

**THE RELATIONSHIP BETWEEN SHARE PRICES AND
EXCHANGE RATES: EVIDENCE FROM KENYA**

By

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**THIS MANAGEMENT RESEARCH PROJECT IS SUBMITTED IN PARTIAL
FULFILMENT FOR THE AWARD OF THE DEGREE OF MASTER OF
BUSINESS ADMINISTRATION OF THE UNIVERSITY OF NAIROBI**

November 2011

DECLARATION

DECLARATION BY THE CANDIDATE

I declare that this management research project is my own original work and has not been presented for award of any degree in any University or Institution. No part of this thesis may be reproduced without prior permission of the author and/or University of Nairobi.

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DECLARATION BY SUPERVISOR

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

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Acknowledgement

I acknowledge the almighty God, Jehovah Rohi for guiding me this far in my academics. To Him be the glory. Secondly, my heartfelt appreciation goes to my supervisor Mr. Lishenga for his strategic guidance and input toward successful completion of this project. Lastly, I acknowledge the entire staff of the Department of Finance and Accounting, University of Nairobi, led by the Chairman Dr. Aduda for their support in this project.

Dedication

I dedicate this project to my Dad and Mum.

Abstract

Kenya adopted a floating exchange rate regime in 1993. Since then the exchange rates have been determined by the market forces of demand and supply. Undoubtedly, the changes in exchange rates do have a diverse effect across the economic spectrum in any country. The sectoral and economy wide effects of exchange rates may ultimately be reflected in the stock prices.

The objective of this research was to examine how changes in exchange rates and stock prices are related to each other for Kenya over the period November 1993- April 2011. The findings have implications for investors, investment managers, regulators, listed companies, financial institutions and other market players. The economic theory points to the relationship between stock price and exchange rates but does not properly define the direction of the relationship.

The research used Toda and Yamamoto (1995) method to determine the relationship between stock prices and exchange rates. This method is applicable “whether the Vector Auto Regression (VAR) may be stationary (around a deterministic trend), integrated of an arbitrary order, or cointegrated of an arbitrary order” (Toda, Yamamoto, 1995, pp. 227). This is an improvement to the traditional granger causality method used by Sifunjo (1999).

The results indicate that there is bi-directional causal relationship between exchange rate and share price. As regards the sign of causality, negative causality exists in both directions.

Table of Contents

Chapter One	1
Introduction.....	1
1.1 Background	1
1.2 Research Problem.....	3
1.3 Research Objective.....	6
1.4 Value of the Study.....	6
 Chapter Two.....	 7
2 Literature Review.....	7
2.1 Introduction	7
2.2 Share price and markets theories.....	7
2.3 Exchange rate theories	12
2.4 Theories linking exchange rates and share prices	14
2.5 Empirical evidence from Kenya.....	16
2.6 Empirical evidence from international research.....	17
2.7 Conclusion.....	20
 Chapter Three.....	 22
3 Research Methodology.....	22
3.1 Introduction	22
3.2 Research design.....	22
3.3 Population and sample design	23
3.4 Data collection.....	23
3.5 Data analysis	23
 Chapter four.....	 26
4 Data Analysis, Results and Discussions.....	26
4.1 Introduction	26
4.2 Data analysis and results	26

4.3	Discussion	29
Chapter five		33
5	Summary, Conclusion and Recommendations.....	33
5.1	Summary of findings.....	33
5.2	Conclusion.....	34
5.3	Limitations of the study.....	34
5.4	Recommendations	35
References.....		36
Appendix.....		39
List of Tables		
Table 1: Results of the Augmented Dickey-Fuller unit root test in levels.....		28
Table 2: Results of the Augmented Dickey-Fuller unit root test in first difference		28
Table 3: Results of the Toda-Yamamoto Causality Test		29
List of Figures		
Figure 1: Graphical analysis of share prices series		27
Figure 2: Graphical analysis of exchange rates series		27

LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
CBK	Central Bank of Kenya
DMAX	Maximum order of intergration
EMH	Efficient Market Hypothesis
LOP	Law of One Price
MWALD	Modified WALD
NSE	Nairobi Stock Exchange
PPP	Purchasing Power Parity
RPPP	Relative Purchasing Power Parity
VAR	Vector Auto Regression

Chapter One

Introduction

1.1 Background

The issue of whether stock prices and exchange rates are related or not, is an important one especially with increased international trade and the integration of the global financial markets. If stock prices and exchange rates are related and the causation runs from exchange rates to stock prices then crises in the stock markets can be prevented by controlling the exchange rates. Moreover, developing countries can exploit such a link to attract foreign portfolio investment in their own countries. Similarly, if the causation runs from stock prices to exchange rates then authorities can focus on domestic economic policies to stabilize the stock market.

There are many factors, such as enterprise performance, dividends, stock prices of other countries, gross domestic product, exchange rates, interest rates, current account, money supply, employment, their information etc. have an impact on daily stock prices. Besides, the continuing increases in the world trade and capital movements have made the exchange rates as one of the main determinants of business profitability and equity prices

Most of countries adopted a floating exchange rate system with the Bretton Woods Agreement in 1973. Kenya adopted a floating exchange rate in 1993. Remarkable changes in exchange rates may occur every day. These changes require adjustments in costs or gains of multinational companies and increase exchange exposure to enterprises and financial institutions.

In the recent years, because of increasing international diversification, cross-market return correlations, gradual abolishment of capital inflow barriers and foreign exchange restrictions or the adoption of more flexible exchange rate arrangements in emerging and transition countries, these two markets have become interdependent. These changes have increased the variety of investment opportunities as well as the volatility of exchange rates and risk of investment decisions and portfolio diversification process. Thus, understanding this relationship will help domestic as well as international investors for hedging and diversifying their portfolio. Also, fundamentalist investors have taken into account these relationships to predict the future trends for each other.

Theoretical framework

There are two theories that link exchange rates and stock prices. The first is the traditional approach. It is argued that currency depreciation will result in higher exports and therefore corporate profits resulting in higher stock prices in the short run. The transmission mechanism according to this approach is the competitiveness of the firm's exports, resulting in changes in the value of the firm's assets and liabilities culminating in higher profits and reflecting its stock prices. This relationship is attributed to Solnick (1987). He argued that a real currency appreciation is a bad news for domestic corporation, because it will reduce its competitive ability to export, while a real depreciation enhances its ability to export in the short run.

