short selling refers to the transaction where an investor (short seller) borrows shares belonging to another investor (lender) believing they are highly priced without the lender's knowledge but through the lender's broker. The short seller subsequently sells them at the prevailing price in the hope that the share prices will decline in the near short term, when he will repurchase the same amount and

type of shares, and restore them to the lender having made a gain. The margin requirement is necessary to safeguard the lender of the securities from assuming losses in the event the securities' prices increase significantly after the short sale, especially when the short seller is unable or unwilling to redeem the amount of the stocks borrowed. Hence margins requirements are used as tools for transferring risk to the short seller. Thus, with price limits in force, the need for these margins may not be necessary as the limits protect the short sellers from adverse stock market volatility. In such occurrences they may quickly redeem their loaned shares before they suffer material losses.

Thirdly, exchanges use price limits as a bargaining tool with the government, as stated by Miller (1989), Moser (1990), and France et al. (1994). This mechanism entices the government to use the stock markets as avenues for privatisation of state corporations where their IPOs would receive adequate protection from adverse volatility and make a decent return. To an extent the government can also be encouraged to invest its excess liquidity in security instruments that receive the protection of price limits and in the end earn a decent return or suffer minimal exposure to volatility.

Since price limits have been seen to reduce overreactions, other researchers suggest that price limits make trading impossible and therefore harm the price discovery process.

2.3.1 Impacts of Price Limits

Opponents of price limits on the other hand, argue that they serve no purpose other than to slow down or delay a price change. Many authors have suggested that price limits are likely to generate a "gravitation" or "magnet" effect, which states that the price of a security is drawn toward the price limit. Under the magnet effect hypothesis, market participants or sellers would have an increasing demand for liquidity as prices approach the halt trigger level. Such that investors in need of liquidity would rush to sell their securities in large numbers to avoid being locked out of the trade. Resulting in order

disequilibria between the buy and sell orders. For example, Miller (1991) argues that price limits might become self-fuelling as traders rush to avoid being locked into their positions when prices come within the range of the trigger point. In contrast, Berkman and Steenbeek (1998) investigated the influence of daily price limits on the price formation process of financial futures on Nikkei-225 futures contracts, which are traded both in Osaka Securities Exchange and Singapore International Monetary Exchange (SIMEX) with price limits. They found no evidence to support the gravitation effect.

Besides the prices being pulled towards the limit prices (magnet effect) the volume of trades are also increased as limit prices are approached. Glen (1994) indicates that liquidity goes beyond the physical ability to trade but also includes market depth, which refers to the ability to transact at the current market price. In a deep market even large orders can be transacted at current prices. In contrast, when market depth is lacking, the larger an order, the more prices will have to be adjusted to fill that order as demand and supply forces will not be at equilibrium. Subrahmanyam (1994) who examined the ex-ante effects of circuit breakers discovered that volume and volatility are expected to change. However, the number of limit moves and locked limit days decreases as the price limit levels increase. Since the price limit rule can prevent overreaction while at the same time not hurt liquidity for the sellers too much.

Moreover, Fama (1989) states that volatility may increase if price discovery is intervened. The delay in price discovery is another costly problem induced by price limits. Since trading usually stops when stock prices hit the limits and resumes when the limits are recalculated (Bildik and Elekdag, 2002). Such price boundaries may prevent stocks from reaching their equilibrium prices for that day. Hence, if limits block prices, then stocks have to wait until a subsequent trading period to continue towards their true price, which is consistent with the delayed price discovery hypothesis (Ibid).

2.4 Empirical Studies Review on Price Limits and Stock Volatility

There is little empirical evidence on the effects of price limits as very few developed markets have them, as this feature gained prominence following the 1987 financial markets crash (Phylaktis, Kavussanos and Manalis, 1999). A majority of empirical studies done so far on the effect of price limits on stock market volatility indicate mixed results. However, among the ones the researcher was able to review due to difficulties encountered in accessing more studies from the World Wide Web owing to subscription restrictions, most indicated effectiveness of price limits in reducing volatility in stock markets. Nevertheless, this mechanism is relatively new in stock markets around the world, particularly the emerging markets, and is yet to be studied extensively by scholars.

The only local study in Kenya that came close to addressing the issue of volatility of securities at the NSE was the one done by Mwangi (1997). However, his main objective was to develop and test a model that could be used to predict price movements at the NSE. He did this by analysing price movements for selected stocks. In financial terms this is known as the contrarian strategy of estimating future prices based on their past movement patterns. Consequently, the issue of volatility was not dealt with at all.

Phylaktis, et al. (1999) did a study on Price Limits and Stock Market Volatility in the Athens Stock Exchange (ASE) in Greece. Here, an 8% price limit was imposed on August 1992 on highly active shares whereas the limit on the less active shares was at 4%. Among the hypotheses tested regarded the consistency in volatility behaviour in pre- and post-limit periods, and another on the fact that volatility in post limit periods should be less than in the pre-limit period. The latter hypothesis is identical to the one tested in this study at the NSE. Generalized Autoregressive Conditional Heteroskedasticity (GARCH) modelling was used to analyse and test the two hypotheses highlighted. Their relevant data set to these hypotheses were the general price indices for the period

beginning January 1990 to June 1996. The daily indices were used to calculate stock market returns using the logarithmic first differences similar to this study. They however, found that price limits do not affect stock market volatility. This lent support to the information hypothesis, which states that if a price limit is present and the true equilibrium prices falls outside the current day's price limit range, the price will move to the appropriate limit on the trading day and subsequently continue to move in a direction towards equilibrium as new limits are established in subsequent trading sessions. This is referred to as serial correlation in stock returns. Nevertheless, the Greece stock market was regarded as a thinly traded market that could be manipulated by big "hands" or investors to signal to uninformed traders thereby creating an illusion of a bullish stock market for selfish objectives. This could have been the probable explanation for the failure of price limits in controlling volatility of returns at the ASE.

