RELATIONSHIP BETWEEN EXCHANGE RATE AND STOCK PRICES IN KENYA

BY

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DECLARATION

This research project is my original work and has not been presented for degree in any other university.

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This research project has been submitted for examination with my approval as University supervisor.

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DEDICATION

I dedicate this to my Parents who showed me and lived practically the virtues of humility, sacrifice and hard work, my wife and my little Sifa for their love, support and encouragement throughout the program

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ABSTRACT

Mutual relations between foreign exchange markets and stock markets have attracted much attention of researchers and academics since the beginning of 1990s. The last quarter of a century has witnessed significant changes in the international financial system such as emergence of new capital markets, gradual abolishment of capital inflows barriers and foreign exchange restrictions, or adoption of more flexible exchange rate arrangements in emerging and transition countries. All these mentioned features have broadened the variety of investment opportunities but, on the other hand, they have also increased volatility of exchange rates and added a substantial portion of risk to the overall investment decision and portfolio diversification process. This study, therefore, sought to establish the relationship between stock prices and exchange rate by establishing the granger causation between the two.

The study was a time-series that used secondary data sources collected on monthly performance of NSE-20 share index and Kenya Shillings/US Dollar over the period 1 January, 2005 up to 31 December 2009. The data was obtained from Nairobi Stock Exchange (NSE) and Central Bank of Kenya (CBK) databases respectively. Auto Regressive Integrated Moving Average test (ARIMA) was conducted after running Unit Root test to remove non-stationarity through differencing then co-integration of the same. Null hypothesis stating presence of causality (H_0: $\beta \neq 0$) was then tested.

The study found a unidirectional causality from Exchange rate (XRATE) to Market stock price (MRT) i.e (XRATE $\rightarrow$ MRT) and concluded that in Kenya foreign exchange granger caused stock exchange markets from 2005 to 2009 with the reverse being untrue. The study, therefore, recommended that management at NSE should create effective 'fuse breakers' in the stock market that would reduce irrational investor's panic that would make low performance of Kenyan Shilling in the international market lead to decrease in the value of stocks at NSE.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Stock market is a public market (a loose network of economic transactions not a physical facility or discrete entity) for the trading of company stock and derivatives at an agreed price; these are securities listed on a stock exchange as well as those only traded privately (Hamilton, 1922). Stock market is one of the most important sources for companies to raise money as it allows businesses to be publicly traded, or raise additional capital for expansion by selling shares of ownership of the company in a public market. Participants in the stock market range from small individual stock investors to large hedge fund traders, who can be based anywhere (Jaswani, 2008). Stocks are listed and traded on stock exchanges which are entities of a corporation or mutual organization specialized in the business of bringing buyers and sellers of the organizations to a listing of stocks and securities together (Preda, 2009).

On the other hand, foreign exchange market (forex, FX, or currency market) is a worldwide decentralized over-the-counter financial market for the trading of currencies. The purpose of the foreign exchange market is to assist international trade and investment, hence, allows businesses to convert one currency to another (Kwapień, et al, 2009). According to a report by United Nations Conference on Trade and Development [UNCTAD], (2007), unchecked speculative movement of currencies by large financial institutions such as hedge funds impedes the markets from correcting global current account imbalances.

In Kenya, capital (stock) market is divided into four independent market segments: the Main Investments Market Segment (MIMS); agriculture sector, commerce and services, the Alternative Investments Market Segment (AIMS), the Fixed Income Securities Market Segment (FISMS) and later Futures and Options Market Segment (FOMS). At present, there are three categories of investor on the capital markets; local, East African and foreign. Stocks are traded at Nairobi Stock Exchange (NSE) which was constituted in 1954 as a voluntary association of stockbrokers registered under the Societies Act and registered under the Companies Act in 1991. Though initially the stock market was characterized by 'call over' trading system, in the same year, this was outphased in favour of 'open outcry system' which later degenerated to 'Electronic Trading System (ETS)' so as to enhance trading efficiency (NSE, 2008).

With institutional development, the Kenyan market has witnessed, centralization of trading and automation aimed, through CDS, to reduce the transaction period. A CDS is important because it provides a means through which the transfer of shares can be done in an efficient, safe and cost effective manner. Prior to November 2004, NSE used a manual delivery and settlement system. This involved the exchange of share certificates between stockbrokers, NSE and the relevant shares registrars of listed companies before a trading transaction could be completed and the buyer issued with a share certificate in his/her name. Introduction of CDS brought about transactional efficiency as the trading period was reduced from T+5 cycle to T+1. CDS also brought about the migration of NSE trading system migrated from floor-based centralized trading, to a Wide Area Network (WAN) further bringing about transactional convenience.

The market has also seen entry of investment banks that are expected to play various roles including market making and underwriting. Other financial models like stock splits cross border listing in the Uganda Securities Exchange, the Dar es Salaam Stock and Rwanda stock exchanges was also introduced in 2004 and 2006 respectively adding to the market the

The currency market is one of the largest and most liquid financial markets in the world. Currencies like the U.S. dollar, the euro and the yen trade in the foreign exchange (FX) market 24 hours a day, fluctuating in value relative to each other almost constantly. Unlike a stock market, the foreign exchange market is divided into levels of access. At the top is the inter-bank market, which is made up of the largest commercial banks and securities dealers. Within the inter-bank market, spreads, which are the difference between the bid and ask prices, are razor sharp and usually unavailable, and not known to players outside the inner circle. The difference between the bid and ask prices widens (from 0-1 pip to 1-2 pips for some currencies) due to volume. If a trader can guarantee large numbers of transactions for large amounts, they can demand a smaller difference between the bid and ask price, which is referred to as a better spread. The levels of access that make up the foreign exchange market are determined by the size of the "line" (the amount of money with which they are trading) (Cross, 1998).

Exchange rate between two currencies specifies how much one currency is worth in terms of the other, that is, the value of a foreign nation's currency in terms of the home nation's currency. The exchange rate is determined by the interaction of supply and demand for foreign currency in the interbank market for foreign exchange. Like

the stock exchange, money can be made or lost on the foreign exchange market by investors and speculators buying and selling at the right times (O'Sullivan and Sheffrin, 2003). Exchange rate in Kenya was liberalized in October 1993 and since then has largely been determined by demand and supplies for the Kenya shilling vis-à-vis other currencies. Through monetary policy, the Central Bank of Kenya (CBK), guards against inflation and ensures stability of prices, interest rates and exchange rates. CBK intervenes in the interbank foreign exchange market largely to smooth out erratic exchange rate fluctuations, thus helping to maintain orderly market conditions crucial for the shilling exchange rate stability. This protects the purchasing power of the Kenya shilling and promotes savings, investment and economic growth (Ndung'u, 2000).

In Kenya, foreign exchange market experimented with virtually all types of exchange rate regimes: from fixed to crawling peg to flexible or floating rate along the general macroeconomic policies adopted since independence. Kenya's economy in the 1960s and 1970s was predominantly characterized by controls in virtually all key sectors. There were controls on domestic prices, foreign exchange transactions, interest rates and import licensing, among others. This approach seems to have served the economy well as evidenced by the remarkable economic growth witnessed in the first decade after independence—with an average GDP growth rate of 6.6% during the period from 1964 to 1973 (Were, Geda, Karingi and Ndung'u, 2001).

Since then, Kenyan exchange policies have gone through various regimes (from fixed to crawling peg to flexible or floating rates) as influenced by economic events such as balance of payments. These exchange regimes have also been determined by

objectives pursued by the policy makers, the sources of shocks hitting the economy and the structural characteristics of the economy. A fixed exchange rate was maintained in the 1960s and 1970s, leading to the currency becoming over-valued. The exchange regime characterized by exchange controls was maintained from the early 1970s until a market-determined regime was adopted in the 1990s to date (Ndung'u, 2000).

Up to 1974, the exchange rate for the Kenya shilling was pegged to the US dollar, but after discrete devaluations the peg was changed to the special drawing rate (SDR). Between 1974 and 1981 the movement of the nominal exchange rate relative to the dollar was erratic; the rate depreciated by about 14% which accelerated in 1981/82 with further devaluations necessitating the regime change to a crawling peg in real terms at the end of 1982. This regime was in place until 1990; a dual exchange rate system ('official' exchange rate and a 'market' rate) was then adopted that lasted until October 1993, when, after further devaluations, the official exchange rate was abolished. That is, the official exchange rate was merged with the market rate and the shilling was allowed to float. That is, in order to conserve foreign exchange and control pressures on the balance of payments (a determinant of exchange regime), the government chose controls instead of liberalization till 1993/95 (Were, et al, 2001).

The emergence of currencies as an asset class in portfolio construction has added to market volatility. Investors typically divide their portfolios by asset classes – developed market equities, developing market equities, bonds, real assets, absolute return, and so on. Sometimes there are more asset classes, sometimes fewer, but, generally, the asset classes are supposed to convey the risk and return opportunities for the portfolio. Currencies

provide real diversification, for two reasons. First, they introduce new factors into a portfolio that are not encompassed by traditional investments. The second, perhaps more subtle reason, is that currencies can help an investor preserve purchasing power of the portfolio in the long run. Currency's historic function has been to facilitate trade, and governments were able to agree in 1944 on a global currency system, known as Bretton Woods, which did exactly that but now the world is divided into two blocks with conflicting views on how currencies should fluctuate. As a consequence, currency is becoming more integrated with government and central-bank policies on economic growth and inflation. Today, currency is a policy tool; yesterday, it simply facilitated trade. The two blocks, of course, are the developed and emerging nations. Developed countries, such as the U.S., are suffering elevated unemployment and fear deflation; and, as a result, they are pursuing expansionary policies that potentially put downward pressure on their currencies. Emerging nations, meanwhile, want to maintain their robust economic expansion, and so have only very reluctantly allowed any currency appreciation.

Current literature in financial economics offers differing opinions about the relationship between stock prices and exchange rates. Economic theory suggests that there should be a causal relationship between stock prices and exchange rates (Caporale, Pittis, and Spagnolo, 2002). However, there is no consensus on the nature of this relationship. The theoretical and empirical relationship between stock prices and exchange rates has been debated for many years. Although scholars and practitioners have studied the subject extensively, the effects of monetary developments on stock markets are not completely

understood. It has been argued that a change in stock prices could change exchange rates or a change in exchange rates could change stock prices. This argument is based on the notion that variations in exchange rates alter firm's profits (Hashemzadeh and Taylor, 1988).