The second is the portfolio adjustment theory (Dornbusch & Fischer, 1980). According to this theory, portfolio adjustments (movements in the foreign capital- inflows and outflows of foreign capital) occur whenever there is a change in the stock prices. If stock

prices are on the increase, they will attract more foreign capital. However, a decline in the stock prices will result in diminished corporate wealth leading to the reduction in the country's wealth. This may lead to a fall in the demand for money and monetary authorities reduce the interest rates to alleviate this situation. When interest rates are lower, capital may flow out of the country to take advantage of higher interest rates in other part of the world resulting in currency depreciation. Therefore, according to this theory, lower stock prices may lead to currency depreciation.

This research attempts to examine how changes in exchange rates (represented by the Kenya shilling price of one U.S. dollar) and stock prices (proxied by the NSE 20 share index) are related to each other for Kenya over the period November 1993- April 2011.

1.2 Research Problem

Kenya adopted a floating exchange rate regime in 1993. Since then the exchange rates have been determined by the market forces of demand and supply. Undoubtedly, the changes in exchange rates do have a diverse effect across the economic spectrum in any country. For instance, exchange rates will impact the cost of imports and value of exports in Kenya. If the cost of importing fuel is adversely affected by changes in exchange rates, the aftermath may be dire. Fuel costs determine the cost of production which may affect many sectors in the Kenyan economy. The sectoral and economy wide effects of exchange rates may ultimately be reflected in the stock prices. On the converse, performance of companies and businesses in Kenya may impact on economic growth. The economic growth may eventually affect levels of exchange rates.

Policy makers, scholars, economists, business owners, regulators and the general Kenyan public are grappling with figuring out the relationship of stock prices and exchange rates. Nyamute (1998) studied the relationship between stock prices and other financial variables like money supply, interest rates, inflation rates and exchange rates in Kenya. The findings were that, a positive relationship exists between stock prices and exchange rates. Sifunjo (1999) investigated the causal relationship between exchange rates and share prices in Kenya. The empirical results obtained over the period November 1993 to May 1999 indicated that the exchange rates granger causes stock prices in Kenya. The study also found out a unidirectional causality from exchange rates to stock prices.

This research attempts to examine how changes in exchange rates (represented by the Kenya shilling price of one U.S. dollar) and stock prices (proxied by the NSE 20 share index) are related to each other for Kenya over the period November 1993- April 2011.

This proposed research differs from that of Sifunjo (1999) in two ways: Firstly, there is an extension of the research period to April 2011 from the previous research (Sifunjo, 1999) which was between November 1993 and May 1999.

Secondly, this research uses Toda and Yamamoto (1995) method to determine the relationship between stock prices and exchange rates. This method is applicable “whether the VAR’s may be stationary (around a deterministic trend), integrated of an arbitrary order, or cointegrated of an arbitrary order” (Toda, Yamamoto, 1995, pp. 227). This is an improvement to the traditional granger causality method used by Sifunjo (1999).

The traditional Granger (1969) causality test for inferring leads and lags among integrated variables will end up in spurious regression results, and the F -test is not valid unless the variables in levels are not cointegrated. Also, the traditional Granger test is very sensitive to the selection of the lag length. If the chosen lag length is incorrect the test results will be biased. New developments in econometric offers the error correction model (Engle & Granger (1987)) and the vector auto regression error-correction model (Johansen & Jesulius, 1990) as alternatives for the testing of non-causality between economic time series. Unfortunately, these tests are cumbersome and all the series used in the test have to be integrated in the same order. In addition, the series have to be cointegrated for the test to be valid (Toda & Yamamoto, 1995; Zapata & Rambaldi, 1997).

Research question

The research question is: Is there a relationship between stock prices and exchange rates?

Research hypothesis

Null hypothesis

- Stock price does not *cause* exchange rates
- Exchange rates does not *cause* stock price

Alternative hypothesis

- Stock price *cause* exchange rates
- Exchange rates *cause* stock price

1.3 Research Objective

The objective of this research is to examine how changes in exchange rates and stock prices are related to each other for Kenya over the period November 1993- April 2011.

1.4 Value of the Study

1. The results of this study will help investors to manage well their portfolios of investments.
 2. The findings can be used by regulators such as CBK in managing the foreign exchange policy.
 3. This linkage of stock price and exchange rates has implications for the management of publicly owned companies in Kenya.
 4. The findings of this proposed research will contribute to the body of knowledge.
- The economic theory points to the relationship between stock price and exchange rates but does not properly define the direction of the relationship.

Chapter Two

2 Literature Review

2.1 Introduction

The literature review is organized into four main areas. The first is the review of the theories that affect the individual variables that form part of the research question namely share prices and exchange rates. The second section summarises the theories that link share prices to exchange rates. The third section reviews the empirical evidence from both the local and international fronts. Finally, the chapter concludes with summary of how this research will contribute to the existing literature.

2.2 Share price and markets theories

The pricing of shares in a stock market is one of the most important subjects in finance. The investors and other stakeholders in the capital market are interested in understanding the factors that affect the movement of share prices. There are two broad theories that attempt to explain the movement in share prices in stock market. The first is the Efficient Market Hypothesis which basically contends that all information affecting a share price is reflected immediately in its price. At the heart of this hypothesis is the assumption that investors are rational. The other theory is behavioural finance which contends that investors are not always rational and that their behavior affects the share prices. The two theories are discussed below:

Efficient Market Hypothesis

Fama (1965) published his dissertation arguing for the random walk hypothesis. He defined market efficiency as follows: "In an efficient market, competition among the

many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its inherent value."

Fama (1970) presented the efficient market theory in terms of a fair game model, contending that investors can be confident that a current market price fully reflects all available information about a security and the reflected return based upon this price is consistent with risk.

The informational efficiency of major stock markets has been extensively examined through the study of causal relations between stock price indices and macroeconomic aggregates. The findings of these studies are important since informational inefficiency in stock market implies on the one hand, that market participants are able to develop profitable trading rules and thereby can consistently earn more than average market returns, and on the other hand, that the stock market is not likely to play an effective role in channeling financial resources to the most productive sectors of the economy.

The Efficient Markets Hypothesis (EMH), in its strong form, assumes that everyone has perfect knowledge of all information available in the market. Therefore, the current price of an individual stock portrays all information available at a specific point in time. Accordingly, if real economic activity affects stock prices, then an efficient stock market immediately incorporates all available information about economic variables. The

rational behaviour of market participants ensures that past and current information is fully reflected in current stock prices. As such, investors are not able to develop trading rules and, thus may not consistently earn higher than normal returns. Therefore, it can be concluded that, in an informationally efficient market, past (current) levels of economic activity are not useful in predicting current (future) stock prices. Therefore informational efficiency exists if a uni-directional lagged causal relationship from a macroeconomic variable to stock prices could not be detected.