In a study by Hassan et al. (2000), they examined the distribution of equity returns as they measured market efficiency and volatility of stock returns. The study period was divided into two sub periods: the pre- and post- financial liberation period; that is 1986 to 1990 and 1991 to 1999 respectively. In order to examine the time-varying risk-return relationship they used the Generalized Autoregressive Conditional Heteroskedasticity in the mean (GARCH-M). They found out that the Dhaka Stock Exchange (DSE) displays stock market inefficiency relating this to the weak capacity in processing new information by the market. Whereas, the price limits were found to be ineffective may be as a consequence of the market displaying inefficiency in information processing. Nevertheless, there are many similarities between the DSE and NSE. Notably, both were formally instituted as stock exchanges in the same era of the early 1950's. Similarly, both countries' economies underwent liberalization in the early 1990's and suffered the same governance and disclosure problems amongst the listed companies. Hence, their study provided a valuable backdrop onto which a similar study could be done locally at the

NSE, using similar economic models and data statistics (market indices). Results could then be compared to facilitate lessons with respect to current and future development needs. For instance, most listed firms in Bangladesh generally failed to hold annual general meetings to facilitate provision of audited financial statements on time to their respective shareholders. This limited the provision of information as regards firms' financial performance and subsequently, the fora for questioning stewardship responsibilities of the managers of some of these firms. Moreover, lack of adequate professional financial community who could analyze stock market data for the investors aggravated the problem in Bangladesh. Kenya similarly suffered the same problems during this period. Interestingly the reforms recommended by the researchers to their stock markets are being implemented Kenya, these include: modernization of the stock exchange to improve the trading system and an increase in the disclosure requirements of listed companies so as to improve on the efficiency of the stock markets and facilitate informed investments. And just like the ASE, the DSE is a thinly traded market where out of 222 listed shares only 40 shares are regularly traded in the market (Hassan et al. 2000).

The study by Bildik and Elekdag (2002) on effects of price limits on volatility focussing on the Istanbul Stock Exchange (ISE) the researchers concluded that there is an overall decline in volatility as a result of the price limits. In their study they reviewed volatility at the ISE during the period before and after price limits were implemented. Price limits at the ISE were pegged at 10% for each $2^{1}/_{2}$ hour-long trading sessions for two sessions in a day. This raised daily cumulative price limits to 21% (compounded of ten percent) from 10%. The period of their study was from 1990 to 1994—the pre-limit period, and from 1995 to 2001—the post limit period. In order to test for the over reaction hypothesis, GARCH analysis was used. The aim under this hypothesis was to ascertain that the volatility in the post limit period was less than in the pre-limit period. Their findings from

the GARCH estimation on the monthly general stock index revealed a decline in volatility in stock prices. This study is similarly relevant to the NSE study, as the ISE is an emerging market having been established in 1986 but having undergone very rapid development in the areas of infrastructure and trading dynamism. Another similarity is the foreign ownership restrictions on local securities, which stood at 50% of the free float of shares at the ISE. Further, their price limit system is pegged at 10% for each trading session; unlike the NSE, which has only one trading session in a day. Most importantly however, is the fact that the study used GARCH modelling where ISE indices were used to measure volatilities. The ISE100 or otherwise referred to as the National-100 index represents 75% of the total market capitalization, traded value, number of shares traded and number of trades realised in the market; similar to the NSE20 share index. A notable difference is the fact that their trading is realised through computerised trading system, soon to be implemented in Kenya, and the fact that they have two sessions of trading in a day. Hence, their study is also closely comparable to the current study and it would provide beneficial insights on comparison with the findings of this study.

In addition, a study done in an African emerging market: the Johannesburg Stock Exchange (JSE), by Ngassam (2002) established that price limits slow down price changes and also have a positive effect on reducing stock price volatility. He used regression analysis and modified Levene statistics to investigate the effect of price limits on volatility of stock prices for the sample period dated January 1990 to December 1999. Due to the uniqueness of price limit structure at the JSE, he divided this sample period into two-year sub-periods so as to determine the variation of price limits effects by sub-sample periods. At the JSE price limits are set for different categories of securities ranked on the basis of their prevailing prices. Based on experience, the identified price ranges has shown how securities' prices fluctuate, and for this reason.different limits have been set. With respect to Africa, availability of this empirical research document is a vital

guide to successive studies to be done in emerging stock markets in Africa. Since African nations have more similarities in their economic and geo-political landscapes as opposed to differences. Hence, information derived from the JSE study provided unparalleled information that could help in greater learning experiences. Conversely, the JSE has a slightly different price limit structure unlike the Kenyan one, which is uniform to all securities. This could be an important point for policy makers to look at, as stocks do not necessarily behave the same way with respect to volatility. Nonetheless, this could indicate new grounds for research that academicians should embark on.

2.5 Conclusions on the Literature Review

With respect to the literature reviewed it is apparent that the area of price limits' effect on stock market volatility is still not yet extensively researched. However, securities markets across the world are conscious of the problem of excessive volatility and have therefore taken measures to control it. Most of the studies have employed regression models to measure volatilities using stock prices, portfolios of stocks and even stock market indices to measure the changes that arise from using price limits in securities markets. Results have been positive with few variations. For instance, in established markets like the NYSE limit prices have been found to be largely ineffective whereas in emerging markets it has been successful with a few exceptions. At the NSE no similar studies have been done and documented.