Causal relationship (more commonly known as Granger-causal relationship in literature) is referred to a situation whereby the movement of one market precedes the movement of the other. In particular, researchers refer to the phenomena whereby changes in the exchange rates followed by changes in stock prices as exchange rates Granger-cause stock prices (Beer, Rafiq and Robbani, 2008). In retrospect of the literature, a number of hypotheses support the existence of a causal relation between stock prices and exchange rates. For instance, 'goods market approaches' (Dornbusch and Fischer, 1980) suggest that changes in exchange rates affect the competitiveness of a firm as fluctuations in exchange rate affects the value of the earnings and cost of its funds as many companies borrow in foreign currencies to fund their operations and hence its stock price.

A depreciation of the local currency makes exporting goods attractive and leads to an increase in foreign demand and hence revenue for the firm and its value would appreciate and hence the stock prices. On the other hand, an appreciation of the local currency decreases profits for an exporting firm because it leads to a decrease in foreign demand of its products. However, the sensitivity of the value of an importing firm to exchange rate changes is just the opposite to that of an exporting firm. In addition, variations in exchange rates affect a firm's transaction exposure. That is, exchange rate movements also affect the value of a firm's future payables (or receivables) denominated in

foreign currency. Therefore, on a macro basis, the impact of exchange rate fluctuations on stock market seems to depend on both the importance of a country's international trades in its economy and the degree of the trade imbalance.

An alternative explanation for the relation between exchange rates and stock prices can be provided through 'portfolio balance approaches' that stress the role of capital account transaction. Like all commodities, exchange rates are determined by market mechanism, i.e., the demand and supply condition. A blooming stock market would attract capital flows from foreign investors, which may cause an increase in the demand for a country's currency. The reverse would happen in case of falling stock prices where the investors would try to sell their stocks to avoid further losses and would convert their money into foreign currency to move out of the country. There would be demand for foreign currency in exchange of local currency and it would lead depreciation of local currency. As a result, rising (declining) stock prices would lead to an appreciation (depreciation) in exchange rates. Moreover, foreign investment in domestic equities could increase over time due to benefits of international diversification that foreign investors would gain. Furthermore, movements in stock prices may influence exchange rates and money demand because investors' wealth and liquidity demand could depend on the performance of the stock market. Although theories suggest causal relations between stock prices and exchange rates, existing empirical evidence on the same provides mixed results (Kim, 2003).

1.2 Statement of the Problem

Mutual relations between foreign exchange markets and stock markets have attracted much attention of researchers and academics since the beginning of 1990s. The last quarter of a century has witnessed significant changes in the international financial system such as emergence of new capital markets, gradual abolishment of capital inflows barriers and foreign exchange restrictions, or adoption of more flexible exchange rate arrangements in emerging and transition countries. In Kenya for instance, the exchange rate market moved from various regimes; from fixed (1960s to 1970s) to crawling peg (1982 to 1990s) to flexible or floating rates (1995 to date) (Were, et al, 2001 and Ndung'u, 2000).

All these mentioned features have broadened the variety of investment opportunities but, on the other hand, they have also increased volatility of exchange rates and added a substantial portion of risk to the overall investment decision and portfolio diversification process. Therefore, studies on interaction between foreign exchange and stock markets have become more complex and have received more research interest than before (Stavárek, 2005).

Previous studies on the relationship between exchange rate and stock markets, have examined the relationship between stock and foreign exchange markets mainly for the developed economies with very little studies being done on the developing countries

(Aggarwal 1981, Soenen and Hennigar 1988, Ma and Kao, 1990, Roll 1992 and Chow, Lee and Solt, 1997). Besides taking the context of the developed world, these studies found different results concerning the links between the two markets. For example, Aggarwal (1981) found that revaluation of the US dollar is positively related to stock market returns. In contrast, when Soenen and Hennigar (1988) considered a different period, 1980-1986, found a significantly negative relationship. Roll (1992), who used daily data over the period 1988-1991 found also a positive relationship between the two markets. On the other hand, Chow, Lee and Solt (1997) using monthly data for the period 1977-1989 found no relationship for monthly excess stock returns and real exchange rate returns. When repeating the exercise, however, with longer than six months horizons they found a positive relationship between a strong dollar and stock returns.

Recent studies examined interactions between stock prices and exchange rates using the concept of Granger causality and cointegration techniques. For example, Abdalla and Murinde (1997) conclude that there is unidirectional causality in the case of four emerging markets: India, Korea, Pakistan, and the Philippines. Engle and Granger (1987) argue that daily data are more adequate for capturing the effects of capital movements, and that it is more appropriate to estimate unit root and cointegration models with breaks as well as computing the impulse response functions.

In Kenya, Sifunjo (1999) studied the causal relationship between exchange rate and stock prices at NSE between November 1993 and May 1999 and found a unidirectional causality from exchange rate to stock prices. However, since his study was done the stock market has changed a lot from stock market automation which has enhance

efficiency to increased financial models like stock splits and cross border listing. These changes could have had an impact on stock liquidity and volatility. Changes have also occurred in foreign exchange market as exhibited by strong appreciation of Kenyan Shilling between 2004 and 2007 of value 30.0% which is a major deviation from its past levels. Therefore, the relationship between the two financial markets might have changed owing to these changes. This brings about the need of another study to confirm if Sifunjo's study is still relevant.

Kiptoo (2007) used cointegration analysis and error correction modeling technique to establish the effects of real exchange rate (RER) volatility and misalignment in Kenya on the country's international trade and investment over the period 1993-2003. The study found that Kenya's equilibrium RER is only affected by real variables, which may be categorized as either external or internal 'fundamentals' such as terms of trade, net capital and financial flows, productivity growth, and trade policy. However, the study did not investigate the relationship between stock market and foreign exchange. This study sought to answer the question: Is there a relationship between stock prices and foreign exchange rates?

1.3 Research Objective

This study sought to establish the causal relationship between the exchange rates and stock prices in Kenya.

1.4 Importance of the Study

This study may be of significance to both current and potential Kenyan and foreign investors for from the findings of the study, they can learn how exchange rate influence

the stock prices hence they would consider the macro-economic variable in their investment decision.

The findings of the study is invaluable to the monetary policy decision makers for they can innovatively formulate foreign exchange Policies that insulate exchange rate in the financial market from speculative tendencies.

Being that few studies have been done in Kenya on the relationship between foreign exchange market and stock market, this study is of importance to Kenyan scholars and academician for the knowledge it adds in the area. Therefore, this study acts as a point of reference for future studies.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents the theories and previous literature related on the causality relationship between exchange rates and stock prices and empirical studies concerning the same.

2.2 Interrelationship between Foreign Exchange and Stock Market

A few recent empirical studies that have used Granger-type causality tests have been particularly supportive of a positive causal relation running from exchange rates to stock prices. Bodnar and Gentry (1993) highlighted three effects of exchange rate fluctuations on the firm's value or cash flows. These include the effect of exchange rates on domestic exporters' terms of competition with foreign firms, on input prices, and on the firm's assets that are denominated in foreign currencies.

There are reasons to believe that exchange rates might lead stock prices, possibly with a positive correlation. For example, at a micro level, Jorion (1990) shows that a currency appreciation might decrease stock prices by reducing firms' profits. The response of stock prices to fluctuations is exchange rates might depend on their degree of exposure to exchange rate risk, although is not always indicative of a strong link (Bodnar and Gentry, 1993). Aggarwal (1981) argues that a change in exchange rates could change stock prices because variations in exchange rates alter firms' profits (not only for multinational and export oriented firms, but for domestic firms as well) and this in turn affects stock prices.

This result implies that the direction of causality runs from exchange rates to stock prices.

According to traditional approach, exchange rates lead stock prices. On the other hand, portfolio balance approach states that exchange rates are determined by market mechanism. In other words, changes in stock prices might have impact on exchange rate movements. This approach states that stock price is expected to lead exchange rate with a negative correlation since a decrease in stock prices reduces domestic wealth, which leads to lower domestic money demand and interest rates. Also, the decrease in domestic stock prices leads foreign investors to lower demand for domestic assets and domestic currency. These shifts in demand and supply of currencies cause capital outflows and the depreciation of domestic currency. On the other hand, when stock prices rise, foreign investors become willing to invest in a country's equity securities. Thus, they will get benefit from international diversification. This situation will lead to capital inflows and a currency appreciation. (Granger, Huang and Yang, 2000, Caporale. Pittis and Spagnolo, 2002, Stavárek, 2005 and Pan, Fok and Liu, 2007)

According to Hussain and Liew (2004), from the traditional point of view, the appreciation (depreciation) of a local currency has two major implications. First, increase (decrease) indebtedness in term of foreign denomination currency. In other words, companies in local country have to pay more (less) for the foreign denominated debt and ultimately companies' cash flows deteriorate (improves). Second, increase (decrease) in production costs, especially in those developing economies which productions rely heavily on imported raw materials. The consequences are twofold; loss (gain) in price competitiveness and the companies' revenues. The above mentioned logic

amounted to depreciation (appreciation) of companies' net worth and stock prices in general.

Alternatively, stock prices may affect the exchange rates through money demand. Ajayi, Friedman and Mehdian (1998) show that changes in stock prices lead to increases in the demand for real money and, subsequently, the value of the domestic currency. Stock prices may be employed to reflect developments in macroeconomic variables, as the market's expectations of real economic activities. Therefore, changes in stock prices can have an effect on the exchange rates, Solnik (1984). Aydemir and Demirhan (2009) stated that exchange rates can affect stock prices not only for multinational and export oriented firms but also for domestic firms. For a multinational company, for instance, changes in exchange rates will result in both an immediate change in value of its foreign operations and a continuing change in the profitability of its foreign operations reflected in successive income statements. Therefore, the changes in economic value of firm's foreign operations may influence stock prices.

Domestic firms can also be influenced by changes in exchange rates since they may import a part of their inputs and export their outputs. For example, a devaluation of its currency makes imported inputs more expensive and exported outputs cheaper for a firm. Thus, devaluation will make positive effect for export firms (Aggarwal, 1981) and increase the income of these firms, consequently, boosting the average level of stock prices (Wu, 2000). Nieh and Lee (2001) state that in an open economy, since the expectations of relative currency values affect the domestic and foreign interest rate and these changes affect the present value of a firm's assets, exchange rates play a crucial

role on stock prices, especially for internationally held financial assets.