While finding causality from lagged values of stock prices to an economic aggregate does not violate informational efficiency, this finding is equivalent to the existence of causality from current values of stock prices to future levels of the economic variable. This would suggest that stock prices lead the economic variable and that the stock market makes rational projections of the real sector.

If, however, lagged changes in some economic variables cause variations in stock prices and past fluctuations in stock prices cause variations in the economic variable, then bi-directional causality is implied between the two series. This behaviour indicates stock market inefficiency. In contrast, if changes in the economic variable neither influence nor are influenced by stock price fluctuations, then the two series are independent of each other and the market is informationally efficient.

Behavioral finance theory

The assumption that investors are rational and behave in a rational manner is at the core of the EMH. Over the years another school of thought has emerged. This school of thought hypothesizes that investors are not always rational and therefore the study of

market efficiencies and security pricing should take into account the behavior of investors. This school of thought has evolved into a branch of finance known as behavioural finance.

Sewell (2005) defined behavioural finance as the study of the influence of psychology on the behaviour of financial practitioners and the study of subsequent effect of markets. Belsky and Gilovich (1999) referred to behavioural finance as behavioural economics in that "Behavioural economics combines the twin disciplines of psychology and economics to explain why and how people make seemingly irrational or illogical decisions when they spend, invest, save, and borrow. Much of economic and financial theories presume that individuals act rationally and consider all available information in the investment decision-making process.

Behavioural finance argues that some financial phenomena can plausibly be understood using models in which some agents are not fully rational. The field has two building blocks: *limits to arbitrage*, which argues that it can be difficult for rational traders to undo the dislocations caused by less rational traders; and *psychology*, which explains the kinds of deviations from full rationality we might expect to see.

Tversky and Kahneman (1973) introduced the availability heuristic: 'a judgmental heuristic in which a person evaluates the frequency of classes or the probability of events by availability, i.e. by the ease with which relevant instances come to mind. The reliance on the availability heuristic leads to systematic biases.

In 1974, the two psychologists, Amos Tversky and Daniel Kahneman, described three heuristics that are employed when making judgments under uncertainty (Tversky and Kahneman 1974) namely representativeness, overconfidence and anchoring as described below:

Representativeness refers to the tendency to form judgments based on stereotypes. For example, one may form an opinion about how a student would perform academically in college on the basis of how he has performed academically in school. While representativeness may be a good rule of thumb, it can also lead people astray. For example, investors may believe that a healthy growth of earnings in the past may be representative of high growth rate in future. They may not realise that there is a lot of randomness in earnings growth rates.

When people are asked to judge the probability that an object or event A belongs to class or process B, probabilities are evaluated by the degree to which A is representative of B, that is, by the degree to which A resembles B.

The second heuristic behavior is overconfidence. People tend to be overconfident and hence overestimate the accuracy of their forecasts. Overconfidence stems partly from the illusion of knowledge. The human mind is perhaps designed to extract as much information as possible from what is available, but may not be aware that the available information is not adequate to develop an accurate forecast in uncertain situations. Overconfidence is mostly observed with people who have special information or past experience. No matter how insignificant the information may be, that persuades them to

think that they have an investment edge. In reality, however, most of the investors do not outperform the market consistently.

The third heuristic behavior is anchoring. In numerical prediction, when a relevant value (an anchor) is available, people make estimates by starting from an initial value (the anchor) that is adjusted to yield the final answer. The anchor may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, adjustments are typically insufficient.

Also, after forming an opinion, people are often unwilling to change it, even though they receive new information that is relevant. Suppose that investors have formed an opinion that company A has above-average long-term earnings prospect. Suddenly, A reports much lower earnings than expected. Because of anchoring, investors will persist in the belief that the company is above-average and will not react sufficiently to the bad news.

2.3 Exchange rate theories

An exchange rate is the price of one country's currency for another's. The two theories of exchange rates discussed below are Law of one price and Purchasing Power Parity.

Law of One Price

The law of one price (LOP), states that a commodity will cost the same regardless of the country in which it is purchased (Krugman & Obstfeld, 2009). The rationale behind LOP is similar to that of triangular arbitrage. If LOP did not hold, arbitrage will be possible by moving commodities from one country to another. For the LOP to hold three assumptions are needed. One, the transaction costs must be zero. Secondly, there should be no barriers of trading such as tariffs or taxes. Lastly, the commodities in question must be identical.

Given that the transaction costs are not zero and the conditions are rarely met, the LOP is really applicable only to traded goods, and then only to the very identical ones.

Purchasing Power Parity (PPP)

The concept of PPP originated with the School of Salamanca in the 16th century and was developed in its modern form by Gustav Cassel (1918). Since consumers purchase many goods, then the PPP is based on the idea that the exchange rates adjust so that a market basket of goods costs the same, regardless of the country of purchase. Another version known as Relative PPP (RPPP) states that the rate of change in price level of commodities in one country relative to the rate of change in the price level in another determines the rate of change of the exchange rate. For example, if we expect the Kenyan inflation rate to exceed that of South Africa, we should expect the Kenyan Shilling to depreciate against the South African Rand.

Having discussed the theories exchange rates, the factors that affect the exchange rates are explained below:

Factors that affect exchange rates

There are various factors that cause a country's currency to depreciate or appreciate against that of another country as summarised below.

The first is the differences in real interest rates. This will cause a flow of capital into those countries with the highest available real interest rates. Therefore, there will be an increased demand for those currencies, and they will appreciate relative to the currencies whose available real rate of return is low.

Also, changes in the investment climate. These are changes in the factors that affect investment risk, such as the fairness of the legal system, stability and transparency of the monetary policy, nature of tax laws, and the effectiveness of the political system. A positive change in the investment climate implies an appreciation of the country's currency.

A difference in income growth is another factor. The differences in income growth among nations will, in the short run at least, cause nations with the highest income growth to demand more imported goods. In part this can be due to the fact that demand for goods is growing faster than the domestically – produced supply. The heightened demand for imports will increase demand for foreign currencies, appreciating the foreign currencies relative to the domestic currency.

Finally, differences in inflation rate is an important factor. This will cause the currency in the country with the higher inflation rates to depreciate as its purchasing power erodes compared with lower-inflation countries.

2.4 Theories linking exchange rates and share prices

There are two theories that link exchange rates and share prices as discussed below:

The traditional approach

It is argued that currency depreciation will result in higher exports and therefore corporate profits resulting in higher stock prices in the short run. The transmission mechanism according to this approach is the competitiveness of the firm's exports, resulting in changes in the value of the firm's assets and liabilities culminating in higher profits and reflecting its stock prices. This relationship is attributed to Solnick (1987). He argued that a real currency appreciation is a bad news for domestic corporation, because

it will reduce its competitive ability to export, while a real depreciation enhances its ability to export in the short run.