This study therefore endeavoured to pioneer research in this field since volatility is a problem not unique to other parts of the world but in Kenya as well.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

Do price limits reduce volatility of stock prices at the stock market? In order to develop a reliable empirical answer, the study examined the distribution of equity returns by dividing the sample period into two sub-periods: periods before and after the market introduced price limits. Return distributions were studied by comparing the descriptive statistics of the NSE index (NSEI). A model of conditional variance was employed using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) formulation to examine the stochastic process over the study period. Other models that could evaluate at the volatility of stock returns include: modified Levene statistics, and simply by looking at the distribution of individual stock returns variances or standard deviations. However, studies on descriptive statistics of stock returns show a high level of kurtosis (leptokurtosis) and volatility clustering prevalent in stock returns as observed in emerging stock markets (Bildik and Elekdag, 2002; Hassan et al., 2000). This inhibits the use of standard deviations of stock returns in reviewing the distribution their respective return volatilities where assumptions of normality have to be made. This implies that some traditional test results concerning stock returns, which assume the normality of stock returns, could be misleading.

Normal distributions have two essential qualities: skinny tails and perfect symmetry. Skinny tails imply a very low occurrence—about 0.3% of the time—of returns that are more than three standard deviations away from the average. Symmetry on the other hand implies that the frequency and magnitude of upside gains is a mirror image of downside losses. For the hypothesis testing of equal variance, Brown and Forsythe (1974) showed

that if data have fatter tails than in the case of normal distribution, the F-statistic rejects the null hypothesis too frequently. Nevertheless, the modified Levene statistic is not sensitive to departure from normality as proposed by (Brown and Forsythe 1974). But GARCH modelling has been the most successful and common method used by researchers (Bildik and Elekdag, 2002).

3.1.1 GARCH Analysis

The Autoregressive Conditional Heteroskedasticity (ARCH) model introduced by Engle (1982) allows the variance of the error term to vary over time, in contrast to the standard time series regression models, which assume a constant variance (homoskedasticity). Bollerslev (1986) generalized the ARCH process by allowing for a lag structure for the variance. Evidence of extensive use and success of the GARCH models in modelling time series behaviour of stock returns is reported by Hassan et al. (2000) in his review of the following studies (Baillie and DeGennaro, 1990; Akgiray, 1989; French et al. 1987; Koutmos, 1992; Koutmos et al. 1993). Bollerslev (1986) allows the conditional variance to be a function of prior period's squared errors as well as of its past conditional variances. Hence the GARCH model has the advantage of incorporating heteroskedasticity into the estimation procedure. All GARCH models are martingale difference, implying that all expectations are unbiased (Hassan et al. 2000). Further, GARCH models are capable of capturing the tendency for volatility clustering in financial data. Volatility clustering in stock returns implies that large (small) price changes follow large (small) price changes of either sign. Engle et al. (1987) provide an extension to the GARCH model where the conditional variance is an explicit function of the conditional variance. Such a model is known as the GARCH in the mean or GARCH-M model (Hassan et al. 2000). Stock returns can be represented by the GARCH (p, q)-M model as follows (ibid):

$$(1) \qquad y_t = u_t + \delta_1 h_t^{1/2} + \varepsilon_t,$$

$$(2) \qquad \varepsilon_t / \Psi_{t-1} \sim N(0, h_t)$$

$$(3) \qquad h_t = \omega + \sum_{j=1}^{p} \beta_j h_{t-j} + \sum_{j=1}^{q} \alpha_j (\varepsilon_{t-j})^2$$

Where y_t is the stock return, u_t is the mean of y_t conditional on the past information (Ψ_{t-1}), and the following inequality restrictions $\omega>0$, $\alpha_j \geq 0$, $\beta_j \geq 0$ are imposed to ensure that the conditional variance (h_t) is positive. The presence of $h_t^{1/2}$ in (1) provides a way to directly study the explicit trade off between risk and expected return. The size and significance of α_j indicates the magnitude of the effect imposed by the lagged error term (ε_{t-j}) on the conditional variance (h_t). In other words the size and significance of α_j implies the existence of the ARCH process in the error term (volatility clustering or heteroskedasticity). The significant influence of volatility on stock returns is captured by the co-efficient of $h_t^{1/2}$ in (1). In other words, the co-efficient δ_1 represents the index of relative risk aversion (time-varying risk premium). A significant and positive co-efficient δ_1 implies that investors trading stocks are compensated with higher returns for bearing higher levels of risk. The converse indicates that investors are penalized for bearing risk. Finally, Engle (1982) advocates the use of the GARCH (p, q)-M in testing for stock market volatility.

3.1.1.1 Economic Interpretation of Parameters in the Model

Following Hassan et al. (2000) review of (Engle and Bollerslev, 1986; Chou, 1988; Bollerslev, Chow and Kroner, 1992) they discover that the persistence of shocks to volatility depends on the sum of the $\alpha + \beta$ parameters. Values of the sum lower than unity imply a tendency for the volatility response to decay over time. In contrast, values of the sum equal to (or greater than) unity imply indefinite (or increasing) volatility persistence

to shocks over time. In a GARCH (1,1)-M model, the series ε_t is covariance stationary if the sum of α and β is significantly less than unity. As the sum of α and β approaches unity, the persistence of shocks to volatility is greater.

3.2 Population

The population of the study was comprised of all the equity securities listed at the Nairobi Stock Exchange. As at 31st December 2003, there were forty eight (48) companies whose stocks were quoted at the bourse (See Appendix I).

3.3 Sampling

The sample of the study was comprised of the equity securities in the NSE 20 share index. The NSEI is regarded as representative of the equity securities listed at the NSE as it is composed of a cross section of stocks from various segments of the market. Further, the index represents over 70% of the entire stock market capitalization making it a robust (powerful) estimator for market performance for the study.

3.4 Data Description

The data set was comprised of daily closing indices (NSEI) series from 1986 to 2003. This data is secondary in nature and was sourced from the NSE electronic database using a secondary data collection instrument (See Appendix II). These were then separated into two sub-periods 1986 to 1990 and 1991 to 2003; that is, the pre-and post-price limit periods respectively. Similar studies done have taken an average duration of ten years with successive sub-periods of five years for pre- and post-limit eras. However, the duration of the study has no significant empirical importance apart from the fact that it highlights consistency or lack of it, in the behaviour of stock return volatility under review. That is, only if the focus is solely on volatility behaviour.

