AN EXAMINATION OF THE DAY OF THE WEEK ANOMALY IN THE KENYA SHILLING/ US DOLLAR FOREIGN EXCHANGE MARKET

BY

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D61/75594/2009

A MANAGEMENT RESEARCH PROJECT SUBMITTED IN PARTIAL FUFILMENT OF THE REQUIREMENT OF THE DEGREE OF MASTERS OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

NOVEMBER, 2012
DECLARATION

This Research Project is a presentation of my original work and has not been presented for a degree in any other university.

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

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This Research Project has been submitted with my approval as the university supervisor.

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ACKNOWLEDGEMENT

First and foremost is my sincere gratitude to the Almighty God for the gift of life, resources, a sound mind and everything else that enabled me sail through the program. I will forever be grateful.

To my supervisor, DR. KISAKA SIFUNJO, for his invaluable guidance and timely feedback in completing the project. May God bless you immensely?

To the understanding of my family members and friends for the many weekends I spend attending classes. Lastly, to the support from the Equity Bank family especially KIKUYU and OTC branches. Colleagues, your encouragement moved mountains.
DEDICATION

To my late loving dad, GABRIEL MWAMBI MAWIA, for your foundation in Education. Daddy I am still climbing on the academic ladder. Rest in peace.

To my dear loving mum, MARY MWELU MUTWIWA, you have always been my inspiration.
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LIST OF ABBREVIATIONS

CRB - Commodity Research Bureau
DOW - Day Of the Week
D/P - Dividend Yield
EMH – Efficient Market Hypothesis.
FOREX- Foreign Exchange Market
GARCH- Generalized Autoregressive Conditional Heteroscedasticity
NSE- Nairobi Stock Exchange Market
LB - Ljung-Box
P/E- Price Earning
S&P 500 Index- Standard & Poor 500 index
TOM-Turn Of the Month
USD- US Dollar
USA- United States of America.
TL- Turkish Lira
ABSTRACT

The primary objective of this study is to assess the day of the week effect in the Kenya Shilling versus Us Dollar foreign exchange market using data over the period, July 2, 2007 and June 29, 2012. An investigation of the day of the effect in returns should also consider the day of the week effect on volatility. The study uses the GARCH (1, 1) framework to estimate the presence of such day of the week effect in the mean and volatility of the foreign exchange returns. Both the return and volatility equations are given. E-views (5) program was used to analyze the data.

The summary statistics reveal that the average returns and standard deviation on each day of the week varies. This implies exchange rate overshooting and undershooting, though this is just a mere statistical aberration as we do not find sufficient evidence supporting the day of the week effect. However there are signals of the Tuesday effect on the volatility equation. The absence of the day of the week effect has implications on the foreign exchange market efficiency.

**Key words**: Day-of-the-Week Effect, Volatility, Exchange rate, Generalized Autoregressive Conditional Heteroscedasticity models
CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Why are turning days better than any other days? It has been jokingly suggested that people are happier heading into the weekend and not so happy heading back to work on Mondays, but there is no universally accepted reason for the negative returns on Mondays.

1.1.1 Market Efficiency and the Day of the Week Anomaly

The concept of efficiency is central to finance. To an economist, efficiency of market has the simple meaning: the allocation of resources generated by the market is said to be efficient (Pareto optimal) if there does not exist an alternative feasible resource allocation which can make some individual better off without making someone worse off (Stiglitz, 1981). In the financial literature, however, the term efficient market takes a slightly different meaning. According to Fama (1970), a capital market is efficient if all the information set is fully reflected in securities price. Jensen (1978) defines a market to be efficient with respect to information set if it is impossible to make economic profit by trading on the basis of information set. By economic profit, we mean the risk adjusted returns net of all costs. Reilly and Brown (2007) argue that for a capital market to be termed as efficient several assumptions are made. A large number of profit maximization participants analyze and value securities, independent of the other. A second assumption is that new information regarding securities comes to the market in a random fashion, and the timing of one announcement is generally independent of others. The third assumption is profit maximizing investors adjust security prices rapidly to reflect the effect of new information. Although the price adjustments may be imperfect, it is unbiased. Meaning that sometimes the market will over-adjust and other times it will under-adjust, but it cannot be predicted which one will occur at any given time.
If the Efficient Market Hypothesis held, then markets would price financial assets broadly correctly. Deviations from equilibrium values would not last for long. If the price of a share, say, was too low, well informed investor would buy it and make a killing. If it looked too dear, they could sell or short it and make money that way. It also followed that bubbles could not form—or, at any rate, could not last as some wise investor would spot them and pop them. It would therefore be impossible to beat the market. If the information was out there, it was already in the price. The combined effect of information coming in a random, independent, unpredictable fashion and numerous competing investors adjusting stock prices rapidly to reflect this new information means that one would expect price changes to be independent and random. The idea of Random Walk Hypothesis was first suggested by Bachelier (1900). He asserted that asset prices in an efficient market are well described by a random walk and therefore they could be normally distributed. The rationale is that if markets quickly impounded any new information into current (i.e the market is efficient) then there could be no pattern in price changes hence asset prices are random.

The notion of Efficient Market Hypothesis is not only observed in stock returns, but also in various financial markets such as money, derivative and commodities markets. Interest in the foreign exchange markets efficiency goes back to the debate concerning whether, financial prices fully and instantaneously reflect all available information and how this affects economic efficiency. If the market then is not efficient, investors will trade to take advantage of the inefficiencies. Foreign exchange market inefficiency is one of the main sources of economic instability around the world and can lead to a depressed international trade. This is because prices of foreign assets, goods and factors of production are influenced if not determined by the change in exchange rates. The issues of foreign exchange market volatility with its massive impacts on real economy, international trade, other financial markets and the government intervention therefore needs to be seriously addressed. It is this volatility that ultimately determines the gains or losses through changing exchange rates.

One of the implications of efficient market hypothesis is that the expected return on assets are evenly distributed across the days, weeks, months, years or any other unit of time. In some situations, however, security or group of securities performs contrary to this notion of efficient
markets. This phenomenon is called an anomaly. The presence of such anomalies signals towards arbitrage opportunities and hence questions the efficiency of the Financial Market. This is the biggest threat to the concept of market efficiency as any one by observing these patterns can beat the market. Theoretically, anomalies are the result of shortfalls in the models applied for testing market efficiency rather than of inefficiency of market (Buchanan, 1995). Anomalies that are linked to particular time are called calendar effects. Some of the most popular calendar effects include the day of the week effect, the turn-of-the-month effect, the turn-of-the-year and the January effect.

The day of the week effect also known as the weekend effect, the Monday effect or the Monday seasonal refers to the tendency of stocks to have high returns on Fridays compared to those on Mondays. This is a particularly puzzling anomaly because as Monday returns span three days, if anything one would expect the returns on a Monday to be higher than returns for the other days of the week due to the longer period and the greater risk. There are various reasons for the day of the week effect. Lakonishok and Levi (1982) attribute the effect to the difference between the trading time and settlement time. Domodaran (1989) argue that bad news tend to be reported on Fridays and due to the delayed release of the information, Mondays are associated with lower returns. Foster and Vishwanathan (1990) also note that Mondays have more news to evaluate; therefore trade tends to be less intensive.

This study will focus on the day of the week effect in the Kenyan shilling Versus the US Dollar foreign exchange market. Our aim is to establish whether the foreign exchange market experiences such day of the week phenomenon.