Wu (2000) explains the positive and negative relationship between exchange rate and stock prices by a real interest rate and an inflationary disturbance. According to real interest rate disturbance, when the real interest rate rises, capital inflow increases and the exchange rate falls. However, since higher real interest rate reduces the present value of future cash flows, stock prices will decline. An inflationary disturbance may explain negative relationship between exchange rate and stock price. That is, when inflation increases, the exchange rate rises and because of high inflation expectations, investors will demand a higher risk premium and high rate of return. As a result, stock prices will decrease (Wu, 2000: p. 261).

On the other hand, the asset market approach to exchange rate determination states a weak or no association between exchange rates and stock prices and treats exchange rate to be the price of an asset (price of one unit of foreign currency). That is, expected future exchange rates determine the exchange rates and factors affecting exchange rates and stock price may be different (Muhammad and Rasheed, 2002: p.536).

Bahmani-Oskooee and Sohrabian (1992) find bi-directional causality between foreign exchange and stock market in the case of the United States. They find that the effect of stock prices on exchange rates and interest rates is through an increase in the real money balance. On the other hand, an exogenous increase in domestic stock prices will lead to an increase in domestic wealth and this, in turn, will result in an increase in the demand for money and an increase in interest rates. Higher interest rates will cause capital

inflows, resulting in an appreciation of the domestic currency, (Krueger, 1983).

The causal relationship between stock prices and exchange rates could be from stock prices to exchange rates. Some research suggests that a change in the money supply upsets the equilibrium position of money with respect to other assets in the portfolios of individual investors. As investors attempt to rearrange their portfolios of financial and real assets to a new equilibrium, stock prices adjust to new levels. There is considerable research that supports the view that the stock market is a leading barometer of economic activity. Sustained upward movements in stock prices are generally indicative of economic upturns, which stimulate money growth as banks respond to increasing demand for more loans. Increasing demand for money will lead to an increase in interest rates. High interest rates will cause capital inflows and appreciation of the domestic currency. In other words, changes in stock prices may affect the inflows and outflows of capital, which will lead to changes in the domestic currency exchange rate (Hashemzadeh and Taylor, 1988).

2.3 Theoretical Review

2.3.1 Goods Market Model

Goods market models are also known as "flow-oriented" models focuses on the association between the current account and the exchange rate (Dornbusch and Fisher, 1980). Dornbusch and Fisher developed a model of exchange rate determination that integrates the roles of relative prices, expectations, and the assets markets, and emphasis the relationship between the behaviour of the exchange rate and the current account. Dornbusch and Fisher (1980) argue that there is an association between the current

account and the behaviour of the exchange rate.

It is assumed that the exchange rate is determined largely by a country's current account or trade balance performance. These models posit that changes in exchange rates affect international competitiveness and trade balance, thereby influencing real economic variables such as real income and output. That is, goods market model suggests that changes in exchange rates affect the competitiveness of a firm, which in turn influence the firm's earnings or its cost of funds and hence its stock price. On a macro level, then, the impact of exchange rate fluctuations on stock market would depend on both the degree of openness of domestic economy and the degree of the trade imbalance. Thus, goods market models represent a positive relationship between stock prices and exchanges rates with direction of causation running from exchange rates to stock prices4. The conclusion of a positive relationship stems from the assumption of using direct exchange rate quotation (Stavarek, 2004).

2.3.2 Portfolio Balance Models

Portfolio balance model is also known as "stock oriented" model. Unlike Goods market models, portfolio balance models put much more stress on the role of capital account transactions (Tahir and Ghani, 2004). Portfolio balance model assumes a negative relationship between stock prices and exchange rates. A rise in domestic stocks prices would attract capital flows, which increase the demand for domestic currency and cause exchange rate to appreciate. A rising stock market leads to the appreciation of domestic currency through direct and indirect channels. A rise in prices encourages investors to buy more domestic assets simultaneously selling foreign assets to obtain domestic

currency indispensable for buying new domestic stocks. The described shifts in demand and supply of currencies cause domestic currency appreciation. The indirect channel grounds in the following causality chain. An increase in domestic assets prices results in growth of wealth that leads investors to increase their demand for money, which in turn raises domestic interest rates. Higher interest rates attract foreign capital and initiate an increase in foreign demand for domestic currency and its subsequent appreciation (Stavarek, 2004).

2.3.3 Purchasing Power Parity

Purchasing power parity (PPP) is a theory of long-term equilibrium exchange rates based on relative price levels of two countries. It states that the exchange rate between one currency and another is in equilibrium when their domestic purchasing powers at that rate of exchange are equivalent. The idea originated with the School of Salamanca in the 16th century and was developed in its modern form by Gustav Cassel in 1918 (Cassel, 1918 and Taylor and Taylor, 2004). The concept is founded on the law of one price; the idea that in absence of transaction costs, identical goods will have the same price in different markets.

Purchasing power exchange rate equalizes the purchasing power of different currencies in their home countries for a given basket of goods. It is often used to compare the standards of living between countries, especially if one country has a more valuable currency, rather than a per-capita nominal gross domestic product (GDP) comparison at market exchange rates (Beer, Rafiq and Robbani, 2008). PPP exchange rates (the "real exchange rate") fluctuations are mostly due to market exchange rates movements. Aside from this

volatility, consistent deviations of the market and PPP exchange rates are observed, for example (market exchange rate) prices of non-traded goods and services are usually lower where incomes are lower (Pedroni, 2001).

Choudhry and Hasan, (2007) stated that the purchasing power parity of a currency differs from the actual market exchange rates. According to Choudhry and Hasan, a currency is either overvalued or undervalued relative to the US or Canadian dollar. For instance, the Danish Krone, the Japanese Yen and the Swiss Franc are overvalued against the US and Canadian dollar. On the other hand, the Mexican peso, the Turkish lira and the Korean won are grossly undervalued. Perez-Seoane (2003) stated that PPP cannot effectively determine factors such as the actual currency exchange rates, the GDP and the living standards of a country. This ineffectiveness can be attributed to the continuous effects of inflation, the value of goods and several other microeconomic issues.

2.3.4 Arbitrage Pricing Theory

The arbitrage pricing theory, APT, was introduced by Ross (1977) as a theoretical alternative to the Capital Asset Pricing Model (CAPM). It helps to establish the price model for various shares of stock. Developed by economist Stephen Ross in 1976, the underlying principle of the pricing theory involves the recognition that the anticipated return on any asset may be charted as a linear calculation of relevant macro-economic factors in conjunction with market indices. It is expected that there will be some rate of change in most if not all of the relevant factors. Running scenarios using this model helps to arrive at a price that is equitable to the anticipated performance of the asset. The desired result is that the asset price will equal to the anticipated price for the end of

the period cited, with the end price discounted at the rate implied by the Capital Asset Pricing Model. It is understood that if the asset price gets off course, that arbitrage will help to bring the price back into reasonable perimeters.

In practical application, the utilization of the arbitrage pricing theory can work very well when it comes to increasing the long term value of a stock portfolio. For example, the use of APT when the current price is very low would result in a simple process that would yield a return while still keeping the portfolio secure. The first step would be to shortsell the portfolio, then buy the low priced asset with the proceeds. At the end of the period, the low priced asset, which will have risen in value, would be sold and the proceeds used to buy back the portfolio that was recently sold. This strategy usually results in a modest amount of revenue for the investor.

Arbitrage pricing theory does not rely on measuring the performance of the market. Instead, APT directly relates the price of the security to the fundamental factors driving it. The problem with this is that the theory in itself provides no indication of what these factors are, so they need to be empirically determined. Obvious factors include economic growth and interest rates. For companies in some sectors other factors are obviously relevant as well - such as consumer spending for retailers.

The theory of arbitrage suggests that a higher real interest rate reduces the present value of firms' future cash flows and causes stock prices to fall. However, under an inflationary disturbance, the exchange rate-stock price relationship could be negative: when inflation increases, the exchange rate rises because the domestic currency loses its value not only in terms of the goods and services but also in terms of foreign currencies; higher

inflation expectations lead investors to demand a higher risk premium and demand a higher rate of return so that stock prices decrease. Although asset prices could exhibit deviations from the predicted stock price-exchange rate relationship, the consequent dynamic adjustments eliminate profit opportunities as predicted by efficient markets theory and thus restore equilibrium.

2.3.5 Fisher Effect Theory

Fisher effect theory states that nominal interest rates in two or more countries should be equal to the required real rate of return to investors plus compensation for the expected amount of inflation in each country (Dimand, 2003). That is, it is the relationship that exists between interest rates and exchange rate movements, so that in an ideal situation interest rate differentials would be exactly off set by exchange rate movements. Fisher hypothesized that the expected nominal return on common stocks consists of a "real" return plus the expected rate of inflation (Dimand, 2003). Results of empirical studies have shown that expected inflation, changes in expected inflation, and unexpected inflation are negatively correlated to stock returns (Kaul, 1987 and Marshall, 1992).

Fama and Schwert (1977) explain the generalized Fisher effect such that the market, if it is efficient and reflects all the available information at time t−1, will set the price of common stocks so that the expected nominal return from t−1 to t is the sum of the appropriate equilibrium expected real rate and the market's assessment of the expected inflation rate for the same time period. When expected inflation is high, investors move out of financial assets into real assets. According to this hypothesis, equities serve as hedges against inflation because they represent claims to real assets, which

suggests a positive stock price is correlated to expected inflation and appreciation in stock price (Dimand, 2003).

2.4 Empirical Studies

Nieh and Lee (2001) examine the relationship between stock prices and exchange rates for G7 countries (Canada, France, Germany, Italy, Japan, United Kingdom and United State) and take the daily closing stock market indices and foreign exchange rates for the period from October 1, 1993 to February 15, 1996. They find that there is no long-run equilibrium relationship between stock prices and exchange rates for each G-7 countries. While one day's short-run significant relationship has been found in certain G-7 countries, there is no significant correlation in the United States. These results might be explained by each country's differences in economic stage, government policy, expectation pattern, etc.

Kim (2003) investigated existence of long-run equilibrium relationships among the aggregate stock price, industrial production, real exchange rate, interest rate, and inflation in the United States. The study applied Johansen's cointegration analysis to monthly data for the 1974:01–1998:12 period, found that the S&P 500 stock price is positively related to the industrial production but negatively to the real exchange rate, interest rate, and inflation. Analysis of error correction mechanism revealed that the stock price, industrial production, and inflation adjusted to correct disequilibrium among the five variables. Structural stability tests show that the parameters of the cointegrating system and the error correction term are stationary. Unlike Kim, Ozair (2006), adopting the same approach, examined the causal relationship between stock prices and exchange rates in

the USA using quarterly data from 1960 to 2004. The results, however, showed no causal linkage and no cointegration between these two financial variables.