Measuring volatility over shorter time durations like within a day, weekly, monthly and even yearly is therefore possible. However, in this study, the researcher captured information over a five-year period before price limits were introduced and for a longer period thereafter. This was deemed appropriate to enable provision of valuable up to date information as to whether volatility has been reduced or not.

3.5 Data Analysis

A GARCH (1,1)-M model, similar to the one used in the by Hassan et al (2000), was used in used in the following form for both sub-periods separately:

$$(4)\ Y_t = u_t + \delta_1 h_t^{1/2} + \varepsilon_t$$

$$(5)\ \varepsilon_t | \Psi_{t-1} \sim N(0, h_t)$$

$$(6)\ h_t = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta_1 h_{t-1}$$

Where Y_t is the stock market return, U_t is the mean of Y_t conditional on past information (Ψ_{t-1}) and the following inequality restrictions apply $\alpha_0 > 0$, $\alpha_1 \geq 0$, $\beta_1 \geq 0$ to ensure that the conditional variance (h_t) is positive. The decision rules highlighted in 3.1.1.1 apply to this model too.

The following steps were used to analyze the data:

Step 1: The daily closing NSE indices for the study period were collected and separated into two sub-periods: 1986 to 1990 and 1991 to 2003. Then daily market returns were calculated as the logarithmic first differences of the closing NSE indices as follows:

$$Y_t = \ln [NSEI_t / NSEI_{t-1}]$$

Where Y_t is the daily market return of the NSEI at time t.

Step 2: The daily market returns was used to compute weekly market returns as follows:

$$Y_T = \frac{\sum_{t=1}^{n} Y_t}{N}$$

Where Y_T is the weekly stock market return computed as the arithmetic mean of the daily market returns (Y_t) and N is the total number of trading days in a calendar week at the NSE. That is, Monday through to Friday excluding public holidays. Aggregation of the daily returns into a weekly average still met the objective of measuring return volatility behaviour for time series data unlike cross sectional data.

Step 3: With the distribution of weekly market returns descriptive statistics of the data were then computed.

Step 4: For each weekly data entry, autoregression was performed on the raw weekly returns (Y_t) as dependent variables and their respective deviations ($h_t^{1/2}$) as the independent variables so as to obtain their respective error terms (ε_t).

Step 5: The error term (ε_t) obtained was then squared (ε^2_t) for each weekly data entry. Another autoregression was done, where this time (h_t), the return variance was the dependent variable, and the squared error terms (ε^2_{t-1}) and variances (h_{t-1}) both lagged by one period being the independent variables as indicated in equation (6). The resulting α_1 and β_1 co-efficients provided valuable information for the rejection or failure to reject the null hypothesis as seen in the findings in chapter four.

CHAPTER FOUR

4.0 FINDINGS AND INTERPRETATION

This study set to determine the effect of price limits on stock market volatility at the Nairobi Stock Exchange (NSE). It was hoped that as a result an effect, if any, would be determined. And from this, give feedback useful to the regulatory authorities and market participants. Hopefully it will set the stage for self re-evaluation by the market and the eventual development of the existing or new mechanisms for controlling undesirable volatility in line with our local experience and world best practices.

4.1 Statistical Properties of the NSE Weekly Returns

Table 1. on page 36 provides the statistical characteristics of the NSE weekly returns for the study.

The mean of the returns is positive in all periods, that is, the pre- and post–limit periods, and declines over time. The mean in the post limit period is less than the mean in the pre-limit period. Interestingly, the standard deviation as a measure of risk does decrease significantly. The period January 1986 to December 1990 displays a higher mean return with a higher level of standard deviation (risk). This gives credence to the risk-return trade-off theory; where the higher the risk, the higher the required rate of return to compensate for additional risk assumed. Whereas, the period January 1991 to December 2003 displays a lower mean return with a lower standard deviation, a possible indication of reduced stock price volatility. All these being an indication that volatility of returns was greater in the pre-limit period than the post limit period, which displayed a reduction of risk and a decline in mean return.

The skewness of the stock returns changes from a slight left skewness in the first period to an excessive right skewness in the second period. However, the total sample period showed that the distribution of the stock returns is skewed to the right. This means that the second period managed to slow down volatility owing to the price limits since the peak of stock returns aggregated on the right. Being an indication of systematic filtering of new information onto the stock prices, but the information is not necessarily inaccessible to investors. Whereas, the pre-limit period showed the converse due to the initial overreaction and subsequent panic trading as no price restrictions are present. Further, positive kurtosis is found for the full sample and the two sub-periods. The post-limit period however, had the largest kurtosis factor in comparison to the pre-limit and full sample periods. This highlights the behaviour of stock returns, that is, the tendency of stock returns to cluster at one point. However, the clustering is magnified further by the presence of price limits, as the delayed eventual reflection of new information is finally reflected 'correctly' onto prices. This explains the positive skewness and increased peakiness in the post limit period.

In sum, the NSE indices show positive skewness, excess kurtosis and deviation from normality (non-normal distribution). Since normal distributions have zero skewness coefficients and a kurtosis factor of three. This is consistent with the findings of other countries as reported by Hassan et al. (2000). Also confirmed by their study of the Dhaka Stock Exchange (DSE), the DSE index showed positive skewness, excess kurtosis and deviation from normality.

Table 1: Unconditional Distribution Statistics for the NSE Weekly Market Returns for the period January 1986 to December 2003.