1.1.2 Foreign Exchange Market in Kenya

The major participants of the foreign exchange market in Kenya are commercial Banks and foreign exchange bureaus. Other participants such as corporations, institutional investors and individual persons have to conduct their bank or broker to obtain foreign currency. Liberalization of the foreign exchange market in Kenya started with a fixed exchange rate regime that lasted up to 1982, followed by the crawling peg from 1983 to 1992. In 1992, Kenya introduced the foreign exchange bearer certificates commonly known as forex Cs), which marked the beginning of the
foreign exchange market. These forex Cs were purchased at the official exchange rate from the central Bank in a “no question asked basis”. These certificates which bore an interest rate were then marketable as any other paper. This meant that Kenya effectively had a dual exchange rate regime: the official exchange rate and a market rate. In January 1993, the forex Cs were suspended by the government meaning that the only existing exchange rate was the official one. However exporters were allowed to retain specified proportions of their foreign exchange earnings, while importers were required to purchase their foreign exchange from commercial Banks. Ngungi, (1999) further notes that following the recall of the forex Cs, speculation in the market grew. As a result, the official exchange rate was devalued three times in the first half of 1993. This persuaded the government to eliminate foreign exchange regulation hence liberalizing the foreign exchange market. This gave birth to the floating exchange rate regime implying that the exchange value of currencies was determined by market forces of demand and supply. The floating exchange rate system adopted was expected to have several advantages for Kenya. First, it would allow a more continuous adjustment of the exchange rate to shifts in the demand for and supply of foreign exchange. Second, it would equilibrate the demand for and supply of foreign exchange by changing the nominal exchange rate rather than the levels of reserves. Third, it would give Kenya the freedom to pursue its monetary policy without having to be concerned about balance of payments effects. Thus the country would have an independent monetary policy, but one that was consistent with the exchange rate movements.

Under the floating system external imbalances would be reflected in exchange rate movements rather than reserve movements. However, the exchange rate was allowed to float in an environment of excess liquidity, and massive depreciation and high and accelerating inflation ensued. The mopping up process pushed the treasury bill rate up and, because this is the benchmark for other interest rates, all other interest rates shot up to historic high levels hence devaluing the exchange rate.

After 1993, the exchange rate appreciated under the influence of short-term capital flows taking advantage of the high interest rate on the treasury bills. Those who were importing on trade credit during this time were uncertain as to what prices they would have to pay for foreign exchange when their letters of credit were called and hence wrote the expected foreign exchange redemption into their price structure. This increased the spiral of inflation.
A shift from a fixed-exchange rate regime to a managed floating exchange rate has raised the level of uncertainty and volatility. This study investigates the day of the week volatility effect in the Kenya shilling/US Dollar foreign exchange market.

1.2 Statement of the Problem
There is extensive literature regarding the day of the week effect on daily currency depreciation, (Hilliard and Tucker, 1992). Such day of the week anomalies have mostly been tested on developed markets and there is limited evidence from the emerging markets. Aydogan and Booth, (2003) in a study of the Turkish Lira, noted the presence of day of the week effect in the currency’s daily depreciation over the period, 1986–1994. Yamori and Mourdoukow, (2003) also reported the presence of the day of the week effect in the Yen/US dollar exchange rate for the 1973–1989 periods. Furthermore, Yamori and Kurihara, (2004) investigated the day of the week effect for 29 foreign exchange markets in the 1980s and found its presence; an effect they noted disappeared for almost all 29 countries in the 1990s.

Most of the studies in the empirical literature above have focused on seasonal pattern in mean return (Jaffe and Westerfield 1985; Solnik and Bousquet 1990). However, an investor should not only be concerned with expectations in asset returns, but also on volatility of the returns. The Generalized Autoregressive Conditional Heteroscedasticity or GARCH models are better suited to detect presence of calendar anomaly in financial time series due to their ability to capture properties of financial time series such as time-varying volatility of higher order moments, auto correlated returns, volatility persistence, fat tails and non-normality (Siddiqui, 2009; Al-Khazali, O.M., E.P. Koumanakos and C.S. Dan Pyun, 2008).

Moreover, most attention on the day of the week effect has been tested on the stock market. In Kenya for example, literature on foreign exchange market efficiency is limited (Kurgat, 1998; Ndunda, 2002; Muhor, 2005; Kimani, 2007). Sifunjo, Ngugi, Pokhariyal and Wainaina, (2008) examined the efficiency of the Kenyan foreign exchange market using the Kenya Shilling/US dollar exchange rate for the period January 2, 1994 to June 30, 2007. In his PHD thesis, Sifunjo, (2007) examined at all the Kenyan foreign exchange market seasonality’s from the period January 2, 1994 to June 30, 2007. However the study is not current as it was done about five years ago. In addition, it didn’t specifically focus on the day of the week effect.
This study therefore looked at an in-depth examination of the day of the week effect in both the mean and volatility of the forex returns from July 1, 2007 to June 29, 2012 in the Kenya shilling/US dollar foreign exchange market using the GARCH (1, 1) model.

The study was guided by the research question: Is there evidence of the day of the week effect in the Kenyan shilling/US dollar foreign exchange market for the period July 1, 2007 to June 29, 2012?. The study was also guided by the hypothesis that Monday returns are lower than Friday returns contradicting the efficient market hypothesis attributed by the day of the week effect.

1.3 Objectives of the Study
The general objective of the study was to analyze whether the Kenyan foreign exchange market is efficient enough by examining the day of the week effect in the Kenyan shilling/US dollar exchange rate.

1.4 Importance of the Study
Importers and Exporters. To traders, they will understand the currency volatility in relation to the day of the week hence devise mechanisms for mitigating against this risk.

Investors. Can anyone profit from the day of the week effect? The study looks at the various recurring anomalies that can be exploited by arbitragers to make abnormal profit. If investors can be able to specify a certain pattern in volatility, then it would be easier to make investment decisions based on both return and risk. This will give investors another tool to design profitable investment strategies.

Financial institutions and forex bureaus. This will provide an insight of the foreign exchange rate trading patterns that will be a useful advice to their clients. Monitoring the exchange rates over a period of time can uncover trends and seasonality’s that can be used to further predict future exchange rate behaviors.

The government and policy makers. The findings will be of help to the Kenyan government in its policy making decisions, factoring the seasonality in the foreign exchange market. Existence of such anomalies is an alarming situation for policy makers. i.e they should concentrate on the market situation and make arrangements to control this anomalous behavior. To other
developing countries, the research gives an idea about the regularities for the day of the week effects, should they decide to adopt a floating exchange rate.

Portfolio managers. Understanding the day of the week effect on the exchange rate as well as on its variance could be important for portfolio managers when they construct international assets portfolios. Knowledge of these regularities will be useful in pricing foreign currency options. This will also provide a mechanism for mitigating against foreign exchange risk brought about by the fluctuating exchange rate.

To economists. Knowledge of the properties of the daily exchange rate has important implications for economists. The effects of exchange rate movements on international trade and capital flows can be vital, especially for small open economies where foreign exchange variability could affect the economic performance significantly.

Research and Academicians. The study forms a basis for future researchers and academicians who may be examining anomalies in the foreign exchange market.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter is divided into four parts. The first section is introduction. Section two presents the theoretical literature. Empirical literature is examined in section three which is later narrowed down to the Kenyan foreign exchange market in section four. The concept of Market Efficiency is not only observed in stock returns, but also in various financial markets such as money, derivative and commodities markets. The literature relevant to the efficient market hypothesis in the foreign exchange market has been examined from the premise that the exchange rates incorporate all available information regarding exchange rate expectations and that it should not be possible to predict one exchange rate as a function of another.

2.2 Efficient Market Hypothesis (EMH)

The classic definition of an efficient market due to Fama, (1970) is a market where prices fully reflect the information available, such that an unusual profit cannot be earned through this information set (informational efficiency); puts available funds to their best possible uses (allocative efficiency) and undertakes transactions at least avoidable cost (operational efficiency).

To an economist, efficiency of market has the simple meaning: the allocation of resources generated by the market is said to be efficient (Pareto optimal) if there does not exist an alternative feasible resource allocation which can make some individual better off without making someone worse off (Stiglitz, 1981). In the financial literature, however, the term efficient market takes a slightly different meaning. According to Reilly and Brown, (2007) an efficient capital market is one in which security prices adjust rapidly to the arrival of new information and, therefore the current prices of securities reflect all information about the security. This is referred to as an informational efficient market meaning that one cannot consistently achieve returns in excess of average market returns on a risk adjusted basis, given the information publicly available at the time the investment is made. The two mostly widely applied definitions, both referring to informational efficiency, are the following. “A capital
market is efficient if all the information set is fully reflected in securities price” (Fama, 1970). According to (Jensen, 1978), a market is efficient with respect to information set if it is impossible to make economic profit by trading on the basis of information set. By economic profit, we mean the risk adjusted returns net of all costs.