Vygodina (2006) investigated relationship between US stock prices and exchange rates controlling for the firm size over a period 1987–2005 using Granger causality methodology. Vygodin found Grainger causality from large-cap stocks to the exchange rate, but no causality for the small-cap stocks. This supported previous findings that global integration might be confined to large multinational corporations. The analysis suggested that nature of the relation changes over time and the points of reversion corresponded to the periods of major changes in US Federal Reserve Policy. Results for the sub-periods identified supported the hypothesis of changing causality between exchange rate and stock prices.

Hatemi-J and Irandoust (2002) studied a possible causal relation between exchange rates and stock prices in Sweden. They used monthly nominal effective exchange rates and stock prices over the period 1993-98 and examined a possible causal relation between these variables in a vector autoregression (VAR) model. The results showed that Granger causality is unidirectional running from stock prices to effective exchange rates. The results also revealed that an increase in Swedish stock prices is associated with an appreciation of the Swedish Kroner.

Tsoukalas (2003) examined the relationships between macroeconomic factors and stock prices in Cyprus. Estimating a reduced form Vector Autoregressive model (VAR) the study sought to determine Granger causality between stock returns and the predictor variables. Tsoukalas found strong evidence of predictability (which implies

inefficiency) in stock returns, which was similar to the pattern observed in developed stock markets. The reason of this is that Cypriot economy depends on services (import sector) such as tourism, off shore banking etc.

Pan, Fok and Liu (2007) took the data of seven East Asian countries (Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand) over the period 1988 to 1998 to examine dynamic linkages between exchange rates and stock prices. The result of study reveals that there is a bidirectional causal relation for Hong Kong before the 1997 Asian crises. Also, there is a unidirectional causal relation from exchange rates and stock prices for Japan, Malaysia, and Thailand and from stock prices to exchange rate for Korea and Singapore. During the Asian crises, there is only a causal relation from exchange rates to stock prices for all countries except Malaysia.

Ibrahim and Aziz (2003) analyze dynamic linkages between stock prices and four macroeconomic variables for Malaysia and use monthly data over the period 1977-1998. The study used standard methods of cointegration and vector autoregression. Empirical results suggested the presence of a long-run relationship between these variables and the stock prices and substantial short-run interactions among them. In particular, the study documented positive short-run and long-run relationships between the stock prices and two macroeconomic variables. The exchange rate, however, was negatively associated with the stock prices. For the money supply, it documented immediate positive liquidity effects and negative long-run effects of money supply expansion on the stock prices. Also notes the predictive role of the stock prices for the macroeconomic variables. Ibrahim and Aziz, however documented the disappearance of the immediate positive

liquidity effects of the money supply shocks and unstable interactions between the stock prices and the exchange rate over time.

Kurihara (2006) chooses the period March 2001-September 2005 to investigate the relationship between macroeconomic variables and daily stock prices in Japan. He takes Japanese stock prices, U.S. stock prices, exchange rate (Yen/U.S. dollar), the Japanese interest rate etc. The empirical results show that domestic interest rate does not influence Japanese stock prices. However, the exchange rate and U.S. stock prices affect Japanese stock prices. Consequently, the quantitative easing policy implemented in 2001 has influenced Japanese stock prices.

Doong, Yang and Wang (2005) investigate the dynamic relationship between stocks and exchange rates for six Asian countries (Indonesia, Malaysia, Philippines, South Korea, Thailand, and Taiwan) over the period 1989-2003. According to the study, these financial variables are not cointegrated. The result of Granger causality test shows that bidirectional causality can be detected in Indonesia, Korea, Malaysia, and Thailand. Also, there is a significantly negative relation between the stock returns and the contemporaneous change in the exchange rates for all countries except Thailand.

Abdalla and Murinde (1997) investigate stock prices-exchange rate relationships in the emerging financial markets of India, Korea, Pakistan and the Philippines using monthly data from 1985 to 1994. The empirical results show unidirectional causality from exchange rates to stock prices in India, Korea and Pakistan. On the contrary, the reverse causation was found for the Philippines. Muhammad and Rasheed (2002) examine the exchange rates and stock price relationships for Pakistan, India,

Bangladesh and Sri Lanka using monthly data from 1994 to 2000. The empirical results show that there is a bi-directional long-run causality between these variables for only Bangladesh and Sri Lanka. No associations between exchange rates and stock prices are found for Pakistan and India. Smyth and Nandha (2003) investigate the relationship between exchange rates and stock prices for the same countries over the period 1995-2001. They find that there is no long run relationship between variables. Also, the empirical results reveal unidirectional causality running from exchange rates to stock prices for only India and Sri Lanka. That is, changes in exchange rates affect stock prices through influencing firms' exports in India and Sri Lanka.

Qayyum and Kemal (2006) examined the volatility spillover between the stock market and the foreign exchange market in Pakistan from 1st July, 1998 to 31st May, 2006. The study used Engle Granger two step procedures and the volatility spillover modeled through bivariate EGARCH method. The results from the volatility modeling showed that the behaviour of both the stock exchange and the foreign exchange markets are interlinked. The returns of one market were affected by the volatility of other market. Particularly the returns of the stock market were sensitive to the returns as well as the volatility of foreign exchange market. On the other hand returns in the foreign exchange market were mean reverting and they were affected by the volatility of stock market returns. The study concluded that there is strong relationship between the volatility of foreign exchange market and the volatility of returns in stock market.

Ajayi and Mougoue (1996) search the relationship between exchange rates and stock indices for eight advanced economies using daily data from 1985 to 1991. According to

results of study, there are significant short-run and long-run feedback relations between these two financial markets. An increase in stock price has a negative short-run effect as well as a positive long-run effect on domestic currency value. Also, currency depreciation has a negative both short-run and long-run effect on the stock market.

Ajayi, Friedman and Mehdian (1998) take daily market indexes and exchange rates to investigate causal relations between stock returns and changes in exchange rates for seven advanced markets from 1985 to 1991 and eight Asian emerging markets from 1987 to 1991. The empirical results show that there is a unidirectional causality between the stock and currency markets in all the advanced economies while no consistent causal relations exist in the emerging economies. They explained the different results between advanced and emerging economies with the differences in the structure and characteristics of financial markets between these groups.

In Kenya, Sifunjo (1999) sought to establish the causal relationship between exchange rate and stock prices at NSE between November 1993 and May 1999. He studied the monthly average stock prices index and nominal dollar exchange rates by employing co-integration and error-correction methodology. Sifunjo found that exchange rate and stock prices are cointegrated, non-stationary in first difference and integrated of order one. The result showed a unidirectional causality from exchange rate to stock prices. However, the results from Sifunjo study could have been obsolesced by passage of time owing to integration of NSE stock automation by Central Depository System (CDS) and change in foreign exchange market. For example the shilling's real exchange rate has experienced a strong appreciation between 2004 and 2007 of value 30.0% representing a major

deviation from its past levels (Choudhry and Hasan, 2007). This has brought about significant changes in the terms of trade, degree of openness and the level of external inflows.

Kiptoo (2007) sought to establish the effects of real exchange rate (RER) volatility and misalignment in Kenya on the country's international trade and investment over the period 1993-2003. Cointegration analysis based on a single equation approach was used to establish the equilibrium RER over the study period and deviations of actual RER from the equilibrium represented misalignment. The study also used multivariate cointegration and error correction modeling technique to estimate three separate equations; the export demand equation, the import demand equation and private investment demand equation. The results from cointegration analysis showed that in the long run, Kenya's equilibrium RER is only affected by real variables, which may be categorized as either external or internal 'fundamentals'. The former fundamentals were terms of trade, and net capital and financial flows while the latter fundamentals were productivity growth and trade policy proxied by the degree of openness. The results of the short run dynamic model also showed that RER misalignments are policy-induced, with the main culprits being monetary and fiscal policies.

Ngugi (2007) sought to establish the determinants of exposure to foreign exchange rate risk on projects funded through ILRI between the period of 2000 and 2005. Ngugi explored the effects of exchange rate fluctuations in the medium term period of a project in terms of project timing, scope and quality and lastly, to establish the effect of exchange rate fluctuation on the operations of ILRI. The results revealed that foreign exchange

loss from financing lag time stood at $146,502.55, due to currency conversion there was an exchange loss of $279,706.11, with monetary revaluation contributing to $192,130.48 for the period under study. However, the study did not relate the exchange rate risk with the stock market. Furthermore, the study did not test for non-stationarity in the data which this study seeks to fulfill.

Kiptui and Kipyegon (2008) adopted an error correction model (ECM) used to capture the long-run and short-run dynamics of the impact of external shocks on the real exchange rate including terms of trade, net foreign exchange flows and openness based on monthly data for 1996 to 2007 and domestic variables such as real GDP growth, interest rates differential and government. The results showed that external shocks to a large extent influenced real exchange rate as demonstrated by the significance of the terms of trade and openness in the long-run and short-run estimations spending.

Choudhry and Hasan (2007) empirically investigated the demand for international reserves (and foreign exchange reserves) during fixed and floating exchange rates periods in three developing countries: Kenya, Mexico and Philippines. Based on theoretical models, three factors were identified as important for the demand of international reserves and foreign reserves: average propensity to import, volume of imports and variability of reserves. The paper employed the cointegration methodology and error correction method to investigate the relationships. Cointegration tests results indicate a reliable long-run stationary relationship between the international reserves (and foreign exchange reserves) and the stated explanatory variables across countries and sub-periods of fixed and clean float. The error correction results indicate causality from

the explanatory variables to the reserves during both the short and long run which was also the case during both the fixed and the floating periods. However, studies conducted by Kiptui and Kipyegon and Choudhry and Hasan did not compare the relationship between exchange rate and stock prices.

2.5 Determination of Optimal Lag Order

Determination of a proper lag structure has a great impact on inferences whether they are about causality, cointegration, impulse response analysis or forecasting. The most common way of selecting an appropriate lag structure for a VAR involves first assuming that the true but unknown lag length is bounded by some finite constant and subsequently using information theoretic criteria such as the AKaike information criterion (AIC) (Akaike, 1974), BIC (Schwarz (1978)) or Hannan–Quin information criterion (HQ) (Hannan and Quinn, 1979) to determine an optimal lag length.