	N	Minimum	Maximum	Mean	Standard Deviation	Variance	Skewness[1]		Kurtosis[2]	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Pre-Limit Period Returns[3]	247	-0.03	0.03	0.0031	0.0074	0.000	-0.490	0.155	4.384	0.309
N	247									
Post-Limit Period Returns[4]	626	-0.02	0.05	0.0004	0.00499	0.000	3.499	0.098	26.233	0.195
N	626									
Full Sample period Returns[5]	873	-0.03	0.05	0.0011	0.00592	0.000	1.485	0.083	11.915	0.165
N[6]	873									

The information in this table is at 5% statistical significance level.

1. The value of skewness co-efficient for normal distributions is equal to zero. The distribution of returns skews to the left if it has a negative value and to the right if it has a positive value.
2. The Value of the kurtosis co-efficient for normal distribution is equal to three.
3. Pre-limit period: January 1986 to December 1990.
4. Post-limit period: January 1991 to December 2003.
5. Full sample period: January 1986 to December 2003.
6. N: Number of observations.

4.2 Time Varying Risk-Return Behaviour of the NSE Returns

4.2.1 Auto-Correlation and Capital Market Efficiency

Table 2. on page 38 presents the empirical results of stock returns volatility and market efficiency tests.

The equity returns were calculated as the log difference of the NSE stock price indices: R_t=ln ($NSEI_t$)-ln ($NSEI_{t-1}$) The findings on the first order auto-correlation [AR (1)] or linear dependence of successive price changes were weakly positive (nearly zero) in the pre-limit period. Whereas, in the post-limit and full sample periods, the tests indicate significant negative results. This means, during the pre-limit period, returns were weakly predictable on the basis of past returns implying weak form market efficiency. On the contrary, the post-limit period and the full sample periods indicate serial independence of stock returns. Accordingly, rejecting the weak-form market efficiency hypothesis of predicting future returns based on past returns. This implies that the stock market is presently beyond the level of weak-form efficiency, and returns are determined more strongly by other factors other than by past returns.

A market displaying these characteristics suggests that relevant market information flows to the market and is reflected in stock price changes relatively fast. In the case of the NSE, the significant change between the two sub-periods may be as a consequence of the improvement in communication infrastructure, disclosure requirements of pertinent information regarding investments' positions and performance, or appreciation of investment knowledge amongst investors or the financial community at large. These findings lend credence to the need for continued modernization of the stock exchange to improve the trading systems as well as communication infrastructure to speed up uniform despatch, reception and sharing of new market information. Finally, the observed negative serial auto-correlation could also be as a result of the development of specialised

financial institutions such as the collective investment schemes, financial advisory firms, merchant banks, investment brokerage houses and banks among others. In the study by Bildik and Elekdag (2002), positive serial correlations were found in the first regime (pre-limit period), whereas in the second regime, the magnitudes decreased. Similarly, Phylaktis et al. (1999), found two stocks with positive serial correlations in both sub-periods. Whereas, the other stocks in their sample had negative serial correlations in the post limit period. However, Hassan et al. (2000) findings indicated serial dependence in stock returns especially in the post limit period: a consequence of the DSE being less efficient at the time of the study.

Table 2. Estimates for AR (1) GARCH (1, 1) Model for the Nairobi Stock Exchange Weekly Returns. (Sample Period January 1986 to December 2003)

	Jan.1986 - Dec.1990	**Jan.1991 – Dec.2003**	**Jan.1986 - Dec.2003**
(p,q)	(1,1)	(1,1)	(1,1)
AR (1) Coefficient	0.0000066	-0.1621571	-0.1787276
δ_1	1.0000000	1.0000000	0.99950010
α_0	0.000026	0.000011	0.0000197
α_1	-0.09311704	0.08340879	-1.1593559
B_1	0.66373282	0.47254198	0.4335030
$\alpha_1 + \beta_1$[1]	0.57061578	0.55595077	-0.7258529
Log Likelihood[2]	6304.2103	6225.7454	6446.0599
S.E.E.[3]	0.00012635	0.00001147	0.00011683
No. of Observations	247	626	873

1. The sum of $\alpha_1 + \beta_1$ represents the change in the response function of shocks to volatility per period. If $\alpha_1 + \beta_1 = 1$, a current shock persists indefinitely in conditioning the future variance. If $\alpha_1 + \beta_1 > 1$, then the response function of volatility increases with time. If $\alpha_1 + \beta_1 < 1$, this means that shocks decay with time, the closer to unity value of the persistence measure, the slower is the decay rate. N all periods, $\alpha_1 + \beta_1$ is significantly less than one. This means, volatility decreases over time.
2. Indicates the estimated maximum likelihood function values.
3. Indicates the standard error of the regression.

4.2.2 Volatility and Returns at the Nairobi Stock Exchange

Table 2 also presents the results for volatility and risk. The hypothesis that volatility is a significant determinant of stock returns is confirmed by the parameter δ_1 capturing the influence of volatility of stock returns. It is positive in all the periods. A positive coefficient δ_1 implies that investors trading equity stocks were compensated with higher returns for bearing higher levels of risk.

The study by Hassan et al. (2000) indicates the converse. That is, investors are penalised for bearing additional risk at the DSE probably as a result of low efficiency in their stock market at that time. Nonetheless, Engle, Lilien and Robins (1987), and Bollerslev, Chou and Kroner (1992) stated that the sign and magnitude of the risk-return parameter depends on the investor's utility function and risk preference, and the supply of securities under consideration. Investors may not demand high risk premia if they are able to bear risk at times of particular volatility (Glosten, Jagannathan, and Runkle, 1993). Moreover, if the future seems risky the investors may want to save more in the present thus lowering the need for larger premia. And if transferring income to the future is risky and the opportunity to invest in a risk free asset is absent, then the price of a risky asset may increase considerably, hence reducing the risk premium. Hence, as per Glosten et al. (1993), both positive and negative relationships between current returns and current variances are possible.