According to Stiglitz, (1981), market efficiency (informational efficiency) used by financial economists is only a part of overall market efficiency. This requires that, the market must provide the correct incentives for gathering the right amount and kind of information, the market prices must reflect the information available to the various traders, and the firms must be able to convey the information efficiently about their prospects to potential investors (Stiglitz, 1981). The most important notion of the theory is that an investor can only get increased returns by taking on more risk (keeping interest rates fixed; increased interest would result in a higher expected ROR). Fama and French (2004) explains that it is the risk that you cannot diversify away that you get compensated for. Efficient market theory states that “prices reflect all available information. In a perfectly efficient market it is impossible to beat the market. Investors are always paying a “fair price”. This means that the only thing investors have to worry about is choosing which risk-returns-trade-off they want to be involved with.”

The efficient market theory (EMT) evolved from Eugene Fama’s dissertation “The Behavior of Stock Market Prices” in 1965. Later in 1965 it was summarized and republished as ”Random Walks in Stock Market Prices”. Bachelier, (1900) observed that asset prices in an efficient market are well described by a random walk and therefore could be normally distributed. Changes in asset prices do not display any pattern. The rationale is that if markets quickly impounded any new information into current asset prices (i.e. the market is efficient) then there could be no pattern in price changes hence asset prices are random.

In the past most of the evidence seems to have been consistent with the EMH (Seyum, 1968). Prices were seen to follow a random walk model and the predictable variations in equity returns, if any were found to be statistically insignificant. Famas second review (1991) on efficient market efficient Hypothesis reiterated that any investigation on market efficiency has at least two problems. The first is information and transaction cost and the other is the joint hypothesis problem. Unlike the 1970 paper which he used the terms weak form, semi strong and the strong
form, Fama (1991) focused on three areas. Tests for returns predictability, event studies, test for private information. The return predictability focuses on predicting from past returns including other variables such as Dividend yields, Earnings Price and term structure variables as well as for longer horizons. Fama points that any test of asset pricing models runs into the joint hypothesis problem, where he emphasizes the fact that one can never know whether the market is inefficient or the model is wrong and that the choice of the model might influence the findings. His conclusion on predictability is the absence of a pricing model.

### 2.2.1 Forms of Market Efficiency

Literature on finance presents three different forms of informational efficiency in stock market: weak-form, semi-strong form, and strong form based on set of information reflected in security prices (Fama, 1970; Jensen, 1978). In the weak form, the information set is taken to be solely the information contained in the past price history of the market as of time t whereas in the semi-strong form is taken to be all information that is publicly available at time t such as published financial data about companies, government data about economy earnings estimates disseminated by companies and security analysis and so on. This includes the past history of prices so that the weak form is just a restricted version of this (Fama, 1970; Jensen, 1978). This hypothesis implies that investors who base their decision on any important new information after it is public should not derive above average risk-adjusted profits from their transactions, considering the cost of trading because the security price already reflects all such new public information (Mishkin, 2007). Finally, in a strong form is taken to be all information known to anyone at time t including even insider information such as imminent corporate takeover plans and extraordinary positive and negative future earnings announcements (Fama, 1970; Jensen, 1978). Seyhun (1986) provides sufficient evidence that insiders profit from trading on information not already incorporated in prices.
2.2.2 Arguments Against the Validity of the EMH

The Efficient Market Hypothesis theory has been met with a lot of opposition. The dominant paradigm has been put on trial recently and subjected to critical re-examination (Porteba and Samwick, 1995). The preliminary evidence indicates that that the initial confidence in the Efficient Market Hypothesis might have been misplaced (Reiganum, 1981).

In 1980 Sanford Grossman and Joseph Stiglitz winners of global prize pointed out a paradox in the Efficient Market Hypothesis which they developed in the context of equity market. As applied in the foreign exchange market, the argument starts by noting that the exchange rate returns are determined by fundamentals like national prize levels, interest rate, and public debt levels and that information about these variables is costly for traders to gather and analyze. Grossman and Stiglitz(1990). The traders must be able to make some excess returns by trading on this analysis, or they will not do it. But if markets were perfectly efficient, the traders would not be able to make excess returns on any available information. Therefore markets cannot be perfectly efficient in the sense of exchange rates always being exactly where fundamentals can recover the cost of fundamental research by profiting from having marginally better information than the rest of the market on where the exchange rate should be. In this case, the exchange rate remains close enough to its fundamental value to prevent less informed people from profiting the difference. Partly for these reasons, Campbell, Lo and Mackinlay (1997) suggest that the debate about perfect efficiency is pointless and that it is more sensible to evaluate the degree of inefficient than to test for absolute efficiency. If prices reflect all the information, then there is no gain from going to the trouble of gathering it, so no one will. A little inefficiency is therefore necessary to give informed investors an incentive to drive prices towards efficiency.

The poor empirical performance of standard exchange rate models is another reason to suspect failure of the efficient market hypothesis. Meese and Rogoff (1983) persuasively showed that no existing exchange rates models could forecast exchange rates better than no change guess at forecast horizons of up to one year. This was true even when the exchange rate models were given true values of future fundamentals like output and money.

In the real world of investments, there are obvious arguments against the EMH. There are investors who have beaten the market. Warren Buffet, whose investment strategy focused on
undervalued stocks, made millions and set an example for numerous followers (Dechow, Hutton, Meulberek and Sloan 2000). There are portfolio managers that have better track of records than others, and there are investment houses with more renowned research analysts than others (Gompers and Metrick, 2001). So how can performance be random when people are clearly profiting from and beating the market? Many investors base their expectations on past prices, past earnings, track records, and other indicators. Since currency prices (exchange rates) are largely based on buyer expectation, many believe it only makes sense to believe that past prices do influence future prices, Goodman (1979)

Behavioral finance which applies the insights of psychology to finance has boomed in the past decade. Behavioral economists have argued that human beings tend to be confident in their own abilities and tend to extrapolate recent trends into the future, a combination that may contribute to bubbles. Studies in behavioral finance which look into the effects of investor psychology on stock prices reveal there are some predictable patterns in the stock market (Hirshleifer and Shumway, 2001). Investors tend to buy undervalued stocks and sell overvalued stocks and in a market of many participants, the market can be anything but efficient (Klein, 1986)

Berber and Odean (1999) argue that the field of modern financial economics assumes that people behave with extreme rationality, but they do not. They point out that people’s deviations from rationality are often systematic. Behavioral finance relaxes the traditional assumptions of financial economics by incorporating these observable, systematic and very human departures from rationality into standard models of financial markets. They highlight two common mistakes investors make: excessive trading and the tendency to disproportionately hold on to losing investments while selling winners. They further argue that systematic biases have their origins in human psychology. That the tendency for human beings to be overconfident causes the first bias in investors and the human desire to avoid regret prompts the second.

Hirshleifer (2001) also makes his contribution that the basic paradigm of asset pricing is in vibrant flux. The purely rational approach is being subsumed by a broader approach based upon the psychology of investors. In his approach security expected returns are determined by both risk and misevaluation. Hirshleifer broader observation is that investor behavior in natural and experimental markets report evidence consistent with a disposition effect, a greater readiness to
realize gains than losses. Certain groups of investors change their behaviors in parallel, in some cases engaging in momentum trading that result in gain.

2.2.3 Efficient Market Hypothesis Anomalies

The growth in the amount of data and computing power available to researchers, along with the growth in the number of active empirical researchers in finance since Fama’s (1970) paper has created an explosion of findings that raise questions about the efficient capital markets (Schweret, 2002). A number of studies have reported time patterns in security returns, returns being higher or lower depending on the time of the day, the day of the week, and the month of the year. Many researchers working on these variables, and set of data, patterns have been found, and they are simply random. Some studies have explained that these patterns are partly induced by the market structure and order flows (Mishkin 2007). Markets are inefficient because one would expect that the patterns would disappear as investors exploit them, but due to transactional costs, the return differences are not large enough to develop a trading strategy to take advantage of them (Mishkin 2007).

These findings are referred to as anomalies. In the non-investing world, an anomaly is a strange or unusual occurrence. In financial markets, anomalies refer to situations when a security or group of securities performs contrary to the notion of efficient markets, where security prices are said to reflect all available information at any point in time (investopedia.com).