For Granger Causality test, an important requirement is to find out the appropriate lag length for each pair of variables. Faust, Swanson and Wright (2004) used the vector auto-regression (VAR) lag order selection method in choosing the optimal lag order. This technique uses six criteria namely log likelihood value (log L), sequential modified likelihood ratio (LR) test statistic, final prediction error (F & E), AKaike information criterion (AIC), Schwarz information criterion (SC) and Hannan–Quin information criterion (HQ) for choosing the optimal lag length. Paulsen (1984) indicated that different leg length selection models affect a lot on the statistical inference of ADF test. Lütkepohl (1993) indicated that selecting a higher order lag length than the true one causes an increase in the mean square forecast errors of the VAR and that undercutting the lag

length often generates auto-correlated errors. Braun and Mittnik (1993) showed that impulse response functions and variance decompositions are inconsistently derived from the estimated VAR when the lag length differs from the true length.

In SPSS determination of optimal lag order can be done by the use of Partial Auto-Correlation Coefficient (Gupta, 1999). In PACF, sufficient number of lags should be taken to capture the data generating process in a general-to-specific modeling framework. According to with annual data, the number of lags is small usually one or two; with quarterly data there are many lags 4 to 8 while with monthly data, the number of lags increases to between 6 to 12 (Mukhopadhyay and Pradhan, 2011 and Wooldridge, 2009).

2.6 Summary

This chapter has discussed literature related to relate on the causality relationship between exchange rates and stock prices and empirical studies concerning the same. The literature reveals the following: There is no long-run equilibrium relationship between stock prices and exchange rates for each G-7 countries; Tsoukalas found strong evidence of predictability (which implies inefficiency) in stock returns, which was similar to the pattern observed in developed stock markets. The reason of this is that Cypriot economy depends on services (import sector) such as tourism, off shore banking etc. There is a unidirectional causal relation from exchange rates and stock prices for countries like Japan, Malaysia, and Thailand and from stock prices to exchange rate for Korea and Singapore. The exchange rate, however, was negatively associated with the stock prices. For the money supply, it documented immediate positive liquidity effects and negative long-run effects of money supply expansion on the stock prices. The

empirical results show that domestic interest rate does not influence stock prices. However, the exchange rate and U.S. stock prices affect Japanese stock prices. The literature also show that there is strong relationship between the volatility of foreign exchange market and the volatility of returns in stock market. Also, currency depreciation has a negative both short-run and long-run effect on the stock market In Kenya. Exchange rate and stock prices are cointegrated, non-stationary in first difference and integrated of order one. The literature also showed a unidirectional causality from exchange rate to stock prices in Kenya.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

This study took on a causal research design. Gay and Airasian (2003) note that causal research designs are used to determine the causal relationship between one variable and another; in this case, the cause and effect relationship between foreign exchange rates and stock prices. Thus the causal research design was, therefore, consistent with the study's objective.

3.2 Population and Sample

The target population of the study was the Nairobi Stock Exchange and the CBK which formed the unit of analysis. However, the unit of observation comprised of the Nairobi 20 share index and the exchange rates, taking the US dollar as the base.

3.3 Data Collection Procedures

The study used secondary data sources available at the NSE and CBK offices. Stock prices were obtained from the NSE offices while the exchange rates were obtained from the CBK database. The secondary material was collected on the data available on the daily closing stock prices and exchange rates.

Monthly data on stock prices for NSE-20 Share index was obtained from NSE database over the period 1 January 2005 up to 31 December 2009 while the average monthly exchange rate for the same period was also collected from NSE and CBK offices. Exchange rates were expressed in term of US dollar and the data obtained from the Central Bank of Kenya (CBK). Two subsets of this data set were analyzed: the

ıll data set consisting of all monthly values of NSE-20 Share index and the nominal xchange rate series for KSH/USD and the subsets covered period prior to stock market inancial crises in 2008 and subset covering later period of the financial crises up to December 2009. The US dollar was used as the base being that it is the most traded currency on the spot market and is the denominator of most business transactions and asset valuations.

3.4 Data Analysis

This research used inferential statistics in the analysis. Inferential statistics are used to draw inferences about a population from a sample and helps make judgments of the probability that an observed difference between groups/variables is a dependable one or one that might have happened by chance in a study.

To measure causality between the stock market and exchange rates, the Granger Causality (GC) Model was used as it tests whether or not one variable is the cause of the other, vice versa, or neither. GC Model was used by Bahmani-Oskooee and Sohrabian (1992) to test causality between the returns of the S&P 500 index and the effective exchange rate of the dollar. After eliminating serial correlation, GC test provides four possible outcomes to a regression of variables x and y: No causality, X granger causes Y only, Y granger causes X only and bi-directional causality (Granger, 1969). Before conducting granger causality test, the study determined the dataset's optimal lag structure.

The study underwent a series of analysis technique as listed below:

i. Test for Unit Root between stock markets and exchange rates using the Partial Autocorrelation Function (PACF) of the SPSS. Given that the study used monthly data, a lag number of 6 was entered into PACF function of SPSS to produce the optimal lag number that will be entered into ARIMA. This was advocated for by Mukhopadhyay and Pradhan (2011).

ii. Based on the result from PACF, if a Unit Root is present, the data was differenced using the appropriate differencing order and PACF execute again.

iii. Estimate co-integration using the same order of integrated variables

iv. The study was then used an Autoregressive Moving Average (ARIMA) to test Causality.

The following multiple linear regression analysis was then utilized:

$$\mathbf{MKT = a_0XRATE_{t-1} + b_0MKT_{t-1} + e_{it}} \quad (1)$$

$$\mathbf{XRATE = a_1MKT_{t-1} + b_1XRATE_{t-1} + e_{it}} \quad (2)$$

Where: MKT = the stock market price for the month;

XRATE = average Kenyan Shilling to US dollar exchange rate for the month;

e = error term (white noise) in the models; and,

a and b = are the coefficients of the variables MKT and XRATE variables.

Using the Granger Causality Model concept equation (1) regress the dependant variable, *MKT*, to how it relates to lagged variables of XRATE and *MKT*. Equation (2) is similar to Equation (1), although it regress *XRATE* to lagged variables of *XRATE* and *MKT*. Both equations assume that the disturbance terms, e, are uncorrelated. Two hypotheses were tested:

1. $H_{0(1)}$: $a_0 \neq 0$

   $H_{A(1)}$: $a_0 = 0$

2. $H_{0(2)}$: $a_1 \neq 0$

   $H_{A(2)}$: $a_1 = 0$

According to Granger causality test: if the alternative hypothesis (H_A) $a_0 = 0$ is not rejected, then XRATE does not cause MKT. Otherwise XRATE causes MKT; if the alternative Hypothesis (H_A) $a_1 = 0$ is not rejected, then, XRATE is not caused by MKT. Otherwise, MKT causes XRATE. The null hypothesis for equation (1) and (2) state evidence of causation from XRATE to MKT and vice versa and if any or all of the null hypothesis stated above are not rejected, then, XRATE causes MKT in the first hypothesis and the opposite if the same is true in the second hypothesis. Based on these results, one of the four possible outcomes, as described above, became evident:

i. Unidirectional causality from MKT to XRATE (denoted MKT → XRATE) if $H_{A(2)}$ is rejected but $H_{A(1)}$ is not rejected.

ii. Unidirectional causality from XRATE to MKT (denoted XRATE → MKT) if

$H_{A(1)}$ is rejected but $H_{A(2)}$ is not rejected.

iii. Bidirectional or feedback causality (denoted XRATE ↔ MKT) if both $H_{A(1)}$ and $H_{A(2)}$ are rejected.

iv. XRATE and MKT are independent of each other if both $H_A(1)$ and $H_A(2)$ cannot be rejected.

4.0 CHAPTER FOUR: DATA ANALYSIS

4.1 Introduction

This chapter presents the data findings on the stock prices and NSE 20 Share Index (NASI) performance and analysis aimed at determining the granger causality between them. The monthly NASI data was collected from NSE offices while the data on Ksh/US dollar exchange rates were obtained from the CBK offices. Using statistical Package for Social Sciences (SPSS version 11.5), the study began by conducting a unit root test by testing for autocorrelation (ACF) and partial autocorrelation (PACF) in the individual variables and in so doing check for non-stationarity.

4.2 Data Findings

The study conducted a descriptive analysis on the data found from the secondary sources which is presented in appendix 1. The study found out that the average monthly exchange rate value that Kenyan Shilling to US dollar has ever attained from 2005 to 2009 is 77.9 while the maximum NASI index as NSE performance indicator for the afore-mentioned five years is 55344.2. The minimum value for the exchange rate and NASI index is 66.5 and 3092.24 respectively. The mean value for the 60 months (5 years) exchange rate and NASI index is 72.7 and 6011.6 respectively. The study also found that half of the values for the 60 months within the 5 year period lied either below or above 72.86 for the exchange rates and 4110.07 for the NSE 20-Share index; this is shown by the median.

4.3 Trend in Exchange Rate and Stock Market Performance

Figure 4.1 below presents the trend in exchange rate over time (2005 to 2009). The trend

shows that the Ksh taken at US dollar base has been taking occasional dip and peeks pointing to randomness of the variable.