Portfolio adjustment theory

According to this theory, portfolio adjustments (movements in the foreign capital-inflows and outflows of foreign capital) occur whenever there is a change in the stock prices. If stock prices are on the increase, they will attract more foreign capital. However, a decline in the stock prices will result in diminished corporate wealth leading to the reduction in the country's wealth. This may lead to a fall in the demand for money and monetary authorities reduce the interest rates to alleviate this situation. When interest rates are lower, capital may flow out of the country to take advantage of higher interest rates in other part of the world resulting in currency depreciation. Therefore, according to this theory, lower stock prices may lead to currency depreciation. Two portfolio models explain the interaction between exchange rate and stock market volatility.

First, the “Flow-Oriented” model (Dornbusch & Fischer, 1980; Gavin, 1989) in which exchange rate movement affects output levels of firms and also the trade balance of an economy. Share price movements on the stock market also affect aggregate demand through wealth, liquidity effects and indirectly the exchange rate. Specifically a reduction in stock prices reduces wealth of local investors and further reduces liquidity in the economy. The reduction in liquidity also reduces interest rates which in turn induce capital outflows and in turn causes currency depreciation.

The second is the “Stock-Oriented” model (Branson, 1983; Frankel, 1983). In the case of the “Stock-Oriented” model the stock market exchange rate link is explained through a country’s capital accounts. In this model the exchange rate equates demand and supply for assets (bonds and stocks). Therefore expectations of relative currency movements have a significant impact on price movements of financially held assets. Thus stock price movements may influence or be influenced by exchange rate movements. That is, if the shilling for example depreciates against a foreign currency (the US dollar), it will increase returns on the foreign currency (the US dollar). Such events will motivate investors to move funds from domestic assets (stocks) towards the dollar assets, depressing stock prices. Thus a depreciating currency has a negative impact on stock market returns.

2.5 Empirical evidence from Kenya

Nyamute (1998) studied the relationship between stock prices and other financial variables like money supply, interest rates, inflation rates and exchange rates in Kenya. The findings were that, a positive relationship exists between stock prices and exchange rates. There are however, fundamental methodological flaws in Nyamute (1998) study. First he performed regression analysis on non-stationary series. Consequently this will lead to spurious relations that induce serial correlation that violate the basic assumptions for estimating the regression equations. Secondly, since the order of integration of the time series used in the study is unknown, the regression co-efficient is unknown.

Sifunjo (1999) investigated the causal relationship between exchange rates and share prices in Kenya. The empirical results obtained over the period November 1993 to May

1999 indicated that the exchange rates granger causes stock prices in Kenya. The study also found out a unidirectional causality from exchange rates to stock prices. Therefore, the movements in exchange rates exert significant influence on stock price determination in Kenya. He tested for stationarity, cointegration and finally used the error correction model to test causality.

2.6 Empirical evidence from international research

Nieh and Lee (2001) examined the relationship between stock prices and exchange rates for G-7 countries and took 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) uses monthly data for the 1974:01-1998:12 periods in the U.S.A. and the empirical results of the study reveal that S&P's common stock price is negatively related to the exchange rate. Ozair (2006) examined the causal relationship between stock prices and exchange rates in the USA using quarterly data from 1960 to 2004. The results show no causal linkage and no cointegration between these two financial variables.

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. They find that Granger causality is unidirectional from stock prices to effective exchange rates.

Tsoukalas (2003) examined the relationship between stock prices and macroeconomic factors in Cyprus. The result of study shows strong relationship between stock prices and exchange rates. The reason of this is that Cypriot economy depends on services (import sector) such as tourism, off shore banking etc.

Kurihara (2006) chose 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 et al. (2005) investigated 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) examined 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.

Aydemir and Demirhan (2009) investigated the relationship between stock prices and exchange rates in Turkey for the period 23 February 2001 to 11 January 2008. They used Toda and Yamamoto (1995) method to analyse the data. The results of empirical study indicated that there is bidirectional causal relationship between exchange rate and all stock market indices. While the negative causality exists from national 100, services,

financials and industrials indices to exchange rate, there is a positive causal relationship from technology indices to exchange rate. On the other hand, negative causal relationship from exchange rate to all stock market indices is determined.

2.7 Conclusion

From the literature and empirical evidence review it is still not clear on the direction of the relationship between exchange rates and stock prices. In some studies such as in the G7 countries no long run equilibrium relationship was found. The studies done in Sweden and Cyprus revealed a unidirectional relationship from stock prices to exchange rates. While in Japan, Kenya and USA the unidirectional relationship was from exchange rate to stock prices. Finally, the studies done in Turkey and other six Asian countries indicated a bidirectional relationship. Therefore, there is still no unanimity in the study of the relationship between exchange rate and share prices. This proposed research will contribute to the growing literature by employing the Toda and Yamamoto (1995) method in the Kenyan scene since the previous research in Kenya used other methods namely traditional Granger (1969) causality test and Error Correction Model. The differences in the models and their influence in the outcome of the research are highlighted below.

The traditional Granger (1969) causality test for inferring leads and lags among integrated variables will end up in spurious regression results, and the F -test is not valid unless the variables in levels are not cointegrated. Also, the traditional Granger test is very sensitive to the selection of the lag length. If the chosen lag length is incorrect the test results will be biased. New developments in econometric offers the error correction

model (Engle & Granger (1987)) and the vector auto regression error-correction model (Johansen & Juselius, 1990) as alternatives for the testing of non-causality between economic time series. Unfortunately, these tests are cumbersome and all the series used in the test have to be integrated in the same order. In addition, the series have to be cointegrated for the test to be valid (Toda & Yamamoto, 1995; Zapata & Rambaldi, 1997).

Toda and Yamamoto (1995) proposed a simple procedure requiring the estimation of an “augmented” VAR, even when there is cointegration of different orders, which guarantees the asymptotic distribution of the MWALD statistic. This method is applicable “whether the VAR’s may be stationary (around a deterministic trend), integrated of an arbitrary order, or cointegrated of an arbitrary order” (Toda and Yamamoto, 1995, pp. 227). This is the method we are going to use in this research.

Chapter Three

3 Research Methodology

3.1 Introduction

Research methodology refers to the procedures to be adopted to obtain answers to the research question and the tasks needed to complete the different components of the research process. This chapter is organized as follows: section 3.2 deals with research design, section 3.3 defines the population and sample, section 3.4 covers data collection, and section 3.5 addresses data analysis.