4.2.3 ARCH and GARCH Effects and Volatility Persistence

The significance of α and β parameters in the model indicates the tendency of the shock to persist. The measure of volatility persistence, $\alpha+\beta$ coefficients, is less than unity in all periods. This indicates the tendency for a volatility response to shocks to decay over time. Comparatively, in Table 2, the pre-limit sub-period shows a slightly higher volatility response to shocks than the post limit sub period. This can be attributed to the

introduction and presence of price limits in the market. The study by Phylaktis et al. (1999) indicates increasing persistence to shocks to volatility. As the sum of the GARCH co-efficients, α_j and β_j were close to one in nine stocks except for one in their ten stocks sample. Similarly, the study by Hassan et al. (2000) indicates a measure of volatility persistence $\alpha+\beta$ co-efficients of greater than one or almost equal to unity. This indicates the tendency for a volatility response to shocks to display a long memory.

4.2.4 Price Limits and the NSE Return Volatility

In order to curb speculation in the equity market, the NSE introduced a price limit system for all equity stocks in 1991 on the advent of the open outcry trading system. The price limit was put at 10 % for all equity stocks, up or down of their previous respective trading closing prices. The findings indicate that price limits provided a cooling off period albeit not by a large magnitude. The persistence in the conditional volatility decreased by at least 2.575% as presented by the GARCH (1, 1) modelling. Where the pre-limit period had a coefficient sum of 0.57061578 whereas, the post-limit period had 0.55595077 showing a reduction of about 0.014665 in absolute terms.

Therefore, based on the results of the study, the researcher fails to reject the null hypothesis. Since a marginal reduction in stock market volatility in the post-limit period is reported from the GARCH estimation of the weekly stock market returns. These results highlight the success and level of efficacy of the price limits at the NSE in endeavouring to control stock market volatility. The marginal results however, may face the risk of being dismissed superficially as insignificant, but careful analysis of the impact may actually prove otherwise.

Consequently, the NSE needs to review the efficacy of the price limits as a result of their marginal results at face value. Since the imposition of a blanket limit on all securities may not necessarily be beneficial, rather price limits could be imposed based on stock

price levels and frequency of trading activity synonymous to the Johannesburg Stock Exchange. There is a possibility that the findings of this study could have been contaminated by the effect of the less active stocks resulting in the little impact of price limits on volatility of the stock market as a whole. Yet the limits could have actually performed strongly on active stocks. For this reason, it may be immaterial to limit volatility of less active stocks, which also complicates monitoring and measuring the efficacy of the mechanism on individual stocks Vis a Vis the market in general. Nevertheless, the results of this study are a sufficient indicator of the direction of the stock market volatility and adequately meet the objectives and scope of the study. Lastly, the automation of the trading system should be hastened to enhance efficiency and probably reduce volatility as information is disseminated symmetrically and transactions are closed much faster to facilitate subsequent transactions of the same securities as investment conditions change in the market.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The objective of this study has been to determine empirically the return behaviour of the Nairobi Stock Exchange, and in particular, the effect of price limits on this behaviour. The NSE returns show positive skewness, significantly large kurtosis and deviation from normality. In addition, the NSE returns display significant serial independence in stock returns, implying stock market efficiency. The results also show a significant relationship between conditional volatility and the NSE stock returns, where the risk-return parameter is positive. The result is consistent with the portfolio theory, where risk is minimized and increases only if it is compensated by additional returns. The imposition of price limits overall did have a marginal effect on stock market volatility having seen a slight reduction in the post limit period. This also indicates an enhancement of the price discovery mechanism, where a positive risk-return time-varying relationship persisted in both sub-periods.

Further, from these results, the processing of new information in Kenya can be judged to be fairly strong. This could be due to the dynamism and vibrancy of the economy, and more so the financial sector especially during the post liberalization era. This can further be attributed to the increased investments in the telecommunications sub-sector, the financial sector and reforms in the capital market regulatory framework with respect to disclosure requirements and corporate governance structures. In addition, the increased capacity and frequency by the regulatory authority in monitoring compliance to the statutory framework by the listed companies has added a lot of value to the stock market.

5.2 Conclusion

Based on the results of the study, the researcher fails to reject the both null hypotheses. Since a marginal reduction in stock market volatility in the post-limit period is reported from the GARCH estimation of the weekly stock market returns and the returns are serially independent. Therefore, the imposition of daily price limits has been effective in controlling stock market volatility at the Nairobi Stock Exchange and improving market efficiency.

5.3 Limitations of the Study

A few constraints were encountered during the research period. The significant ones being, difficulty accessing the few identical studies done elsewhere, both locally and from the Internet. However, this could have been as a result of the little attention given to this problem by researchers especially in emerging markets around the world. Hence only a few of these studies are readily available. Secondly, the data set for this study is secondary in nature where the primary source was the NSE Library electronic database and archives. Over 90% of the data required was readily available, whereas the remainder was difficult to access and process. The glaring cause for this was the poor recording and unprofessional storage of stock market information.

5.4 Recommendations and Suggestions for Further Research

The NSE needs to review the efficacy of the price limits as a result of its marginal results. Further, the imposition of a blanket limit on all securities may not necessarily be beneficial, as it is immaterial to limit volatility of less active stocks.

Further research can be conducted on the effect of daily price limits on active and less active stocks similar to Phylaktis et al. (1999). Moreover, after the modernization and

automation of the NSE is fully implemented, another research can be conducted to determine whether efficiency gains would have an impact on stock market volatility.

Bibliography

Akgiray, V., (1989), "Conditional Heteroskedasticity in Time Series Stock Returns: Evidence and Forecasts," Journal of Business, 62, pp 55-80.

Baillie, R. and R. Degennaro (1990), "Stock Returns and Volatility," Journal of Financial and Quantitative Analysis, 25(June, 1990): 203-214.