Calendar Anomalies

Calendar anomalies include the calendar or seasonal regularities such as the day of the week effect, January effect, turn of the month effect. These phenomena have been referred to as anomalies because they cannot be explained within the existing paradigm of EMH.

The Day of the Week Effect

The day-of-the-week effect (also called as weekend effect or Monday effect) indicates that the average daily return of the market is not the same for all the days of the week, as we would expect on the basis of the efficient market theory. The weekend effect describes the tendency of stock prices to decrease on Mondays, meaning that closing prices on Monday are lower than
closing prices on the previous Friday. Hence it would be advisable for traders to sell late on Fridays and purchase on Mondays. For some unknown reason, returns on Mondays have been consistently lower than every other day of the week. In fact, Monday is the only weekday with a negative average rate of return (invesopedia.com).

Several hypotheses have been extended to explain the day-of-the-week effect; the most prominent among them are the information release hypothesis, the information processing hypothesis and the settlement regime hypothesis. The information release hypothesis (French, 1980; Rogalski, 1984; Penman, 1987; Damodaran, 1989;) suggests that business leaders delay in release of negative information until after the closure of stock exchange on Friday so that the investors get some time to cool down before they react on next trading day. On the other hand, good news is released as soon as it is available. Clustering of negative information release at weekends is responsible for bearish environment in the stock market on its reopening on Monday. The information processing hypothesis according to Abraham and Ikenberry, (1994) argues that the behaviour of individual investors is responsible for observed Monday-effect. It is argued that gathering information during weekdays trading hours is particularly costly for individual investors as most of them are employed with other activities during that period. For them, weekend provides a convenient opportunity to gather and process the information and to reach at investment decisions. On the other hand, the institutional investors use Monday morning to frame the trading strategy for the coming week (Osborne, 1959), therefore there is less trading from institutional traders on Monday. This situation produces a downward pressure on prices on that day. The settlement regime hypothesis (Gibbons and Hess, 1981; Lakonishok and Levi, 1982; Solnik and Bousquet, 1990,) suggests that the delay in cash payment for the security can lead to escalation of rate of returns on specific days due to extra credit period availability. On the other hand, the trading time hypothesis postulates that market considers only the trading time while determining the period of credit available for settlement and does not expect any interest for the delay in settlement because of holidays.

**Turn-of-the-Month Effect**

This indicates that average daily rate of returns on common stock around the turn-of-the-month is different to that of average rate of return of remaining days of the calendar month. There are two accepted lines of definition regarding the turn of- the-month days. These include that of
Ariel (1987) and Lakonishok and Smidt (1988). Ariel defines turn-of-the-month days to include the last trading day of the previous month and the first four trading days of the month. He analyzes the value weighted CRSP index for 19 years period (1963-1981) and provides some evidence that days around the turn-of-the-month (-1 to +4) exhibit a high rate of return. Lakonishok and Smidt (1988) analyzed Dow Jones Industrial Average for turn of month effect with an event window of (-1, +3) i-e last working day of previous month and first three days of new month. He analyzed a ninety year period, 1897 to 1986, and found a cumulative average return of 0.473% for his event window which is higher than cumulative average return for rest of the month. Hensel and Ziemba (1996) used five day event window i-e (-2, +3) for U.S stock market to show the existence of TOM effect. He analyzed data for 1928 to 1993 and found that returns on -1, +2 and +3days are significantly higher.

Different hypothesis have been formulated to explain the existence of turn of month effect. Pay Day Hypothesis explains that the turn of the month effect takes place because at end of the month, usually investors need cash to pay the compensation of employees or for other business purposes like dividend and interest. So they take their money out of the market at end of month and reinvest the amount in new month. This gives birth to high stock prices at turn of month (Bahadur and Joshi 2005, Ogden 1990). Secondly, the Window Dressing Hypothesis asserts that at the end of the month investors, especially institutional investors tend to wipe out their portfolios in order to come up with only winners in hand at month end as an indicator of their high performance over the month. As the month changes, investors start buying back the stocks which push the stock prices up in market (Lakonishok’et al 1991). Lastly, the Time of release of information points out that Positive returns at beginning of a month may be a result of some positive news arrived in market. As Penman (1987) reported that investors launch positive news in beginning of new quarter and so positive returns along with new announcement are observed especially in beginning of quarter.

**January Effect**

Small-company stocks outperform the market and other asset classes during the first two to three weeks of January. This phenomenon is referred to as the January effect. (investopedia.com)
Various hypotheses (Chen & Singal, 2001) have been formulated to explain the anomaly of January effect. According to the tax selling hypothesis, investors wanting to realize capital losses in the current tax year create a downward price pressure at the end of the year (December) on securities that have previously experienced negative return. Branch (1977). Subsequently, at the beginning of the new tax year (January), this selling pressure is relieved and the affected securities earn excess return as their prices rebound.

Evidence in support of this hypothesis is provided by Jones, Lee and Apenbrink (1991); Poterba and Weisbenner (2001); Chen and Singal (2001); Dai (2003). Contradicting evidences are also abundant, Brown et. al (1983) report significant January effects in Australia, even though January is not the beginning of the tax year.

The window-dressing hypothesis developed by Haugen and Lakonishok (1988), asserts that institutional managers are evaluated based on their performance and their investment philosophy. To improve their performance, the institutions buy both risky stocks and small stocks but sell them before the end of the year so that they do not show up in their year-end holdings. At the beginning of the following calendar year (in January), investment managers reverse the process by selling winners, large stocks, and low risk stocks while replacing them with small and risky stocks that typically include many past losers.

Other Seasonal Effects

Holiday Effect. The consistency of the pattern around the weekend closing suggests that it may apply to any gap in trading. Empirical studies in US and other countries have reported high rates of return before holidays. For example, Roll (1988) observe high rates of return on the last trading day of December and Lakonishok and Smidt, (1988) report high rates of return around Christmas. Lakonishok & Smidt define a holiday as a day when trading would normally have occurred but did not. Further, the days are classified as pre-holiday, post-holiday, or regular (neither) without regard to the day of the week. Pre-holidays are those days which have at least one preceding day as trading day, but at least one succeeding day as holiday. Post-holidays include those days which have at least one preceding day as holiday, but at least one succeeding day as trading day.
**Small Firm Effect.** Banz (1981) published one of the earliest articles on the small firm effect which is also known as the size effect. His analysts of the 1936-1975 period reveals that excess returns would have been earned by holding stocks of low capitalization companies. Supporting evidence is provided by Reinganum (1981) who reports that the risk adjusted annual return of small firms were greater than 20%. If the market were efficient, one would expect the prices of stocks of these companies to go up to a level where the risk adjusted returns would be normal. But this did not happen.

**P/E Ratio Effect.** Basu (1977) shows that stocks of companies with low P/E ratios earned a premium for investors during the period 1957-1971. An investor who held the low P/E ratio portfolio earned higher returns than the investor who held the entire sample of stocks. The results also contradict the EMH.

**Over/Under Reaction of Stock prices to earnings Announcements.** Debondt and Thaler (1985) presents evidence consistent with stock prices over reacting to current changes in earnings. They report positive (negative) estimated abnormal stock returns for portfolios that previously generated inferior (superior) stock prices and earnings performance. This could be construed as the prior period stock price behavior overreacting to earnings development (Bernard, 1993). Bernard (1993) provides evidence that is consistent with the initial reaction being too small and being completed over a period of at least six months. He further notes that such anomalies are not due to research design flaws, inappropriate adjustment for risk or transaction costs. Thus the evidence suggests that information is not impounded in prices instantaneously as the EMH would predictive when it is.