3.2 Research design

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The study will use an empirical design in which the secondary data will be analyzed and the research hypothesis tested. This design will help to build on what is already known in the subject area. The research is designed to perform causality test. The Toda and Yamamoto (1995) method of testing causality is employed to test the relationship between stock prices and exchange rates in Kenya. In summary, in order to apply Toda and Yamamoto method, firstly, the VAR order, k , and the maximum order of integration of the variables, d_{max} , should be determined in the VAR model. To employ causality test, modified Wald test (MWALD), is applied to the first k VAR coefficients to investigate causality.

3.3 Population and sample design

The two variables used in the research are exchange rates stated as the number of Kenya shillings that one US dollar can buy ($1 \text{ US\$} = \text{XX Kenya shillings}$) and the NSE share index. The NSE share index used in the study is NSE 20 share index. This index tracks the performance of the shares of twenty companies as selected by the management of NSE from time to time. The sample data is based on the NSE stock index values for the time periods between November 1993 and April 2011. The prevailing exchange rates for the same time period of between November 1993 and April 2011 are selected for use in the research. This data set consists of average monthly observations from November 1993 to April 2011. The reason of selecting the start date is that exchange rate regime in Kenya is determined as independently floating in 1993.

3.4 Data collection

The data used in this research is secondary data. The monthly data on the NSE share index (1964=100) was obtained from the NSE. Monthly data on the effective foreign exchange rate (U.S. dollar rate) was obtained from CBK.

3.5 Data analysis

Traditionally to test for the causal relationship between two variables, the standard Granger (1969) test has been employed. This test states that, if past values of a variable Y significantly contribute to forecast the value of another variable X_{t+1} then Y is said to Granger cause X and vice versa. To analyze Granger causality between exchange rate and stock market price the research will use Toda, Yamamoto (1995) procedure, as explained below:

Toda and Yamamoto Model

The integrated properties of the stock price series and exchange rates series are not important in Toda and Yamamoto method, providing that the risk of misspecification of the order of integration of the series is minimized. Thus, the causality relationship between series which are integrated different orders can be investigated. In order to apply Toda and Yamamoto method, firstly, the VAR order, k , and the maximum order of integration of the variables, $d_{\max}$, should be determined in the VAR model. The sum of k and $d_{\max}$, is taken into consideration as the total order of VAR, that is $(k+d_{\max})$ th order of VAR is estimated. Then, in order to employ causality test, modified Wald test (MWALD), proposed by Toda and Yamamoto (1995), is applied to the first k VAR coefficients to investigate causality. This test has an asymptotic chi square (χ^2) distribution when a VAR $(k + d_{\max})$ is estimated. A Monte Carlo experiment, presented in Zapata and Rambaldi (1997), provides evidence that the MWALD test has a comparable performance in size and power to the likelihood ratio and WALD tests if (i) the correct number of lags for estimating $k + d_{\max}$ is identified and (ii) no important variables are omitted, provided a sample of 50 or more observations is available. According to Zapata and Rambaldi (1997), the advantage of this procedure is that it does not require the knowledge of cointegration properties of the system. Moreover, according to Toda and Yamamoto, the MWald statistic is valid regardless whether a series is $I(0)$, $I(1)$ or $I(2)$, non-cointegrated or cointegrated of an arbitrary order.

To analyse *Granger* causality between exchange rate and stock market price by using Toda and Yamamoto procedure, the following VAR system should be estimated.

$$ex_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} ex_{t-i} + \sum_{j=k+1}^{dmax} \alpha_{2j} ex_{t-j} + \sum_{i=1}^k \lambda_{2i} stp_{t-i} + \sum_{j=k+1}^{dmax} \lambda_{2j} stp_{t-j} + \mu_{1t}$$

$$stp_t = \beta_0 + \sum_{i=1}^k \beta_{1i} stp_{t-i} + \sum_{j=k+1}^{dmax} \beta_{2j} stp_{t-j} + \sum_{i=1}^k \Phi_{2i} ex_{t-i} + \sum_{j=k+1}^{dmax} \Phi_{2j} ex_{t-j} + \mu_{2t}$$

Where ex_t is the nominal exchange rate between US dollar and Kenya shilling and stp_t is the NSE 20 share index.

Chapter four

4 Data Analysis, Results and Discussions

4.1 Introduction

This chapter provides a summary of the data analysis, results of the study and the discussion on the results of the study. The chapter is organized as follows: section 4.2 describes the data analysis and the results of the study and section 4.3 discusses the implication of the findings of the study.

4.2 Data analysis and results

We obtained the data for the stock prices and corresponding exchange rates for the period between November 1993 and April 2011. The data for share prices and exchange rates were obtained from NSE and the CBK respectively. Based on the monthly data obtained we generated the two series one for exchange rates and the other for share prices and plotted on separate graphs.

By observing the trends on the two graphs in figures one and two below, one for exchange rates and the other share prices we note an important relationship. The two series trend in opposite directions. For example, between 1994 and 2002 the share prices declined while the exchange rates was trending upwards (implying depreciating Kenya shillings). For the period between 2003 and 2007 the share prices increased steadily while the exchange rates declined though minimally.

The following figures one and two depict the graphical analysis of the share prices and exchange rates series:

