PORTFOLIO FLOWS, MACROECONOMIC PRICES AND MONETARY POLICY IN KENYA.

OWEN NYANG`ORO

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

Owen Nyang`oro

Signature:.....

This thesis has been submitted for examination with our approval as University supervisors

Professor Francis M. Mwega

Signature:.....

Date:.....

Dr Seth O. Gor

Signature:.....

Date:.....

DEDICATION

In honour of my late parents Zadock Nyang`oro and Grace Nyang`oro

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The views expressed in this study are solely mine and not related to any mentioned institutions or persons. I, therefore, assume full responsibility for any errors or omissions that may have gone unnoticed in the study.

ABBREVIATIONS

ACF	Autocorrelation Function
ADF	Augmented Dickey-Fuller Test
APT	Arbitrage Pricing Theory
CBK	Central Bank of Kenya
CBR	Central Bank Rate
CDS	Central Depository System
CIP	Covered Interest Parity
CMA	Capital Markets Authority
CPI	Consumer Price Index
DSGE	Dynamic Stochastic General Equilibrium Model
EAC	East African Community
EMP	Exchange Market Pressure
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
HPF	Hodrick–Prescott Filter
IMF	International Monetary Fund
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
MPC	Monetary Policy Committee
MPRF	Monetary Policy Reaction Function
MSCI	Morgan Stanley Capital Index

MWG	Macroeconomic Working Group
NDA	Net Domestic Assets
NIR	Net International Reserves
NFA	Net Foreign Assets
NSE	Nairobi Securities Exchange
OMO	Open Market Operation
PACF	Partial Autocorrelation Function
SSA	Sub Saharan Africa
SVAR	Structural Vector Autoregressive
UIP	Uncovered Interest Parity
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
VAR	Vector Autoregressive

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ABSTRACT

This study focuses on short term capital flows in Kenya. It investigates the effect of short term capital flows on macroeconomic prices and monetary policy management in Kenya. Empirical analysis is carried out to determine: the impact of short term capital flows on stock market performance using a multifactor pricing model, interest rate and exchange rate using a structural vector autoregressive model, and the effect of short term capital flows on monetary policy using a monetary policy rule.

The main findings are that stock market returns are affected by the expected and lagged unexpected portfolio flows. The price pressure and base-broadening hypotheses are supported. Participation of local investors improves returns. Macroeconomic factors, especially change in exchange rate and Treasury bill rate, improve returns. Short term flows affect monetary stability by reducing the interest rates over time and leads to currency appreciation. The exchange market pressure is mainly affected by changes in exchange rate and not by short term flows.

The bank rate is adjusted to accommodate changes in the economy to restore inflation to the targeted rate, but prominence is given to ensuring growth targets are met. Monetary authorities always ensure that changes in interest rates do not affect the macroeconomic activity, given the level of the smoothing parameter. The bank rate is adjusted with a higher magnitude when exchange rate is considered in the monetary policy rule.

The results suggest that short term capital flows have a disruptive effect on macroeconomic prices. Hence, to maintain stability in the economy and effectively manage monetary policy, short term capital flows should be considered in monetary policy management.

CHAPTER ONE

BACKGROUND AND CONTEXT

1.0 Introduction

Advancement of economies the world over, coupled with globalization of the financial systems has led to financial integration, mainly focused on meeting the financing gaps of different economies and facilitating trade and investment[1]. Integration of the financial markets has been driven by reduction in capital controls to allow for capital mobility. Capital is said to be mobile if finances can easily flow across national borders. Some countries, however, maintain either partial or complete control of their capital accounts.

Capital controls is justified as a way of preventing inflows of hot money which may excessively increase the value of the home currency, hence undermine competitiveness, and a way of reducing vulnerability to sudden changes in financial market sentiments that may affect domestic growth and employment[2]. The practice, however, has been to remove capital controls and allow for free capital mobility as a way of integrating with the rest of the world. Integration of financial markets removes covered interest differentials across countries, but not exchange-rate variability (Frankel, 1992).

[1] Financial sector globalisation started in different periods for the developed and developing countries, starting much earlier for the developed countries, and the process of globalisation also varied among countries. In developing countries, globalisation of the financial sector began in late 1970s with the syndicated bank loans (Frankel, 2011).

[2] Volatility of capital flows are only of concern if they are exogenous for the domestic economy since they can result into exchange rate volatility in a flexible exchange rate policy or into variations in official reserves in a fixed or pegged exchange rate policy (Claessens et al., 1995). While capital controls have been advocated to address the effect of volatility of capital flows, Ostry e al. (2011) have shown that they can only address temporary flows and can only be effective if certain economic conditions are not met, for example for an economy operating near its potential, reserves are adequate, if the exchange rate is not undervalued.