Figure 4.1: Trend in Ksh/US Dollar Exchange Rate

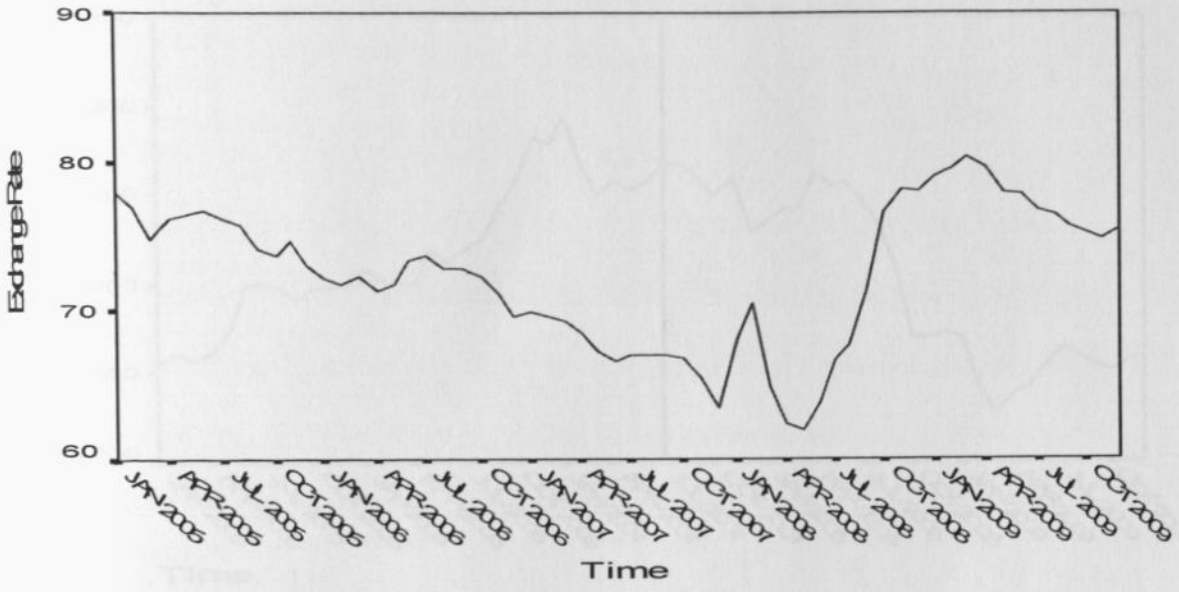
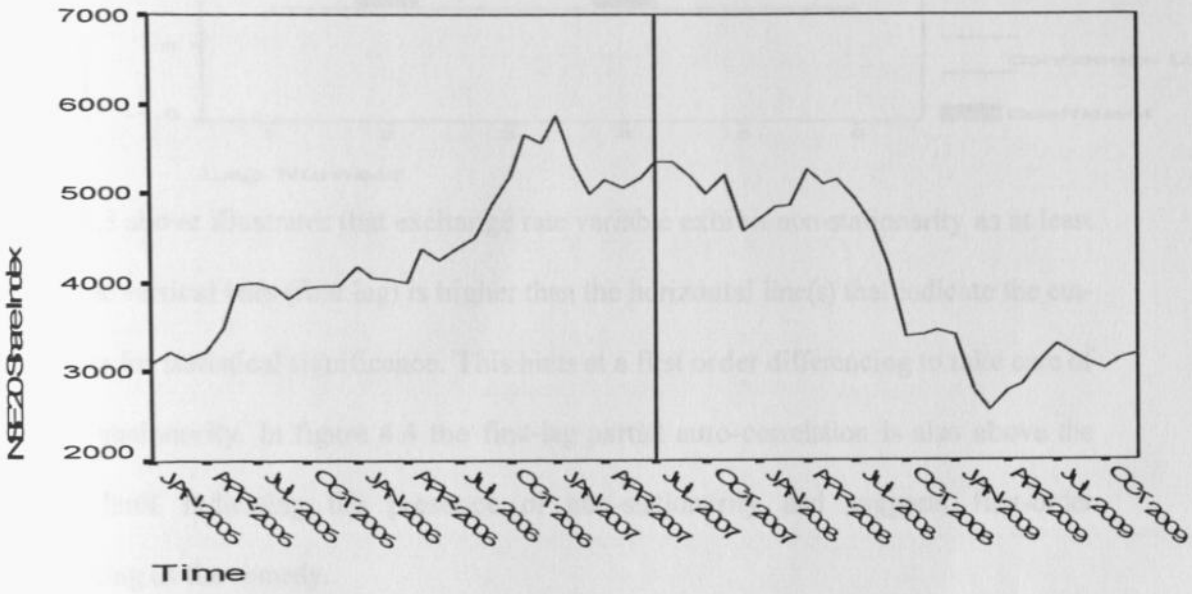


Figure 4.2 below shows the NSE performance for the study period. The figure illustrates that the performance has had an up and down trend with no aggregate consistent upward sloping graph. This points to randomness hence absence of non-stationarity. Looking at the period after the timeline (mid of 2007) all the way to beginning of 2009, the performance had been on the decline point to the negative effect of global financial crisis on the stock market performance.

However, looking at the shilling performance against the US Dollar in the same period (figure 4.1), the performance was random; decline and rise with the 'rise' in Dollar value being evidently on the increase between May of 2008 and beginning of 2009 showing a

tinge of non-randomness. This leads to a preliminary deduction that there may be no causality between the two variables and that exchange rate may be 'non-random'.

Figure 4.2: NSE 20-Share Index (2005 – 2009)



4.4 Testing for Randomness using Partial Auto Correlation Functions (PACF)

The study further tested for the unit root/non-stationary and the nature of the non-stationarity using autocorrelation with number of lags (prior periods) being 6. The results are presented in figure 4.3 and 4.4. On both figures, number 1,2,3..6 imply the 'partial correlation' between the value of the variable today (that is at time "T") with the value at time "T-1," "T-2,"..."T-6" respectively. This horizontal line (and its mirror image on the negative side) defines the critical limits (95% confidence interval). If a bar goes beyond the horizontal line, then significant autocorrelation between the present and lagged values of the variable is indicated and partial correlation coefficient is statistically significant.

Figure 4.3: Exchange Rate Partial Autocorrelation Function Graph

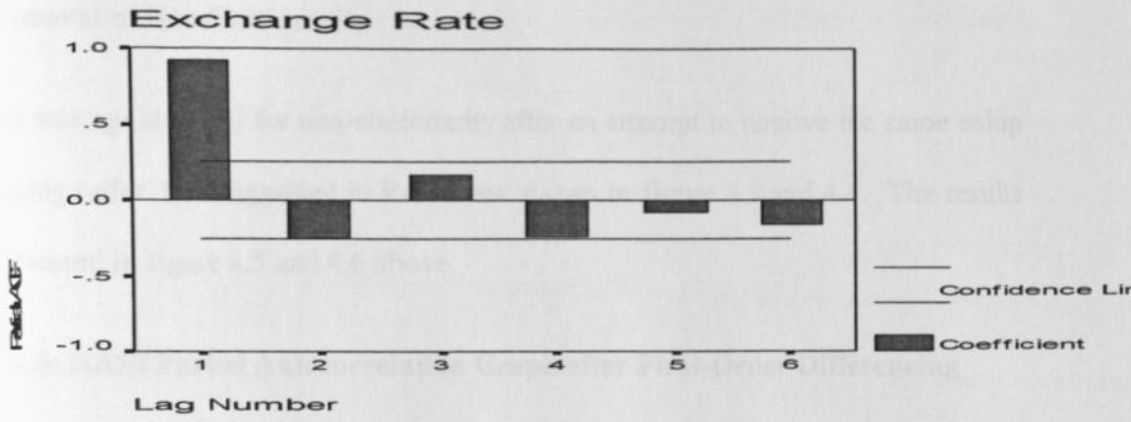
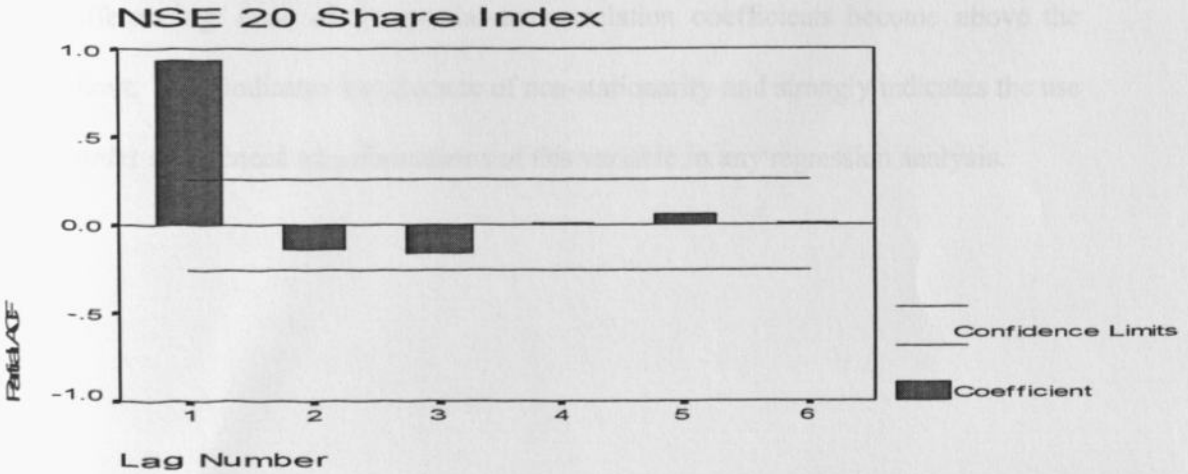


Figure 4.3 above illustrates that exchange rate variable exhibit non-stationarity as at least one of the vertical bars (first lag) is higher than the horizontal line(s) that indicate the cut-off points for statistical significance. This hints at a first order differencing to take care of the non-stationarity. In figure 4.4 the first-lag partial auto-correlation is also above the critical limit indicating the presence of non-stationarity and suggests first-order differencing as the remedy.

Figure 4.4: NSE 20 Share Index Partial Autocorrelation Function Graph



4.4.1 Removal of Non-Stationarity

The data was again tested for non-stationarity after an attempt to remove the same using differencing order 1 as suggested in PACF test shown in figure 4.3 and 4.4. The results were presented in figure 4.5 and 4.6 above.