Figure 1: Graphical analysis of share prices series

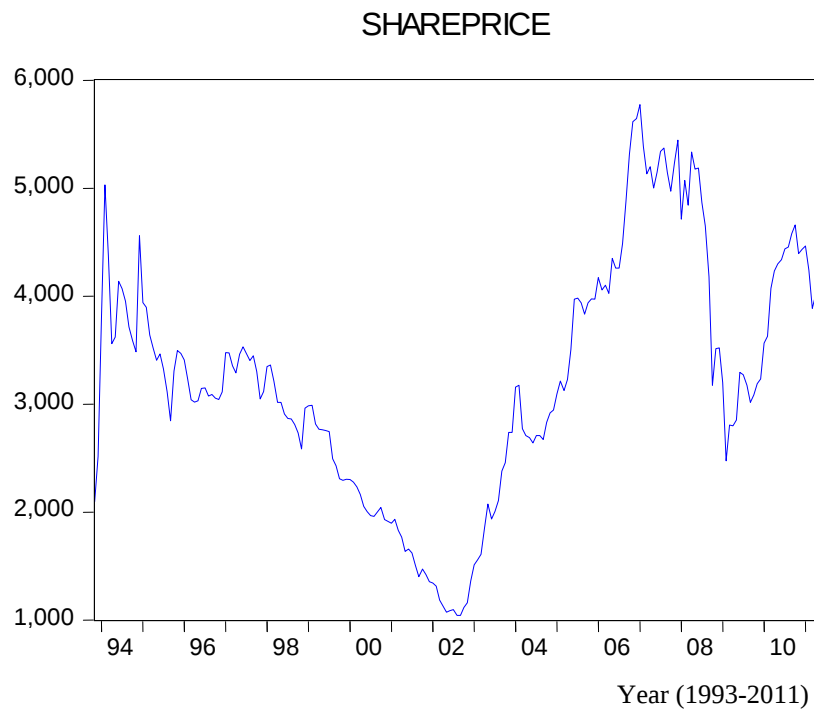
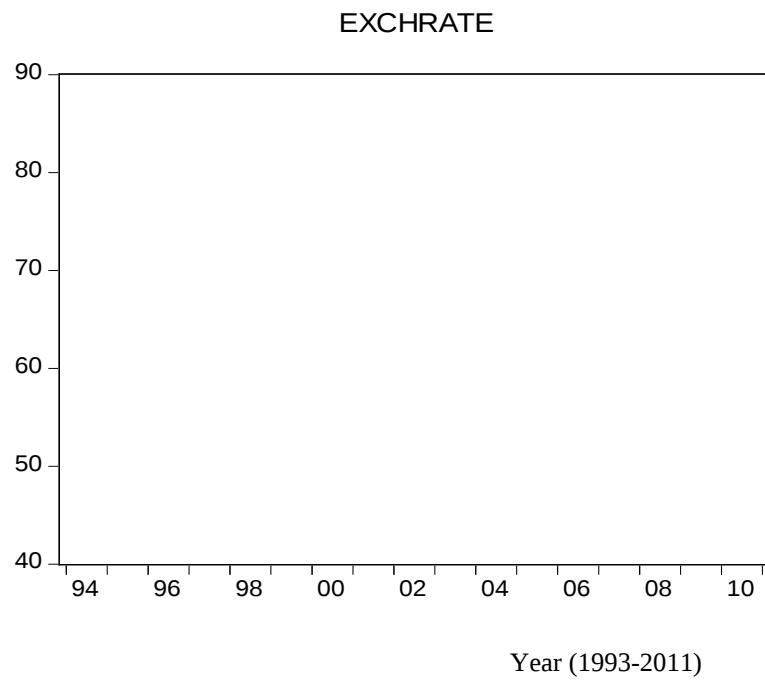


Figure 2: Graphical analysis of exchange rates series



We therefore perform causality test in order to empirically establish any relationship between exchange rates and share prices.

Toda Yamamoto method for causality test

Firstly, we perform unit root tests on the time series to investigate whether they are stationary or not. The Augmented Dickey-Fuller (ADF) unit root test is used for this purpose. The tests are based on the null hypothesis (H_0): exchange rate is not $I(0)$ and share price is not $I(0)$. If the calculated ADF statistics are less than their critical values from Fuller's table, then the null hypothesis (H_0) is accepted and the series are non-stationary or not integrated of order zero. The test is repeated until we obtain the level in which the series become stationary. We then determine $dmax$ as the maximum order of integration. The results of the unit root tests are summarised below:

Table 1: Results of the Augmented Dickey-Fuller unit root test in levels

Variables	Test Critical Value (1%)	Test Statistic	P values
Exchange rate	-3.461783	-1.400984	0.5813
Share price	-3.461783	-1.755215	0.4020

The results in table 1 above suggest that none of the variables are stationary, that is, integrated of order 0 since the variables are not statistically significant at 1%.

However, the results in table 2 below suggest that both variables are stationary, that is, integrated of order 1 since the variables are statistically significant at 1% in their first difference. Therefore maximum order of integration ($dmax$) is 1.

Table 2: Results of the Augmented Dickey-Fuller unit root test in first difference

Variables	Test Critical Value (1%)	Test Statistic	P values
Exchange rate	-3.461783	-11.05731	0.0000
Share price	-3.461783	-12.57780	0.0000

Having determined that d_{max} as 1, we then proceed in estimating the lag structure of a system of VAR in levels and our results indicate that the optimal lag length (VAR order k) using AIC optimal lag technique to be 18. We then estimate a system of VAR in levels with a total of $(d_{max}+k)$ lags. Therefore the lag length is determined to be 19 (18+1).

The MWALD test statistic is then computed using the systems of VAR computed above. The MWALD statistic will be asymptotically distributed as a Chi Square, irrespective of whether the series are $I(0)$, $I(1)$ or $I(2)$, non-cointegrated or cointegrated of an arbitrary order. The result of the Toda-Yamamoto causality test is shown below:

Table 3: Results of the Toda-Yamamoto Causality Test

Null Hypothesis	d_{max} and Var(k)	MWALD statistic	P values	<i>The Sign of the Sum of Lagged Coefficients</i>
Stock price does not <i>cause</i> exchange rates	(1,18)	33.04564	0.0165*	(-)
Exchange rates does not <i>cause</i> stock price	(1,18)	41.37849	0.0013**	(-)

*Significant at 5%

**Significant at 1%

Based on the results of the MWALD test statistic as well as its p-values we reject the two null hypotheses at 5% and 1% significance level respectively. The results showed in the table 3 indicate that there is bi-directional causal relationship between exchange rate and share price. As regards the sign of causality, negative causality exists in both directions.

4.3 Discussion

The study has established a bi-directional negative relationship between share price and exchange rates. The exchange rate is stated as the Kenya shillings price of one US dollar

(1US dollar = 'XX' Kenya shillings). Therefore when the exchange rate “increases” it implies depreciation of the Kenya shilling or appreciation of the foreign currency. The study has established a bi-directional negative relationship between exchange rates and share prices. This means that when the foreign currencies appreciate or Kenya shilling depreciates, the stock prices fall. Also, when the stock prices rise, the foreign currencies depreciate or Kenya shilling appreciates. The findings have implications for investors, investment managers, regulators, listed companies, financial institutions and other market players.

Portfolio managers are mandated to maximize the wealth for their clients by optimizing portfolio values. The sharp fluctuations in share prices as a result of oscillations in foreign exchange rates cause panic among portfolio managers. This may predispose them to liquidate some of the holdings in their portfolios. This may result to a slump in the stock market. On the contrary, when the foreign currency depreciates the portfolio of equity securities may appreciate in value. Therefore, the portfolio managers need a thorough understanding of the relationship between exchange rates and share prices. Based, on the results of this study, portfolio managers are better when they dispose shares in their portfolio if they predict an appreciation of the foreign currency. On the flip side, the portfolio managers should increase their positions in equity shares when they forecast a depreciation of the foreign currency.

The regulators such as CBK who are in charge of monetary policy have a reason to be concerned with volatility in exchange rates and the resulting impact on the stock market.