**Standard & Poor (S&P) Index Effects.** Shleifer (1986) find a surprising increase in share prices (up to 3 percent) on the announcement of a stocks inclusion into the S&P 500 index. Since in an efficient market, only information should change prices, than the positive stock price reaction appears to be contrary to the EMH because there is no new information about the firm other than its inclusion in the index.
**Pricing Closed End Funds:** The investment company act of 1940 USA regards all investment funds that do not continuously issue and redeem their shares as closed end funds. Unlike open end funds, closed end funds do not stand ready to sell or repurchase their securities at the net asset value per share. They float a fixed number of shares in an initial public offering and after that, investors wishing to buy to sell shares of a closed end funds must do so in the secondary market. The prices in the secondary market are dictated by the market forces of demand and supply which may not be directly linked to the funds fundamental or net asset value. Malkiel (1977) argues that that market valuation of closed end investment company shares reflect mispricing. As he notes, the pricing of closed end funds does not seem to provide an illustration of market imperfection in capital asset pricing. In general the funds have shown to trade at a discount relative to their net asset values. Between 1970 and 1990, the average discount on closed end funds ranged between 5 to 20 percent. The existence of discounts clearly contradicts the value additivity principle of efficient and frictionless capital markets.

**Weather.** Few would argue that sunshine puts people in good mood. People in good mood make more optimistic choices and judgments. Saunders (1993) shows that the New York stock exchange index tends to be negative when it is cloudy. More recently, Hirshleifer and Shumway (2001) analyzed data for 26 countries from 1982-1997 and find out that stock market returns are positively correlated with sunshine in almost all of the countries studied.

**2.3 Empirical Literature on the Day of the Week Effect**

Osborne (1959) was the first to document the day of the week effect. Since Osborne’s discovery, Cross (1973), French (1980), Gibbons and Hess (1981), Lakonishok and Levi (1982), Keim and Stambaugh (1984), Rogalski (1984), Harris (1986), Ho (1990), Berument and Kiymaz (2001) amongst others have confirmed that there are differences in the distributions of stock returns in each of the week days (Olsen 1998). Cross (1973) demonstrated empirically that Monday yields were lower than Friday ones for the S&P 500 Index. The findings reveal that both lowest mean return and highest variance occur on Monday offering a poor risk–returns relationship compared to those of the other days of the week. French (1980) reported similar results after comparing Monday, Friday and weekly average returns for the same index. He observed that Monday returns
were lower than the average while Friday returns were greater than the average. Gibbons and Hess (1981) on a study of a sample of 30 stocks from the Dow Jones Industrial Index also concluded that Mondays resulted in negative returns.

Such phenomenon has also been investigated in the non Equity markets. Flannery and Protopapadakis (1988) detected the presence of the day of the effect in the stock and bond markets. Using daily S&P 500 and Treasury security closing price (yield) data from mid-1977 through mid-1984, the two authors investigated the extent to which intra-week seasonality existed and whether its pattern was uniform across three stock indices and Treasury bonds with seven different maturities. They found out that intra-week seasonality continues to be significant and that its pattern was not uniform, either between the stock indices and the Treasury bonds or even among the bonds alone. A pattern shared by stocks and bonds is that Monday returns became increasingly negative with maturity. Gay and Kim (1987) confirm day-of-the-week effect in the commodity future market by analyzing a twenty-nine-year history of the Commodity Research Bureau (CRB) futures price index. The index is based on the geometric average of twenty-seven commodities using prices from all contract maturities of less than twelve months for each commodity.

Empirical examination of the day of the week anomaly in foreign exchange markets has been limited. Nevertheless, the extant studies point out to the presence of such effect in the spot rates of major currencies. McFarland, Pettit and Sung (1982), were the first to document the day-of-the-week effect in the foreign exchange market, with empirical results showing that Monday and Wednesday offer higher average returns than Thursday and Friday. They observed that for eleven foreign exchange markets, the dollar denominated price changes were high on Mondays and Wednesdays and low on Thursdays and Fridays. This was re-examined and confirmed by So (1987). Later, Hsieh (1988) examined the statistical property of daily rates of change of five foreign currencies and found evidence of mean and variance being different across days of the week. Tang (1997) investigated the interaction between diversification and day-of-the-week effects on exchange risks in six foreign currencies. He found that different days in week have significant impact on the diversification of foreign currency risk, especially on skewness and
kurtosis. According to his results, both the skewness and kurtosis are unsystematic and they keep on changing, in both value and sign over different days in the week.

Bessembinder (1994) motivates day of the week effects in the foreign exchange market through inventory-carrying costs. He demonstrates that bid-ask spreads in the spot and forward market are higher on Fridays and prior to holidays. This result was supported by Glassman (1987), while Breuer (1999) showed that although day of the week effect is present in the forward foreign exchange markets, it is statistically insignificant.

Yamori and Mourdoukow (2003) investigated the day of the week effect for the Yen/US dollar exchange rate. They reported the presence of the day of the week effect for the 1973–1989 periods. They further argued that the day of the week effect disappeared in the 1990s, an occurrence they ascribed to the financial deregulation in Japan that increased the efficiency of the financial markets. Furthermore, Yamori and Kurihara (2004) found some support for the day of the week effect for 29 foreign exchange markets in the 1980s. They also stated that the day of the week effect disappeared for almost all 29 countries in the 1990s. Aydogan and Booth (2003) argued that the day of the week effect was present in the daily depreciation of the local currency in Turkey for the 1986–1994 period. Berument, Coskun and Sahin (2006) in a similar study on the depreciation and volatility of the Turkish lira (TL) against the US dollar (USD), reported discovered the day-of-the-week effect in both return and volatility equations.

This was later confirmed by Hakan, B., M.N. Coskun and A. Sahin, (2007) who later found a significant day-of-the-week-effect in the Turkish foreign exchange market, while Ke, M., Y. Chiang and T.L. Liao, (2007) indicated that higher returns appear on the first three days of the week across different trading-day regimes in the Taiwan foreign exchange market.

2.4 Empirical Literature in Kenya

Mokua (2003) sampled 43 companies listed in the NSE continuously for 5 years from 1st April 1996 to 31st March 2001. Secondary data was obtained daily on transaction prices extracted from NSE records. The data collected was analyzed using linear regression and comparison of mean done under independent sample t test. His study concluded that Monday returns are not significantly lower than the other days nor are Friday returns significantly higher than the other
days of the trading week. This was later confirmed by Elima (2007) who studied the reverse weekend effect in the Nairobi Stock exchange Market. The data for the study consisted of daily stock returns of 32 sampled companies listed on the NSE from 1st January 2001 to 31st December 2005. The data was split into two sub samples for large and small companies and analyzed using regression analysis. The study found out that Monday returns are highly significant though their coefficient was not positive, hence there was no day of the week effect at the Nairobi Stock exchange market.

Recently, Onyuma (2009) investigated the presence of the day of the week effect and month of the year effects on the Kenyan Stock Market returns. Data on prices and adjusted returns were derived from the NSE 20 index for the period 1980 to 2006 and analyzed using regression analysis. Results indicated that Mondays produced the lowest negative returns, while Friday and January produced the largest positive returns thus confirming the day of the week effect in the NSE.

Studies in the context of the day of the week anomaly in the Kenyan foreign exchange market have been almost non-existent. Those who have studied the foreign exchange market efficiency have approached it from a wholesome approach without singling out a particular seasonality. Never the less all these studies agree that foreign exchange markets in Kenya are inefficient.

Kurgat, 1998) pointed out inefficiency of the Kenyan foreign exchange market due to the existence of arbitrage opportunities. He showed that there was an opportunity to make instantaneous risk free profits through locational arbitrage. The same is confirmed by Muhoro (2005) who examined the presence of locational and triangular arbitrage in the currency market. She used data in form of daily closing counter foreign exchange rates for six banks and fifty seven bureaus. The data was analyzed using chi- square and line graphs. The research concluded that the foreign exchange market was not efficient due to the existence of arbitrage opportunities for both bureaus and banks.

Recently Sifunjo, Ngugi, Pokhariyal and Wainaina, (2008) conducted an analysis of the foreign exchange market in Kenya. The study examined the Efficiency Market hypothesis in its weak form using run tests, unit root tests and the Ljung-Box Q-statistics. The motivation was to determine whether foreign exchange rate returns followed a random walk. The data covered the
period starting January 1994 to June 2007 for the daily closing spot price of the Kenya shillings per US dollar exchange rate. The study found out that the foreign exchange rate market was not efficient. The results showed that most of the rejections are due to significant patterns, trend stationarity and autocorrelation in foreign exchange returns. This is attributed to both exchange rate undershooting and overshooting phenomena. In his thesis, Sifunjo, (2007) examined at all the Kenyan foreign exchange market seasonality’s from the period 1994 to June 30, 2007. Studies examining the rationality of market participants include those for Ndunda, 2002; and Kimani, 2007). All these studies agree that foreign exchange markets in Kenya are inefficient.