Berkman, H., and Steenbeek, O.W., (1998), ''The Influence of Daily Price Limits on Trading in Nikkei futures'', The Journal of Future Mark*ets* 18, 265-279.

Bildik, R and Elekdag, S., (2002), "Effects of Price Limits on Volatility: Evidence from the Istanbul Stock Exchange"

Black, F., (1986), "Noise", Journal of Finance, vol. XLI, No. 3, 529-543.

Bollerslev, T., Ray, Y. C., and Kenneth F. K., (1992), "ARCH Modelling in Finance," Journal of Econometrics, 52 (April): 5-59.

Bollerslev, T., (1986). "Generalized Autoregressive Conditional Heteroskedasticity," Journal of Econometrics, 31 (April): 307-327.

Brennan, M. J., (1986), ''A Theory of Price Limits in Future Markets'', Journal of Financial Economics 16, 213-233.

Brown, M.B and A.B. Forsythe (1974), Robust Tests for the Equality of Variances. Journal of the American Statistical Association, 364-367.

Buckberg, E., (1995), "Emerging Stock Markets and International Asset Pricing." The world Bank Economic Review Journal Vol. 9 (1) May pp 51-74.

Chou, R., (1988), "Volatility Persistence and Stock Valuation: Some Empirical Evidence Using GARCH", Journal of Applied Econometrics, October/December, 3, pp 279-294.

Editor, (2004, April 7), Worrying trends at the NSE. Daily Nation.

Engberg, H. L., (1975), "Indigenization of Business Sector through the Organized Capital Market: The Lagos Stock Exchange", Journal of Management Studies, University of Ghana Vol. 7 No. 4.

Engle, R. F., Lilien, D. M., and Robins R. P., (1987), "Estimating Time Varying Risk Premia in the Term Structure: The ARCH-M Model", Econometrica. 55 (1987): 391-407.

Engle, R. F., and Bollerselv, T., (1986), "Modelling the Persistence of Conditional Variances", Econometric Reviews, 5, pp 1-50, 81-87.

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

Fama E. F., (1991), "Efficient Capital Markets", Journal of Finance, Vol. 46 1575-1617.

Fama, E., F., (1989), Perspectives on October 1987, ''Black Monday and the Future of Financial Markets'' (Irwin, Homewood III).

Fama, E. F., (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work", Journal of Finance, 25 383-487.

Feldman R. A and Kumar M. S, (1995), "Emerging Equity Markets: Growth, Benefits, and Policy Concerns" The World Bank Research Observer. Vol. 10 (2) August, pp 181-201.

France, V.G., Kodres, L., and Moser, J.T., (1994), "A Review of Regulatory Mechanisms to Control the Volatility of Prices, Economic Perspectives", Federal Reserve Bank of Chicago, November/December, 15-26.

French K., William S., and Robert S., (1987), "Expected Returns and Volatility", Journal of Financial Economics, 19, pp 3-29.

Glen, J., (1995), "An Introduction to the Microstructure of Emerging Markets." The World Bank Discussion Paper No. 124. Washington DC.

Glosten, L., Jagannathan R., and Runkle, D. (1993), "On the Relation between the Expected Value and the Volatility of Nominal Excess Return on Stocks", Journal of Finance, Vol. 48: 1779-1801

Hassan M. K., Islam. A. M., and Basher S. A., (2000), "Market Efficiency, Time-Varying Volatility and Equity Returns in Bangladesh Stock Market"

International Finance Corporation (IFC), (2000), "Emerging Stock Markets Fact-Book", Washington DC.

Kodres L. and O'Brien D., (1994), "The Existence of Pareto Superior Price Limits", American Economic Review, 84, 919-932.

Koutmos, G., C. Negakis, and P. Theodossiou, (1993), "Stochastic Behavior of the Athens Stock Exchange," Applied Financial Economics, Vol. 3119-26.

Koutmos, G., (1992), "Asymmetric Volatility and Risk Trade off in Foreign Stock Markets", Journal of Multinational Financial Management, 2, pp 27-42.

Ma, C.K., Rao, R.P., Sears, R.S., (1989a.), ''Volatility, price resolution, and effectiveness of price limits'', Journal of Financial Services Research 3, 165-199.

Miller, M.H., (1989), ''Comment: Volatility, Price Resolution, and the Effectiveness of Price Limits'', Journal of Financial Services Research 3, 201-203.

Miller, M.H., (1991), ''Financial Innovations and Market Volatility'', Oxford: Basil Blackwell, Inc.

Moser, J.T., (1990), Circuit Breakers, Economic Perspectives, Federal Reserve Bank of Chicago, September/October, 2-13.

Mullins, G., (2000), "Stock Market Volatility: Measures and Results," Central Wisconsin Research Bureau. United States of America.

Munga D. N., (1974), "The Nairobi Stock Exchange, Its History Organization and Role in Kenya Economy." Unpublished MBA Thesis, University of Nairobi.

Mwangi, M., N., (1997), "An Analysis of Price Movement for Selected Stocks in Nairobi Stock Exchange," Unpublished MBA Research Project Report, the University of Nairobi.

Ngassam, C., (2002), "Effects of Price Limits on Volatility and Stock returns in Emerging Markets: Evidence from the Johannesburg Stock Exchange."

NSE, (2003) website, Available from http//: www.nse.co.ke downloaded on August 14, 2004.

NSE, (2000), Market Fact File Report.

Nyamute, M. N., (1998), "The Relationship between the NSE Index and Major Economic Variables: Inflation Rate, Money Supply, TB Rate and Exchange Rate," Unpublished MBA Research Project Report, the University of Nairobi.

Phylaktis, K., Kavussanos, M. and Manalis, G., (1999), "Price Limits and Stock Market Volatility in the Athens Stock Exchange." European Financial Management, Vol.5 No.1, 69-84.