Figure 4.5: NASI Partial Autocorrelation Graph after First-Order Differencing

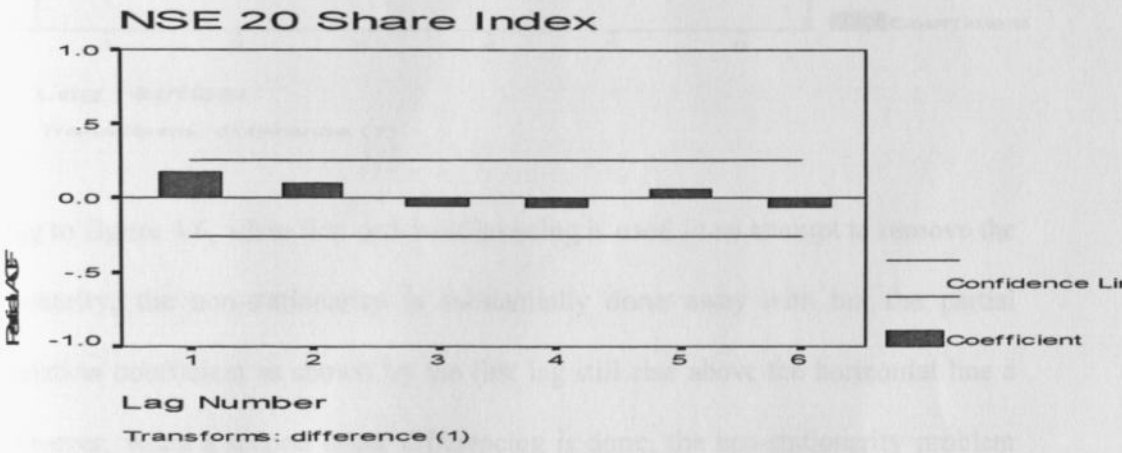
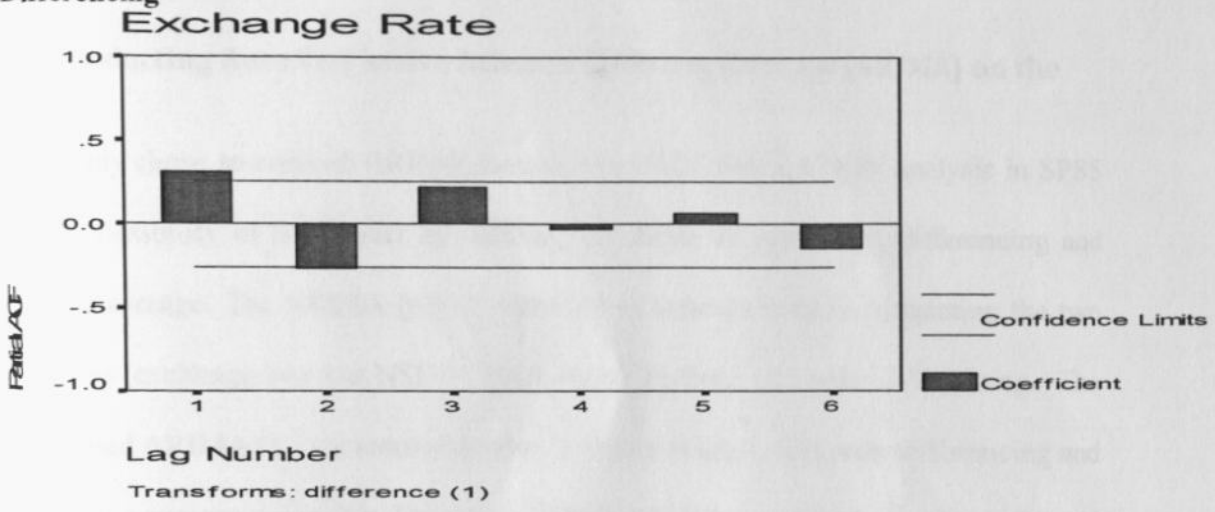


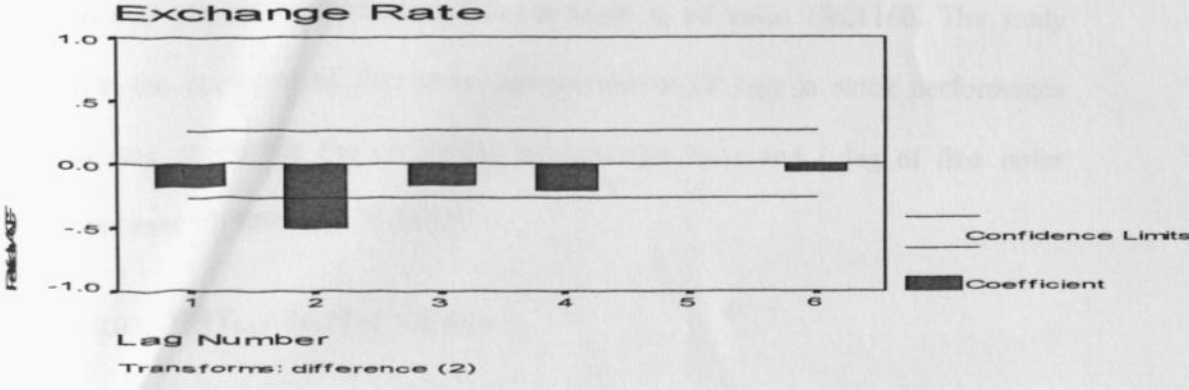
Figure 4.5 shows that when an attempt to remove non-stationarity is made by using first order differencing, none of the partial-autocorrelation coefficients become above the critical limit. This indicates the absence of non-stationarity and strongly indicates the use of first-order differenced transformations of this variable in any regression analysis.

Figure 4.6: Exchange Rate Partial Autocorrelation Graph after First-Order Differencing



According to figure 4.6, when first order differencing is used in an attempt to remove the non-stationarity, the non-stationarity is substantially done away with but the partial autocorrelation coefficient as shown by the first lag still rise above the horizontal line a little. However, when a second order differencing is done, the non-stationarity problem becomes even more (see figure 4.6). This point to first order differencing as the only remedy on removing the non-stationarity.

Figure 4.7: Exchange Rate Partial Autocorrelation Graph after Second-Order Differencing



4.5 Conducting Auto Regressive Integrated Moving Average (ARIMA) on the Model

The study chose to conduct ARIMA instead of AUTOCORELATION analysis in SPSS due to flexibility of the former in enabling the choice of period lag, differencing and moving average. The ARIMA (p,d,q) regression is conducted by co-integrating the two variables (exchange rate and NSE 20 share index) by their first order differencing. The study used ARIMA (1,1,0); autoregressive parameter at lag 1, first order differencing and no moving average parameter. The results of the analysis were presented in figure 4.8 and 4.9. Since the study sought to establish the granger cause effect between exchange rate and stock performance, ARIMA (1,1,0) brought out the relationship in these autoregressive models:

$$\mathbf{MRT = a_0XRATE_{t-1} + b_0MR^{7}_{t-1} + e_{it}} \text{ and } \mathbf{XRATE = a_1MRT_{t-1} + b_1XRATE_{t-1} + e_{it}}$$

The study further sought υ establish if the exchange rate granger causes the stock performance as stipulated n the first model. The data analysis was presented in figure in Appendix II. Accordin to the results, the final outcome were obtained just after 2 iterations and obtaine a standard error/white noise ε_{it} of value 256.1160. The study found that the coefficient of first order autocorrelation (1 lag) in stock performance indicator was .03ó while the coefficient between the same and 1 lag of first order differenced exchnge rate was -36.2702.

$$\mathbf{MRT = 0.03^{ó}\ MRT_{t-1} - 36.2702\ XRATE_{t-1}}$$

The result of the causality test means that for NSE performance (AR1) autocorrelates with itself such that for every 1 unit increase in the change of NSE performance between two and 1 periods back (that is, NSE performance in Feb 2005 and Jan 2005) the effect on the change in itself between the last period and the current period (Mar 2005 and Feb 2005) is .0325.

If the difference in monthly NSE performance between two periods back/prior (two months ago and last month) increases, then the difference between this month and last month will increase by the same coefficient (.0325). However, is the significant is low as it is prone to errors, that is, there is 81.4% likely hood that this parameter might be wrong.

The results further indicates that for every 1 unit increase in the change of exchange rate between the last and current periods, the effect on the change in NSE performance between the last period and the current period is 36.2702 decrease. This is quite significant as the parameter estimate might be 7.72% incorrect as shown by the p-value. This shows that exchange rate significantly granger causes decrease in stock performance.

This depicts causality from exchange rate to stock prices performance (XRATE → MRT) as the first alternative hypothesis (H_A: $a_0 = 0$) developed in the previous chapter is rejected and null hypothesis (H_0: $a_0 \neq 0$) accepted since $a_0 > 0$. The nature of the relationship is however negative.

From the results presented in Appendix III, the study found that the standard error/ε_{it} (marked in yellow) for the residual was 1.6100. The study found when the today's

exchange rate (in the first regression model) is autoregressed with itself/AR1 (taking yesterday's rate/lag 1) as shown the second model, the Beta value/β (coefficient) become 0.2567 that is:

$$\mathbf{XRATE = 0.2566\ XRATE_{t-1} - 0.0006\ MRT_{t-1}}$$

This means that for every 1 unit increases in the change of exchange rate between two and 1 periods back (that is, exchange rate of Feb 2005 – Jan 2005) the effect on the change in exchange rate between the last period and the current period (that is, exchange rate for Mar 2005 – Feb 2005) is 0.2567. That is the difference in exchange rate between Jan 2005 and Feb 2005 increases, then the difference between Feb 2005 and Mar 2005 increases. This is significant as the p-value is below .05 critical for 95% confidence level. The figure also showed that when the for every 1 unit increase in the change of NASI index between the last and current periods (that is, NASI indicator Feb 2005 – Jan 2005), the effect on the change in exchange rate between the last period and the current period (that is, exchange rate for Feb 2005 – Jan 2005) is 0.00057.

If the difference in NASI indicator between Feb 2005 and Jan 2005 increases, then the difference between exchange rate for Feb 2005 and Jan 2005 decreases. However this is very insignificant as the p-value exceed the .05 critical limit (α) for 95% confidence limit. The study concludes that stock performance insignificantly or to a very small extent granger causes exchange rate.

The second results rejected the second alternative hypothesis (H_A: $a_1 = 0$) thereby accepting the null hypothesis (H_0: $a_1 \neq 0$) since $a_1 > 0$. Although this shows causality

from MRT to XRATE (MRT → XRATE), the p-value is too erratic for any statistic significant conclusions to be drawn.

The results of the above results, therefore, points to a unidirectional causality from XRATE to MRT (denoted XRATE → MRT) as $H_{A(1)}$ is rejected but $H_{A(2)}$ is rejected but with low significance level as we might probably 48% reject an alternative hypothesis that should be accepted.

CHAPTER FIVE

5.0 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides relevant discussion on the research objective from data processed in the previous chapter. This study sought to establish the relationship between exchange rate and the NSE stock performance establish if the two granger-cause each other. From the discussions, conclusions and recommendations on the subject matter are made.

5.2 Discussions

The study found that both stock performance and exchange rates data were non-stationary; present observation is affected by previous observations. Partial Autocorrelation conducted by this study required that the non-stationarity data be differenced.

By taking a first order differencing, the time series to become stationary and eliminated misspecification in the Granger causality test, that is, all variables are stationary in their first difference forms but not in their levels. ARIMA test was thus done with first order difference co-integration and the results obtained formed these autoregressive models (ARIMA):

$$\mathbf{MRT = 0.0326\ MRT_{t-1} - 36.2702\ XRATE_{t-1}} \quad 1$$

$$\mathbf{XRATE = 0.2566\ XRATE_{t-1} - 0.0006\ MRT_{t-1}} \quad 2$$

These results shows that there is a unidirectional causality from XRATE to MRT (denoted XRATE → MRT) as $H_{A(1)}$ (equation 1) is rejected. Although $H_{A(2)}$

(equation 2) was also rejected, the significance level was too low for a good statistical conclusion (parametric prediction) since such rejection of alternative hypothesis would mean 48% error in rejection an alternative hypothesis that should be accepted and conversely accepting a null hypothesis that should be rejected.