2.5 Summary
The EMH revolutionized beliefs about the pricing and the operation of capital markets, because it was in line with an ideology that markets, whether capital or otherwise, know best. However, the theory has been met with a lot of opposition. The paradigm has been put on trial and subjected to critical re-examination. The preliminary evidence indicates that that the initial confidence in the Efficient Market Hypothesis might have been misplaced. It has been well documented in Finance literature that any predictable pattern in returns may be exploitable and judged as evidence against the Efficient Market Hypothesis. One statistically significant pattern in exchange rates stems from seasonality. As such, these effects in currency markets have attracted much interest and numerous researchers have studied daily seasonal anomalies in the foreign exchange market. For a long time such effects were noted but largely dismissed as anomalies; deviations or departures from the norm. It was not until prospect theory of Kahneman and Tversky found its way to the financial economics literature that an alternative logic of investors’ behavior has been seriously contemplated and tested. This literature is referred to by its practitioners as behavioral finance.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction
This chapter outlines the Research Methodology that the researcher used to execute the study in a bid to satisfy the study objectives. The methodology details the research design adopted, population of the study and the methods used for data collection and data analysis. The source of the Data outlining its validity and reliability is also captured.

3.2 Research Design
The study was descriptive in nature describing whether the Kenya shilling Vs Us Dollar Foreign Exchange Market over the period from July 1, 2007 to June 29, 2012 shows the day of the week effect. The day of the week effect in both the foreign exchange rate return and its volatility was assessed. To achieve this objective two methods were used: (1) log-different - to compute the foreign exchange rate returns (2) GARCH (1,1) model to estimate the day-of-the-week effect in both the foreign exchange rate return and volatility.

3.3 Population
The population of the study consisted of the foreign exchange rates on the Kenya shilling Vs Us Dollar exchange rates from 1st July 2007 to 29th June 2012 downloaded from the Central Bank of Kenya website (www.centralbank.go.ke/index.php/rate-and-statistics). All the items in the population were tested. There were 1,243 observations.

<table>
<thead>
<tr>
<th>Day</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>245</td>
<td>252</td>
<td>253</td>
<td>251</td>
<td>242</td>
<td>1243</td>
</tr>
</tbody>
</table>

3.4 Data and Data Collection
The study used secondary data on the daily Kenyan Shilling/Dollar exchange rates from July 1, 2007 to, June 29 2012 downloaded from the Central Bank of Kenya’s website. Duration of five years from July 1, 2007 to June 29, 2012 was considered ideal. The return on the exchange rate was preferred to the actual mean exchange rate. Campbell, Lo and Mackinlay (1997) give two mean reasons for using returns. First, for average investors, return of an asset is a complete and
scale-free summary of the investment opportunity. Second, return series are easier to handle than price series because the former have more attractive statistic properties.

3.5 Data Analysis

The return on exchange rate (appreciation or depreciation) was computed using the formula:

$$ R_t = \log (e_t/e_{t-1}) $$

Where $R_t$ is the return on the exchange rate, $e_t$ is the mean Kenyan shilling/dollar exchange rate at time $t$ and $e_{t-1}$ represent Kenyan shilling exchange rate at time $t-1$. Descriptive statistics was used to analyze data on exchange rate returns. This includes the mean, median, maxima, minima, standard deviation, skewness, kurtosis and Jarque-Bera.

Volatility of the daily exchange rate return series was modeled using GARCH (1,1) where both the Return and Volatility equations of the model are given. Most of the studies searching for the day of the week effect in the depreciation rate (e.g. Aydogan and Booth, 2003, for Turkey) use the standard ordinary least square method, which has two drawbacks. Firstly, errors in the model may be auto-correlated, resulting in misleading inferences. Secondly, error variances may not be constant over time, which means heteroscedasticity. In order to account for the auto-correlation problem, lagged values were included in the return equation.

**Mean Equation (R_t)**

$$ b_0 + b_1 \delta_{1t} + b_2 \delta_{2t} + b_4 \delta_{4t} + b_5 \delta_{5t} + \sum_1^4 e_t R_{t-1} + e_t $$

$\delta_{jt}$ is a dummy variable which takes on the value 1 if day is $j$ and 0 otherwise ($j = 1, 2, 4, 5$). Since data is available on five day basis, there will be four dummies treating Wednesday as the reference day. Wednesday dummy variable is excluded to avoid the dummy variable trap.

$b_1, b_2, b_4, b_5$ are coefficients representing Monday effect, Tuesday effect, Thursday effect and Friday effect, $b_0$ represents the day of the week effect at day 0. Their statistical significance will determine the presence of the day of the week effect in the exchange rate return series.

$e_t$ represents the coefficient of lag of the exchange rate returns, $t$ takes the value of 1 if day is Monday, 2 if day is Tuesday, 4 if day is Thursday and 5 if day is Friday. These are added to correct for autocorrelation in the exchange rate return series.

$\varepsilon_t$ represents White Noise Error term uncorrelated with all explanatory and past variables and has a constant variance over time.
The second problem brought about by standard least squares method where the error variances are not constant over time was solved allowing variances of errors to be time dependent in the volatility by the volatility equation.

\[
\text{Volatility Equation } (\sigma^2_t) = h_0 + \alpha \varepsilon^2_{t-1} + \beta \sigma^2_{t-1} + h_1 \delta_{1t} + h_2 \delta_{2t} + h_3 \delta_{3t} + h_4 \delta_{4t} + h_5 \delta_{5t} \tag{3}
\]

\[
\varepsilon_t = z_t \sigma_t \quad z_t \sim D_r(0,1) \tag{4}
\]

Where \( \alpha \) and \( \beta \) are volatility parameters, \( \sigma^2 \) is the variance of the mean returns, \( \varepsilon \) represents a white noise error term and \( h_0 \) is an incorporated lagged variable. It is a coefficient taking on the value of \( h_1, h_2, h_4 \) and \( h_5 \) if Monday, Tuesday, Thursday and Friday effect respectively. \( h_0 \) was tested at 5\% confidence level in the equation to test whether volatility of the exchange rate returns demonstrates the day of week effect. \( D_r(0,1) \) is the probability density function of the residual with zero mean and unit variance. \( V \) are additional distribution parameters to describe the skew and shape parameters of the distribution.

Auto-correlation test is a reliable measure for testing of either dependence or independence of random variables in a series. The serial correlation coefficient measures the relationship between the values of a random variable at time \( t \) and its value in the previous period \( t-1 \). Autocorrelation test provides evidence whether the correlation coefficient for lagged variables are significant different from zero. The LJung Box test \( Q \) statistics was used to confirm autocorrelation in the exchange rate returns while \( Q^2 \) test was used to test for heteroscedascicity in the exchange rate returns. The unit root test was used to test for the exchange rate return series using the Augmented Dickey-Fuller test and Phillips-Perron test statistics for the exchange rate returns series.

**3.6 Data Validity and Reliability**

The data was sourced from the Central Bank of Kenya website to ensure that it is free from errors. The Central Bank of Kenya is responsible for managing the country’s foreign exchange reserves. It is mandated with regulation of the financial system and plays a supervisory role with regard to the management of the foreign exchange business. The US dollar has been selected since it is the most traded currency on the spot market and is the denominator of most business transactions and asset valuations. A recent data for the last five years was considered ideal.
CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents an analysis of the results for the study. This includes the summary statistics comprising the mean, median, maximum, minimum, standard deviation, skewness, kurtosis and the Jarque- Bera. Further the empirical model is also presented. The chapter concludes with a discussion of the results and a summary.