Pardy, R., (1992), "Institutional Reform in Emerging Securities Markets." Policy Research Working Papers WPS 907, The World Bank, Washington DC, pp51-74.

Samuelson, P., (1965), "Proof that Properly Anticipated Prices Fluctuate Randomly", Industrial management Review 6. 41-49

Sharpe W. F., Alexander G. J and Bailey J. V., (2003), "Investments" 6th Ed. Prentice Hall of India, New Delhi.

Stijn C., (1995), "The Emergence of Equity Investment in Developing Countries: Overview." The World Bank Economic Review Journal, Vol. 9 (1) May, pp 1-17.

Subrahmanyam, A., (1994), ''Circuit Breakers and Market Volatility: A Theoretical Perspective", Journal of Finance 49, 237-254.

Telser, L.G., (1981), ''Margins and Futures Contract'', The Journal of Futures Market 1, 225-253

Umstead, M. E., (1974), "Stock Prices and their Effect on the Market," Journal of Finance. Vol. 30 No. 4, pp 103.

U.S. Securities and Exchange Commission, (2003). .Available from http//: www.sec.gov/answers/circuit.htm Modified April 29, 2003. Downloaded August 14, 2004.

Appendix I

Listed Companies at the NSE

The Companies listed at the Nairobi Stock Exchange as at 31st December 2003.

MAIN INVESTMENT MARKET SEGMENT.

Agricultural.

Unilever Tea Kenya Limited. Ordinary shares at Kshs. 10.

Kakuzi. Ordinary shares at Kshs. 5.

Rea Vipingo Plantations Limited. Ordinary shares at Kshs. 5.

Sasini Tea & Coffee Limited. Ordinary shares at Kshs. 5.

Commercial and Services.

Car & General (K) Limited. Ordinary shares at Kshs. 5.

CMC Holdings Limited. Ordinary share at Kshs. 5.

Hutchings Biemer Limited. Ordinary shares at Kshs. 5.

Kenya Airways Limited. Ordinary shares at Kshs. 5.

Marshalls (E. A) Limited. Ordinary shares at Kshs. 5.

Nation Media Group. Ordinary shares at Kshs. 5.

TPS Limited. Ordinary shares at Kshs. 5. (Serena).

Uchumi Supermarket Limited. Ordinary shares at Kshs. 5.

Finance and Investment.

Barclays Bank Limited. Ordinary shares at Kshs. 10.

C.F.C bank Limited. Ordinary shares at Kshs. 5.

Diamond Trust Bank Kenya Limited. Ordinary shares at Kshs. 4.

Housing Finance Company Limited. Ordinary shares at Kshs. 5.

I.C.D.C Investments Company Limited. Ordinary shares at Kshs. 5.

Jubilee Insurance Company Limited. Ordinary shares at Kshs. 5.

Kenya Commercial Bank Limited. Ordinary shares at Kshs. 10.

National Bank of Kenya Limited. Ordinary shares at Kshs. 5.

NIC Bank Limited. Ordinary shares at Kshs. 5.

Pan Africa Insurance Holdings Limited. Ordinary shares at Kshs. 5.

Standard Chartered Bank Limited. Ordinary shares at Kshs. 5.

Industrial and Allied

Athi River Mining. Ordinary shares at Kshs. 5.

B.O.C Kenya Limited. Ordinary shares at Kshs. 5.

Bamburi Cement Limited. Ordinary shares at Kshs. 5.

British American Tobacco Kenya Limited. Ordinary shares at Kshs. 10.

Carbacid Investments Limited. Ordinary shares at Kshs. 5.

Crown Berger Limited. Ordinary shares at Kshs. 5.

Olympia Capital Holdings Limited. Ordinary shares at Kshs. 5.

E. A. Cables Limited. Ordinary shares at Kshs. 5.

E. A. Portland Cement Limited. Ordinary shares at Kshs. 5.

East African Breweries Limited. Ordinary shares at Kshs. 10.

Firestone East Africa Limited. Ordinary shares at Kshs. 5.

Kenya Oil Company Limited. Ordinary shares at Kshs. 0.50.

Mumias Sugar Company Limited. Ordinary shares at Kshs. 2.

Kenya Power & Lighting Limited. Ordinary shares at Kshs. 20.

Total Kenya Limited. Ordinary shares at Kshs. 5.

Unga Group Limited. Ordinary shares at Kshs. 5.

ALTERNATIVE INVESTMENT MARKET SEGMENT.

A. Baumann & Company Limited. Ordinary shares at Kshs. 5.

City Trust Limited. Ordinary shares at Kshs. 5.

Eaagads limited. Ordinary shares at Kshs. 1.25.

Express Limited. Ordinary shares at Kshs. 5.

Williamson Tea Kenya Limited. Ordinary shares at Kshs. 5.

Kapchorua Tea Company Limited. Ordinary shares at Kshs. 5.

Kenya Orchards Limited. Ordinary shares at Kshs. 5.

Limuru Tea Company Limited. Ordinary shares at Kshs. 20.

Standard Group Limited. Ordinary shares at Kshs. 5.

FIXED INCOME SECURITIES MARKET SEGMENT.

Preference Shares

Kenya Power & Lighting Limited. 4% Preference Kshs. 20.

Kenya Power & Lighting Limited. 7% Preference Kshs. 20.

Appendix II

Data Collection Table

Relevant Daily Indices to be inserted for each year of the study period.

Table 3: Data Collection Table

	YEAR: _ _ _ _				
Day	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
January					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
February					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
March					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
April					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					

	YEAR: _ _ _ _				
Day	Monday	Tuesday	Wednesday	Thursday	Friday
May					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
June					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
July					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
August					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
September					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					

	YEAR: _ _ _ _				
Day	Monday	Tuesday	Wednesday	Thursday	Friday
October					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
November					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					
December					
Week 1					
Week 2					
Week 3					
Week 4					
Week 5					