The result of the study is in contradiction with Hussain and Liew (2004) study that showed a feedback/bidirectional causal relationship between exchange rate and stock price in Malaysia; Granger, Huang and Yang (2000) found a bidirectional causal/granger relationship between the two in Asia till the Asian Financial Crisis, when the Singapore's exchange rates lead the price of stock.

However, the study's findings is in line with Hussain and Liew (2004) who find a unidirectional causal relationship running from exchange rate to stock price in Thailand and also Wu (2000) who show unidirectional causality from exchange rate to stock price instead. Further, Gunduz and Hatemi-J (2004) found a unidirectional Granger causality from exchange rates to stock prices for Israel and Morocco before and after the Asian financial crisis.

Although the same found change in the type of relationship between stock prices and exchange rates for Jordan and Turkey after the Asian crisis. Harjito and McGowan (2004) further found unidirectional causality between the Rupiah/US$ rates and three countries' Composite Indexes (Singapore, Phillipines and Thailand). For instance, the Set Composite Index (SCI) Granger Causes the Rupiah/US$ rates of Singapore, the Rupiah/US$ rates Granger Cause the Manila Composite Index (MCI) of Philippines, and

the Rupiah/US$ rates Granger Causes the Strait Time Index (STI) of Thailand.

5.3 Conclusion

This study investigated the causal relationship between the foreign exchange and stock exchange markets in Kenya from 2005 to 2009. Among others, our results show that there is a unidirectional causal relationship between exchange rates (Ksh/US$) for the five-year period, that is, Ksh/US$ granger causes stock prices at NSE. This relationship was strong and significant at 90% confidence level (p=0.077). While other researchers have suggested the existence of significant bi-interactions between the two markets, the study, base on facts revealed in the results of the test, conclude that return in exchange rate has had causal influence on return in stock market with possibility of mild influence in reverse direction as shown by very low significance to that effect. However, the correlation is in opposite direction; increase in exchange rate causes decrease in stock prices.

This observation can be explained by the fact that though stock market investment does not constitute a very significant portion of total household savings compared to other form of financial assets, when the value of Kenyan shilling reduces against the US dollar, households sells their stock and invest in forex/foreign investment anticipating short-term appreciation in the value such assets other than the market value of their assets in stocks declining due to poor performance of Kenya shilling in the international market. Sale of the stock leads to high supply and less demand, this in turn transitionally effectively causes the stock prices to decline.

The study recommends that the management at NSE should create

effective 'fuse breakers' in the stock market that would reduce irrational investor's panic that would make low performance of Kenyan Shilling in the international market lead to decrease in the value of stocks at NSE. This would reverse the granger causation between exchange rate and stock market to be upward sloping.

The study did not investigate the causal relationship between stock market prices/performance and macro-economic aggregates. This relationship help determine which macro-economic aggregates that hinder or foster the performance of stock market.

5.4 Limitation of the study

Several limitations can be noted in this study:

The findings of this study are limited to the years between 2005 and 2009. Furthermore, monthly data as used owing to the imitations in using daily data for the 5 years giving rise to 60 months. This makes the findings a statistics - not a population parameter – and, thus, subject to an error margin. It, therefore, follows that the results of this study is not necessarily representative of the prior years and years after 2011. Furthermore, the exchange regime has gone through numerous regimes which making this study unrepresentative of the previous regimes; fixed to crawling peg to floating exchange regimes. The study results cannot be generalized to how exchange rate would relate with the other macro-economic relationship such as GDP, interest rate, balance of trade and government expenditure as the study concentrated solely on stock market performance.

The regression model used by this study, produced some results that had low significance which exceeded the 0.05 threshold for 95% confidence level. Thus the regression model

can indicate existence of causal relationship between exchange rate and exchange where none exists. The study is also limited to the extent of accuracy of the data set used being that the study used secondary data sources which are at times prone to manipulations to suit specific needs. However, this is overcome by the fact that the source of the data was reliable being that the reports were obtained from CBK and NSE.

In this study, US dollar currency was used as a base. However, there are other currencies that would have been used such as Euro, Sterling Pound, Japan Yen, Franc et cetera. Thus, same results might not be got should the Kenyan shilling be taken to the base of another currency. However, US dollar is used as a base in many international transitions warranting the use of the same in the study.

5.5 Suggestions for further research

The researcher suggests that further studies be done on the causal relationship between exchange rate and macro-economic aggregates such as GDP, interest rate, balance of trade and government expenditure. This would help determine how exchange rate and strength of the Kenya shilling can affect the macro-economic performance in the country.

Further studies can be done on how exchange rate relates with the stock market performance during different exchange regimes (fixed to crawling peg to floating exchange regimes) in the country. This would help establish the significance of each exchange regime in the macroeconomic aggregates. Future studies can also be used using primary data as this would exude how stakeholders' view the relationship between exchange rate and macro-economic performance.

Further studies can be conducted using other currencies (Euro, Sterling Pound, Japan Yen and Franc) as the base. This would bring about a holistic view of how exchange rate influences the macro-economic performance. Further, studies can be done using other statistical analysis techniques such as correlations which would reinforce the findings from granger causality analysis.

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APPENDICES

Appendix I: Monthly 20-Share Index and Foreign Exchange Rate (Ksh/USD)

Time	Exchange Rate	NSE 20 Share Index	Time	Exchange Rate	NSE 20 Share Index
Jan-05	77.92513	3092.24	Jul-07	67.06773	5340.08
Feb-05	76.93811	3219.37	Aug-07	66.96758	5341.16
Mar-05	74.80281	3126.07	Sep-07	67.02428	5176.88
Apr-05	76.15091	3217.01	Oct-07	66.85121	4989.02
May-05	76.39662	3492.96	Nov-07	65.48995	5198.23
Jun-05	76.68067	3972.15	Dec-07	63.42483	4576.31
Jul-05	76.23365	3989.74	Jan-08	68.08122	4690.72
Aug-05	75.80855	3939.66	Feb-08	70.46626	4843.75
Sep-05	74.10334	3816.37	Mar-08	64.80759	4855.36
Oct-05	73.71644	3939.45	Apr-08	62.33983	5255.42
Nov-05	74.72739	3968.33	May-08	61.89926	5090.36
Dec-05	73.1067	3969.4	Jun-08	63.78279	5152.03
Jan-06	72.21435	4169.99	Jul-08	66.70396	4931.29
Feb-06	71.80357	4050.14	Aug-08	67.69162	4622.61
Mar-06	72.28148	4038.55	Sep-08	71.29762	4180.4
Apr-06	71.30352	4004.48	Oct-08	76.65714	3386.65
May-06	71.76355	4365.9	Nov-08	78.18284	3397.95
Jun-06	73.40527	4239.96	Dec-08	78.03973	3459.97
Jul-06	73.65693	4396.09	Jan-09	78.9997	3410.105
Aug-06	72.86991	4507.15	Feb-09	79.53273	2799.466
Sep-06	72.86662	4881.1	Mar-09	80.26149	2556.974
Oct-06	72.28907	5177.9	Apr-09	79.62581	2776.194
Nov-06	71.12651	5656.67	May-09	77.86135	2845.04
Dec-06	69.62676	5560.44	Jun-09	77.85117	3095.025
Jan-07	69.88452	5870.68	Jul-09	76.75133	3298.106
Feb-07	69.61594	55344.2	Aug-09	76.37187	3205.108
Mar-07	69.29285	4978.93	Sep-09	75.60489	3088.49
Apr-07	68.57708	5148.07	Oct-09	75.24358	3022.139
May-07	67.19063	5051.21	Nov-09	74.73922	3128.038
Jun-07	66.57483	5163.88	Dec-09	75.43115	3188.968
Max	**77.92513**	**55344.2**			
Min	**66.57483**	**3092.24**			
Average	**72.76446**	**6011.603**			
Median	**72.86827**	**4110.065**			
Kurtosis	**-0.53543**	**29.568**			
Skewness	**-0.3696**	**7.537925**			

Appendix II: ARIMA Results with Stock Market Index as the Dependent Variable

```
MODEL:  MOD_13

Split group number: 1  Series length: 60
No missing data.
Melard's algorithm will be used for estimation.
-

Conclusion of estimation phase.
Estimation terminated at iteration number 2 because:
   Sum of squares decreased by less than .001 percent.

FINAL PARAMETERS:

Number of residuals  59
Standard error       256.11602
Log likelihood       -409.91009
AIC                  823.82017
SBC                  827.97525

           Analysis of Variance:

              DF  Adj. Sum of Squares    Residual Variance

Residuals     57          3739006.0            65595.416

          Variables in the Model:

                    β         SEB      T-RATIO   APPROX. PROB.

AR1              .032565     .138395     .2353007       .81481870
XRATE          -36.270193  20.158736   -1.7992295       .07727660

The following new variables are being created:

  Name        Label

  FIT_3       Fit for VAR00003 from ARIMA, MOD_13 NOCON
  ERR_3       Error for VAR00003 from ARIMA, MOD_13 NOCON
  LCL_3       95% LCL for VAR00003 from ARIMA, MOD_13 NOCON
  UCL_3       95% UCL for VAR00003 from ARIMA, MOD_13 NOCON
  SEP_3       SE of fit for VAR00003 from ARIMA, MOD_13 NOCON
```

Appendix III: ARIMA Results with Exchange Rate as the Dependent Variable

```
MODEL:  MOD_11

Split group number: 1  Series length: 60
No missing data.
Melard's algorithm will be used for estimation.
-


Conclusion of estimation phase.
Estimation terminated at iteration number 5 because:
   Sum of squares decreased by less than .001 percent.

FINAL PARAMETERS:

Number of residuals  59
Standard error       1.6099889
Log likelihood       -110.84771
AIC                  225.69542
SBC                  229.85049

           Analysis of Variance:

               DF  Adj. Sum of Squares    Residual Variance

Residuals      57           147.91836            2.5920642

          Variables in the Model:

                    β         SEB      T-RATIO   APPROX. PROB.

AR1          .25662833   .12279282    2.0899295       .04109686
MRT         -.00057270   .00081631    -.7015706       .48580171

The following new variables are being created:

  Name        Label

  FIT_1       Fit for VAR00002 from ARIMA, MOD_11 NOCON
  ERR_1       Error for VAR00002 from ARIMA, MOD_11 NOCON
  LCL_1       95% LCL for VAR00002 from ARIMA, MOD_11 NOCON
  UCL_1       95% UCL for VAR00002 from ARIMA, MOD_11 NOCON
  SEP_1       SE of fit for VAR00002 from ARIMA, MOD_11 NOCON
```