4.2 Summary Statistics

Table 1: Summary Statistics of the Exchange Rate Returns

<table>
<thead>
<tr>
<th></th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>ALL DAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-1.38E-06</td>
<td>1.26E-05</td>
<td>-7.38E-06</td>
<td>-1.51E-05</td>
<td>0.001360</td>
<td>0.000262</td>
</tr>
<tr>
<td>Median</td>
<td>0.000361</td>
<td>4.14E-05</td>
<td>0.000194</td>
<td>0.000370</td>
<td>0.000155</td>
<td>0.000214</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.030774</td>
<td>0.026852</td>
<td>0.026250</td>
<td>0.036136</td>
<td>0.224657</td>
<td>0.224657</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.100486</td>
<td>-0.098326</td>
<td>-0.103620</td>
<td>-0.104711</td>
<td>-0.026323</td>
<td>-0.104711</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.008861</td>
<td>0.008913</td>
<td>0.009368</td>
<td>0.009306</td>
<td>0.015735</td>
<td>0.010721</td>
</tr>
<tr>
<td>Skewness</td>
<td>-5.930610</td>
<td>-5.386439</td>
<td>-5.579172</td>
<td>-5.645704</td>
<td>11.89376</td>
<td>4.565216</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>69.99072</td>
<td>61.19091</td>
<td>61.53463</td>
<td>66.97020</td>
<td>169.8824</td>
<td>182.3905</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>47248.71</td>
<td>36773.49</td>
<td>37431.48</td>
<td>44130.84</td>
<td>285339.7</td>
<td>1669678.</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Sum</td>
<td>-0.000338</td>
<td>0.003164</td>
<td>-0.001867</td>
<td>-0.003787</td>
<td>0.327813</td>
<td>0.324987</td>
</tr>
<tr>
<td>Sum Sq.Dev.</td>
<td>0.019159</td>
<td>0.019938</td>
<td>0.022114</td>
<td>0.021650</td>
<td>0.059420</td>
<td>0.142642</td>
</tr>
<tr>
<td>Observations</td>
<td>245</td>
<td>245</td>
<td>253</td>
<td>251</td>
<td>241</td>
<td>1242</td>
</tr>
</tbody>
</table>

Source: AURTHOR (2012)

Table 1 reports the descriptive statistics for the returns on exchange rates for the study period as well as the returns for each day of the week. The average return for the entire study period is 0.000262. Only Tuesday and Friday exhibit a positive average return. The standard deviation of the return is 0.010721, and skewness is 4.565216. The kurtosis is 182.3905 which is much larger than three. The relatively high kurtosis indicates that the series is non-symmetric with higher
peaks and fatter tails than the normal distribution. Further, the Jarque-Berra normality test (p < 0.001) reveals a statistically significant deviation of the data from normality.

It shows that Wednesday had the lowest mean which is (-7.38E-06) and the highest mean was recorded on Friday (0.001360). This indicates that the return on every Wednesday of the particular year is lower compared to other weekdays. The signs of the findings are in line with day of the week effect literature which stipulates that returns for each day of the week vary, with returns on Monday being lower than Friday returns. Furthermore, Monday returns are lower than the average returns, while Friday returns are greater than the average.

An investor should not only be concerned about variations in asset returns but also on the variances in the returns. The standard deviation for all reported days of the week shows a variance of the possible rates of return around the expected rate of return. Friday had the highest standard deviation of 0.015735 while the lowest standard deviation was reported on Monday (0.008861). The results also show that late days of the week had higher standard deviation compared to earlier days of the week. Again, the signs of the findings are in line with the day of the week effect on the return variance.

The minimum index for Monday, Tuesday, Wednesday, Thursday and Friday was -0.100486, -0.098326, -0.103620, -0.104711 and -0.026323 respectively. Wednesday had the lowest index among the minimum index in all days of the week. The maximum index for Monday, Tuesday, Wednesday, Thursday and Friday was 0.030774, 0.026852, 0.026250, 0.036136 and 0.224657 respectively. The highest maximum index among all days was falls on Thursday that was 0.036136. (Refer to table 1).

The measure for asymmetry indicates skewness in the data. Skewness for all days apart from Friday showed a negative value and was near to zero. It means that the dispersion of possible rates of return from Monday to Thursday is near to zero since it showed negative values. Finally, the positive kurtosis reported indicates a flatter distribution than the normal distribution.
**Table 2: Autocorrelation and Heteroscedasticity tests for the Exchange Rate Returns**

<table>
<thead>
<tr>
<th>Lags</th>
<th>1</th>
<th>6</th>
<th>12</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung-Box Q statistics</td>
<td>30.15</td>
<td>47.67</td>
<td>58.41</td>
<td>93.13</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Lung-Box Q² statistics</td>
<td>0.145</td>
<td>0.49</td>
<td>0.98</td>
<td>1.44</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.703</td>
<td>0.998</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: AUTHOR (2012)

The Ljung –Box test Q statistic was significant as reported in Table 2 confirming the presence of autocorrelation in the exchange rate returns. This means that the data are independently distributed i.e the correlations in the population from which the sample taken are zero, so that any observed correlations in the data result from randomness of the sampling process. This supports the Random Walk Hypothesis that stipulates that asset prices are described by a random walk and there are no patterns in price changes hence the exchange rate cannot be predicted as a function of another. This supports the Efficient Market Hypothesis notion. In order to account for the autocorrelation, lagged variables were introduced in the return equation.

The Ljung Box test for heteroscedasticity Q² statistic was not significant for all reported lags, which confirmed the absence of heteroscedasticity in the exchange rate returns.

**Table 3: Unit Root Test of the Exchange Rate Returns**

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
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<tr>
<td>ADF (Fisher Chi-square)</td>
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<td>0.0000</td>
</tr>
<tr>
<td>PP (Fisher Chi-square)</td>
<td>532.013</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Source: AUTHOR (2012)

Table 3 shows the results of unit root test for the exchange rate return series. The Augmented Dickey-Fuller test and Phillips-Perron test statistics for the exchange rate returns series are less
than their critical values at the 5% level. This shows that the exchange rate return series has no unit root. Thus, there is no need to difference the data.

4.3 Empirical Model

Table 4: Regression Analysis for the Mean Equation

Mean Equation \( (R_t) = b_0 + b_1 \delta_{1t} + b_2 \delta_{2t} + b_4 \delta_{4t} + b_5 \delta_{5t} + \sum e_t R_{t-1} + e_t \)

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<th>Probability</th>
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<td>e5</td>
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<td>0.000114</td>
<td>29.10360</td>
<td>0.00384</td>
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</tbody>
</table>

Source: AURTHOR (2012)

Total observations were 1241. The coefficients \( b_1, b_2, b_4, b_5 \) representing Monday, Tuesday, Thursday and Friday effect are not significant at the 5% level. This implies the absence of the day of the week effect in the exchange rate return of the Kenya Shilling Vs Us Dollar. However the effect is felt on Fridays only at 10% significant level. This is further confirmed by the \( t \) statistic where the critical value of 1.645 is lower than the \( t \) statistic value confirming the significance of the Friday returns at 10% level.

In the mean equation, \( e1, e2, e3 \) and \( e4 \) (coefficient of lag of exchange rate returns) are significant confirming the correctness of adding the variable to correct for autocorrelation in the exchange rate return series.
Table 5: Modeling of the Volatility Equation

Volatility Equation \( (\sigma^2_t) = h_0 + \alpha \sigma^2_{t-1} + \beta \sigma^2_{t-1} + h_1 \delta_{t1} + h_2 \delta_{t2} + h_4 \delta_{t4} + h_5 \delta_{t5} \)

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<th>t statistic</th>
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<td>(\beta)</td>
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<td>(h_2)</td>
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<td>(h_4)</td>
<td>0.046128</td>
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<td>0.031314</td>
<td>0.049076</td>
<td>0.736671</td>
<td>0.5234</td>
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</tbody>
</table>

Source: AURTHER (2012)

In the volatility equation, \(h_1\), \(h_4\) and \(h_5\) representing Monday, Thursday and Friday Effects are not significant at 5% significance level, confirming the absence of the day of the week effect. However, there are signals of Tuesday effect represented by the \(h_2\) coefficient which is statistically significant. The \(\alpha\) and \(\beta\) coefficients are also statistically significant. This implies that the volatility parameters are well pronounced in the model.