The findings in this research will assist CBK in mastering the relationship between exchange rates and share prices. This may help them employ the monetary policy tools at their disposal to control the exchange rates and consequently averting adverse effect on the stock market. Based on the finding of this research, the free fall of the Kenya shilling may erode the value of shares. The CBK may intervene to stabilize the exchange rates by among other things increasing the interest rates.

The stock market is an important institution for price discovery. The forces of demand and supply in the market determine the market price of shares. This market price is useful in valuation of companies, evaluating portfolio performance, facilitating transfer or disposal of securities among others. High volatility in the currency market and by extension the stock market will have an adverse effect on pricing efficiency. If volatility persists for a long time there will be a disruption in the price discovery process in the market. This disruption in price discovery process renders the stock market inefficient.

The linkage between exchange rates and share prices is important to managers of listed companies in Kenya. The managers of these companies have to plan in advance ways of mitigating the risk of adverse effects of exchange rates movement on the performance of their companies. The managers also need to position themselves in order to benefit from favourable movements in the exchange rates as has been established in this research. In addition, the performance of managers of such companies is evaluated based on the profitability of the company. The managers are rewarded with company shares for their

good performance through executive share option plans. Therefore, it is in their best interest to grasp the relationship between exchange rates and share prices.

The findings in this research have also contributed to the body of knowledge. Previous study done in Kenya (Sifunjo, 1999) had established a unidirectional relationship from exchange rates to share price in Kenya. This research having used Toda Yamamoto (1995) method, an improved version of the traditional granger causality test that was used by Sifunjo (1999), has found out a bi-directional negative relationship between exchange rates and share prices. Therefore, the stock prices cause exchange rates and also exchange rates cause share price.

Chapter five

5 Summary, Conclusion and Recommendations

5.1 Summary of findings

The study examined the relationship between foreign exchange rates and stock prices in Kenya for the period between November 1993 and April 2011. The relationship was tested using the Toda and Yamamoto method. Firstly, unit root test was performed and the maximum order of integration (d_{max}) was determined as 1. The lag structure of a system of VAR in levels was then estimated and the results indicated that the optimal lag length (VAR order k) using AIC optimal lag technique to be 18. We then estimated a system of VAR in levels with a total of ($d_{max}+k=19$) lags. The MWALD test statistic was then determined based on the estimated system of VAR.

Based on the results of the MWALD test statistic as well as its p-values the two null hypotheses were rejected at 5% significance level. The results therefore indicated that there is bi-directional causal relationship between exchange rate and share price. As regards the sign of causality, negative causality exists in both directions.

The findings are similar to those of Aydemir and Demirhan (2009) who found out bi-directional relationship between exchange rates and share price in Turkey. Doong et al. (2005) also found a bi-directional relationship in five of the six Asian countries that they investigated. The finding in this research is a different from earlier study done in Kenya. Sifunjo (1999) had established a unidirectional relationship from exchange rates to share price in Kenya. This research having used Toda Yamamoto (1995) method, an improved

version of the traditional granger causality test that was used by Sifunjo (1999), has found out a bi-directional negative relationship between exchange rates and share prices. Therefore, the stock prices cause exchange rates and also exchange rates cause share price.

5.2 Conclusion

The empirical evidence from the study shows that exchange rates cause share price in Kenya. The converse is also true, stock prices cause exchange rates. As regards the sign of causality, negative causality exists in both directions. The exchange rate is stated as the Kenya shillings price of one US dollar (1US dollar = 'XX' Kenya shillings). Therefore when the exchange rate "increases" it implies depreciation of the Kenya shilling or appreciation of the foreign currency. The findings have implications for investors, investment managers, regulators, listed companies, financial institutions and other market players as discussed above.

5.3 Limitations of the study

There were no limitations in so far as data collection and analysis is concerned. However, this research considered only two variables; exchange rates and share prices. In addition, the study considered only the exchange rates between Kenya shilling and the US dollar whereas there are emerging important currencies such as the Euro, Sterling pound and Yuan. The study was limited to average monthly data as opposed to more frequent data observations such as daily or weekly which may have an impact on the findings.

5.4 Recommendations

This research considered only two variables; exchange rates and share prices. In addition, the study considered only the exchange rates between Kenya shilling and the US dollar. Another study may be done using additional variables. Also, future research should not be restricted to the exchange rates between Kenya shilling and the US dollar, but can consider other major exchange rates. We, also suggest that the significance of our results could possibly be improved upon by applying daily or weekly data. The use of more frequent observations may better capture the dynamics of stock and currency market interrelationships. Another possible extension is to employ the firm level data for these countries and examining the above relationship for those firms that are engaged in international trade (e.g., multinational firms) and for those firms that are not directly affected by exchange rates.

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Appendix

The monthly data observations for the two variables used in this research are as follows:

Period	NSE Share Index	Exchange Rate
Nov-93	2,096.14	69.00
Dec-93	2,517.07	68.39
Jan-94	3,818.74	67.91
Feb-94	5,030.55	67.42
Mar-94	4,377.97	66.07
Apr-94	3,558.51	62.75
May-94	3,620.24	57.95
Jun-94	4,137.22	56.15
Jul-94	4,070.42	55.97
Aug-94	3,951.77	55.43
Sep-94	3,715.39	51.44
Oct-94	3,585.56	42.39
Nov-94	3,483.54	43.85
Dec-94	4,559.40	45.16
Jan-95	3,939.68	44.50
Feb-95	3,897.42	44.51
Mar-95	3,639.86	44.13
Apr-95	3,519.44	44.07
May-95	3,405.49	51.99
Jun-95	3,464.23	53.49
Jul-95	3,326.11	56.57
Aug-95	3,114.60	55.69
Sep-95	2,845.43	55.46
Oct-95	3,307.08	55.55
Nov-95	3,495.92	55.55
Dec-95	3,468.88	55.84
Jan-96	3,409.40	56.78
Feb-96	3,230.08	58.29

Period	NSE Share Index	Exchange Rate
Mar-96	3,041.00	58.44
Apr-96	3,019.20	58.39
May-96	3,031.00	58.25
Jun-96	3,144.33	57.96
Jul-96	3,150.08	57.30
Aug-96	3,073.88	57.00
Sep-96	3,089.83	56.40
Oct-96	3,055.97	55.88
Nov-96	3,042.06	55.63
Dec-96	3,114.11	55.14
Jan-97	3,476.67	54.74
Feb-97	3,473.99	54.93
Mar-97	3,354.72	54.86
Apr-97	3,288.84	54.43
May-97	3,460.55	53.75
Jun-97	3,530.43	54.23
Jul-97	3,466.92	57.47
Aug-97	3,403.22	66.97
Sep-97	3,447.41	63.56
Oct-97	3,302.13	62.68
Nov-97	3,046.60	63.85
Dec-97	3,115.15	63.02
Jan-98	3,348.11	61.27
Feb-98	3,362.23	60.56
Mar-98	3,213.30	60.12
Apr-98	3,015.01	59.59
May-98	3,016.44	62.49
Jun-98	2,907.55	60.50
Jul-98	2,868.22	59.36
Aug-98	2,862.66	59.37
Sep-98	2,810.32	60.03

Period	NSE Share Index	Exchange Rate
Oct-98	2,733.68	59.86
Nov-98	2,583.73	59.66
Dec-98	2,962.06	61.95
Jan-99	2,983.48	61.80
Feb-99	2,988.88	62.64
Mar-99	2,815.29	64.07
Apr-99	2,767.89	65.63
May-99	2,762.85	68.88
Jun-99	2,756.43	72.78
Jul-99	2,744.55	73.14
Aug-99	2,493.51	74.51
Sep-99	2,428.09	75.71
Oct-99	2,309.33	75.57
Nov-99	2,294.12	74.77
Dec-99	2,303.18	73.92
Jan-00	2,301.07	71.01
Feb-00	2,277.89	73.31
Mar-00	2,233.18	74.41
Apr-00	2,162.20	74.32
May-00	2,052.90	75.90
Jun-00	2,003.10	77.03
Jul-00	1,967.00	76.42
Aug-00	1,959.00	76.47
Sep-00	2,001.00	78.12
Oct-00	2,043.00	79.24
Nov-00	1,930.00	78.81
Dec-00	1,913.00	78.74
Jan-01	1,897.00	78.56
Feb-01	1,933.00	78.23
Mar-01	1,831.00	77.76
Apr-01	1,768.00	77.51

Period	NSE Share Index	Exchange Rate
May-01	1,636.00	78.51
Jun-01	1,657.00	78.58
Jul-01	1,621.00	78.98
Aug-01	1,506.00	78.87
Sep-01	1,401.00	78.93
Oct-01	1,473.00	78.94
Nov-01	1,420.00	78.97
Dec-01	1,355.00	78.62
Jan-02	1,343.00	78.60
Feb-02	1,314.00	78.26
Mar-02	1,183.00	78.06
Apr-02	1,129.00	78.26
May-02	1,071.00	78.32
Jun-02	1,087.00	78.63
Jul-02	1,097.00	78.81
Aug-02	1,043.00	78.58
Sep-02	1,043.00	78.80
Oct-02	1,116.00	79.28
Nov-02	1,161.00	79.56
Dec-02	1,363.00	79.60
Jan-03	1,511.00	77.62
Feb-03	1,558.00	76.88
Mar-03	1,608.00	76.55
Apr-03	1,847.00	75.63
May-03	2,074.67	71.70
Jun-03	1,934.96	73.39
Jul-03	2,005.08	74.75
Aug-03	2,107.43	75.94
Sep-03	2,379.91	77.92
Oct-03	2,457.21	77.72
Nov-03	2,736.98	76.80

Period	NSE Share Index	Exchange Rate
Dec-03	2,737.59	75.99
Jan-04	3,157.88	76.27
Feb-04	3,175.36	76.41
Mar-04	2,770.60	77.29
Apr-04	2,707.60	77.90
May-04	2,689.14	79.21
Jun-04	2,639.75	79.25
Jul-04	2,708.03	79.98
Aug-04	2,708.86	80.78
Sep-04	2,670.69	80.66
Oct-04	2,829.65	81.23
Nov-04	2,918.34	81.20
Dec-04	2,945.58	79.86
Jan-05	3,094.38	77.91
Feb-05	3,212.81	76.94
Mar-05	3,126.07	74.56
Apr-05	3,227.59	76.01
May-05	3,505.39	76.37
Jun-05	3,972.15	76.66
Jul-05	3,982.00	76.24
Aug-05	3,938.70	75.79
Sep-05	3,832.69	74.07
Oct-05	3,939.45	73.69
Nov-05	3,974.12	74.64
Dec-05	3,973.04	73.16
Jan-06	4,171.80	72.23
Feb-06	4,056.63	71.81
Mar-06	4,101.64	72.29
Apr-06	4,025.21	71.28
May-06	4,349.75	71.75
Jun-06	4,260.49	73.29

Period	NSE Share Index	Exchange Rate
Jul-06	4,258.54	73.69
Aug-06	4,486.07	72.84
Sep-06	4,879.86	72.86
Oct-06	5,314.36	72.29
Nov-06	5,615.20	71.14
Dec-06	5,645.65	69.64
Jan-07	5,774.27	69.88
Feb-07	5,387.28	69.68
Mar-07	5,133.67	69.26
Apr-07	5,199.44	68.62
May-07	5,001.77	67.17
Jun-07	5,146.73	66.54
Jul-07	5,340.08	67.03
Aug-07	5,372.00	66.90
Sep-07	5,146.46	66.98
Oct-07	4,971.04	66.81
Nov-07	5,234.54	65.58
Dec-07	5,444.83	63.32
Jan-08	4,712.71	68.09
Feb-08	5,072.41	70.41
Mar-08	4,843.17	64.94
Apr-08	5,336.03	62.21
May-08	5,175.83	61.98
Jun-08	5,185.56	63.74
Jul-08	4,868.27	66.64
Aug-08	4,648.78	67.78
Sep-08	4,180.40	71.44
Oct-08	3,175.49	76.34
Nov-08	3,514.30	78.19
Dec-08	3,521.00	77.87
Jan-09	3,198.00	78.99

Period	NSE Share Index	Exchange Rate
Feb-09	2,474.00	79.48
Mar-09	2,805.00	80.21
Apr-09	2,800.00	79.66
May-09	2,852.00	78.00
Jun-09	3,294.00	77.88
Jul-09	3,273.00	76.69
Aug-09	3,175.00	76.39
Sep-09	3,015.00	75.51
Oct-09	3,083.00	75.24
Nov-09	3,189.00	74.80
Dec-09	3,232.00	75.45
Jan-10	3,565.28	75.77
Feb-10	3,629.00	76.71
Mar-10	4,072.93	76.94
Apr-10	4,233.24	77.26
May-10	4,298.84	78.58
Jun-10	4,339.00	80.99
Jul-10	4,439.00	81.39
Aug-10	4,455.00	80.41
Sep-10	4,580.00	80.89
Oct-10	4,660.00	80.66
Nov-10	4,395.17	80.40
Dec-10	4,432.00	80.53
Jan-11	4,464.92	81.00
Feb-11	4,240.18	81.43
Mar-11	3,887.07	84.23
Apr-11	4,029.23	83.82

Source: NSE and CBK