4.4 Discussion

Foreign exchange market inefficiency is one of the main sources of economic instability around the world and can lead to a depressed international trade. This is because prices of foreign assets, goods and factors of production are influenced if not determined by the change in exchange rates. Foreign exchange market volatility with its massive impacts on real economy, international trade, and other financial markets ultimately determines the gains or losses through changing exchange rates. The presence of the day of the week effect as one of the most important financial market anomalies is often promoted as a conflict with the efficient market hypothesis.

This study sought to empirically examine the presence of the day of the week effect in the Kenya shilling/ US dollar foreign exchange market. We wanted to establish whether the effect is felt in both the mean and volatility of returns. We used data from 1st July 2007 to June 29th, 2012. Our findings show the absence of the day of the week effect in both the mean and volatility equations at 5% significance level. However, there are signals of Tuesday effect in the volatility equation. The absence of the day-of-the-week effect on exchange rate return and volatility has some suggestions about the efficiency of the Kenya shilling / US Dollar foreign exchange market.
The Central Bank of Kenya constant and timely intervention into the foreign exchange market has greatly contributed to its efficiency and hence decreased volatility in the market. For instance when the shilling depreciates, several mechanisms are put in place to prevent this deviation. Example of such policy issues include tightening of the monetary policy, increase of base lending rates and harvesting shillings already in the market through repurchase agreements. Similarly, if the shilling appreciation deviates too much from the norm, the reverse is true. This intervention saw the exchange rate shoot from a low of 106 Kenya shillings per Us Dollar in October 2011, to a high of 84 Kenya shillings per Us dollar in December 2011. This implies that government regulations are improving efficiency of the foreign exchange market and deviations from equilibrium values do not last for long. However there are warning signals of a bit of inefficiency demonstrated by the Tuesday effect in the volatility equation. Control measures should therefore be enhanced to ensure 100% market efficiency.

In a non efficient financial market, investors will develop strategies to explore any regulatory pattern that may exist in the markets. Therefore, if investors can be able to specify a certain pattern in volatility, then it would be easier to make investment decisions based on both return and risk. The absence of the day of the week anomaly renders it difficult to identify volatility patterns that can be used as a tool to design long term investment strategies. It would therefore be impossible to beat the market. For short term gains, say, if the Kenya shilling appreciated too much against the dollar, a well informed investor would purchase the dollars and sell them back to the market if the shilling depreciates. However this exchange rate overshooting and undershooting experienced in the Kenya shilling/ Us Dollar foreign exchange market is just a mere statistical aberration that cannot be treated as an anomaly as we do not find sufficient evidence supporting this.

For academicians the findings from this study form the basis for other studies in the foreign exchange market efficiency. This should enable them to focus on other areas of research on foreign exchange market efficiency.

4.5 Summary
This study investigated the day-of-the-week effect in the Kenya shilling Vs Us Dollar foreign exchange market using the GARCH (1, 1). The study looks at the day of the week effect in both the return and volatility equations.
The summary statistics reveal that the returns on each day of the week are different, but there is no sufficient evidence supporting the day of the week effect in both the mean and return equations as revealed by the model. This can be explained by the fact that new information is rapidly reflected in the exchange rates. This price adjustment is unbiased meaning that although sometimes the market will over adjust, other times it will under adjust, it cannot be predicted which one will occur at any given time. It cannot therefore be possible to predict the exchange rate. This is further confirmed by presence of autocorrelation tested by Ljung box Q implying that the data are independently distributed i.e the correlations in the population from which the sample taken are zero, so that any observed correlations in the data result from randomness of the sampling process. This supports the Random Walk Hypothesis that stipulates that asset prices are described by a random walk and there are no patterns in price changes in line with the Efficient Market Hypothesis theory.

The results revealed absence of the day-of-the-week effect in both the exchange rate return and volatility equation. However, there are signs of Tuesday effect in the volatility equation. The absence of the day-of-the-week effect on exchange rate returns has some suggestions about the efficiency of the Kenya shilling/Us Dollar foreign exchange market.
CHAPTER FIVE

SUMMARY AND CONCLUSION

5.1 Introduction
The chapter presents the summary of the study findings derived from the research. The chapter also looks at the limitations of the study and suggests areas identified by the researcher that require further studies.

5.2 Summary of the Study
The study examines the presence of the day of the week effect in the Kenya shilling/Us Dollar foreign exchange market. The study is descriptive in nature describing whether the Kenya shilling Vs Us Dollar Foreign Exchange Market over the period from July 1, 2007 to June 29, 2012 exhibits the day of the week effect. The day of the week effect in both the foreign exchange rate return and its volatility was assessed. To achieve this objective two methods were used, log-different to compute the foreign exchange rate returns and the GARCH (1, 1) model to estimate the day-of-the-week effect in both the return and volatility equation.

The data was sourced from the Central Bank of Kenya website to ensure that it is free from errors. The US dollar has been selected since it is the most traded currency on the spot market and is the denominator of most business transactions and asset valuations. A recent data for the last five years was considered ideal.

Descriptive statistics was used to analyze data on exchange rate returns. This includes the mean, median, maxima, minima, standard deviation, skewness, kurtosis and Jarque-Bera. The summary statistics reveal that the mean and standard deviation of the return for each day of the week varies. Skewness for all days apart from Friday showed a negative value. There is relatively high kurtosis indicating that the series is non-symmetric with higher peaks and fatter tails than the normal distribution. Further, the Jarque-Berra normality test (p < 0.001) reveals a statistically significant deviation of the data from normality.

The Ljung–Box test Q confirmed the presence of autocorrelation while The Ljung Box test for heteroscedasticity Q² confirmed the absence of heteroscedasticity. The Augmented Dickey-Fuller test and Phillips-Perron test statistics reveal that the exchange rate returns has no unit root.
Eviews (5) program was used to model both the mean and volatility equations. The model does not find sufficient evidence supporting the day of the week effect in both the mean and volatility equations. However there is evidence of the Tuesday effect in the volatility equation. The absence of the day of the week effect implies that the Kenya shilling Vs Us Dollar foreign exchange market is efficient.

5.3 Conclusion
This study assesses the day of the week effect on the Kenya Shilling /US Dollar foreign exchange market rate return changes and their volatility by modeling the GARCH (1,1) specification using Eviews (5) program. The day of the week effects are presented in mean and volatility equations.

The evidence presented in this study suggests that the returns on each day of the week are different with Fridays associated with the highest returns while Wednesdays associated with the lowest returns. However, this exchange rate overshooting and undershooting is just a mere statistical aberration as we do not find sufficient evidence supporting the day of the week effect. On volatility Friday reported the highest standard deviation, while Monday reported the lowest standard deviation. Again, there was no sufficient evidence supporting the day of the week effect tough there are warning signals on Tuesday. The disappearance of the day of the week effect is interpreted as higher efficiency in the market.

5.4 Limitations of the Study
The study considered duration of five years. A longer period, say ten years is usually recommended for modeling financial time series data. The study also used one variable- the day of the week effect to gauge the Efficiency of the foreign exchange market.
5.5 Recommendations for Further Research

The study looked at the day of the week effect in the Kenya shilling Vs US Dollar data, there is need to examine the effect in other currency denominations say the Great British Pound, Sterling Pound, the South Africa Rand etc.

The study also focused on a specific seasonality i.e day of the week effect. Similar study should be done to investigate all the seasonality’s in the Kenyan foreign exchange market. Such include the turn of the month effect, January effect, month of the year effect, the holiday effect etc,

The same study effect could also be investigated using a longer period, say ten or fifteen years. This will give a longer period to model the financial data. Equally, a comparison of selected micro variables could also be done to investigate the relationship between the foreign exchange rate volatility and the selected micro economic variable. These micro economic variables include stock market performance, interest rate, and inflation.

A similar study should be done, to investigate whether the global financial crisis of the 2007 had any impact on the foreign exchange market volatility.
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## APPENDICES

### Appendix 1: Ljung-Box Q statistics

#### Standardized residuals

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Included observations: 1241

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<th>PAC</th>
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<th>Prob</th>
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Appendix 2: Ljung-Box $Q^2$ statistics

Standardized residuals squared

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Included observations: 1241

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