Opening up of capital account has been accompanied by stock market liberalization which started in the early 1990s, resulting in many developing countries opting to integrate their economies, both financially and economically[3], to the rest of the world. This led to opening of the domestic stock markets to foreign investors[4], driven by the need to integrate and make the markets more vibrant, leading to increased foreign portfolio inflows aimed at portfolio diversification mainly by the developed countries. At the same time, there has been growth in short-term debt as off-shore borrowing increase to take advantage of the competitive costs of credit in the world market.

The level of direct participation by foreign investors in local exchanges depends on the opportunities for investment in the market (Errunza, 2001). The ability of a country to attract short term capital depends on macroeconomic, political and institutional factors. The attraction of the emerging markets lies, to a large extent, in their much lower average correlations with developed markets, hence emerging market equities may serve as attractive diversification vehicles for investors in developed countries (Conover et al., 2002; Allen et al., 2011). Liberalization changes the source of systematic risk for pricing stocks and the expected return that can be received from a stock determines its attractiveness. At the same time, once a country liberalizes and allows inflow of capital, issues of macroeconomic stability become of paramount importance, given the nature of some of these flows. Short term capital flows may be volatile and are easily reversible, thereby impacting macroeconomic stability.

[3] Economic integration involves reduction in trade barriers, while financial integration is associated with reduction in barriers to portfolio investment (Narag, 2000); hence free access by foreigners to local capital markets and local investors to foreign capital markets (Bekaert and Harvey, 2000). A market is financially integrated if a project with identical risk has identical expected returns across different markets (Narag, 2000). Stock market liberalization is where a government removes barriers to transactions by foreigners to trade in the country's stock market (Henry, 2000b).

[4] The benefits of global investment are derived from their ability to reduce risk since they have relatively low correlations with national equities and due to the higher returns in emerging markets (Conover et al., 2002).

Portfolio inflows can have two effects in emerging markets; lowering the cost of capital for the economies and helping in financing their growth (Bekaert and Harvey, 2000; Henry, 2000b). Growth is financed by the fact that portfolio inflows lower the cost of capital and facilitate the flow of capital to firms and countries that have the best investment opportunities irrespective of their location (Stulz, 1999; Narag, 2000). The change in investor composition affects equity prices when foreign investors buy shares to lower risk premium, and by foreign investors offering domestic investors an inducement to sell. This compensation only affects prices in the short-run and its size depends on the liquidity of the market (Stulz, 1999).

Short term capital flows, such as foreign portfolio investments, impact on growth through their contribution to development of domestic capital markets, which is through resource mobilization, market development and globalisation effect (Errunza, 2001). However, foreign portfolio is reversible[5] and tends to leave as fast as they come in an economy (Bekaert et al., 2002). Due to this, portfolio flows may have a drastic impact on the economy and on the value of shares of companies in which foreign investors offload their holdings, hence the stability of the stock market in general[6]. A good understanding of the effect of foreign portfolio flows on stock market performance is therefore important in assessing the role that foreign portfolio plays in the domestic stock market, given the concern that such flows may destabilise the fragile markets, especially at times of crisis (Pavabutr and Yan, 2007). For instance, much of the volatility experienced in developing countries originates from financial shocks from global financial markets, mainly due to globalisation of the financial sector (Frankel, 2011). Most of the financial

[5] Short-term capital (for example, portfolio flows) movements are speculative and reversible, while long-term capital flows are reversible only when fundamentals they are based on change (Claessens et al., 1995).
[6] Capital inflow slowdown or reversal may make a country insolvent or drastically lower the productivity of its capital stock (Gazioglu, 2008).

shocks are depicted by the behaviour of foreign investors in emerging markets as a response to financial crisis in their home countries.

The fact that short term capital flows are easily reversible is also a concern in terms of monetary policy management. A monetary policy measure that results to an increase in interest rates, for instance, makes the domestic economy attractive for foreign portfolio investments, especially if this is translated into return on assets, leading to increased short term inflows, which, on the other hand leads to appreciation of the exchange rate which has implications on tradables. However, these are reversed by an occurrence of a "sudden stop". The concern here is that though the monetary authorities can determine short term capital flows indirectly through monetary instruments, they have no direct control over short term flows, thus they may not be able to stop sudden reversals caused by global factors such as financial crises.

The effect of short term capital flows in an economy can be considered either through its effects on monetary policy[7] or through the capital market. When looked at from the monetary policy perspective, the aim is to establish the role monetary authorities play in managing the macroeconomy, given the volatile nature of short term capital flows and its inherent impact on other macroeconomic prices. The capital market perspective, on the other hand, considers both stocks and bonds focusing mainly on the speculative elements in the stock market. This approach considers how short term capital flow feeds into the capital market and how they affect the market fundamentals. In the capital markets, monetary policy effect is transmitted through the bonds market (using the interest rate channel of monetary policy). In this thesis, only the first

[7] Capital inflows tend to increase domestic money growth (Collins, 1988), meaning that for a country whose monetary policy framework is monetary targeting, a disequilibrium will be experienced in the economy which calls for a policy action to address.

option is covered in detail, and incorporates the effect of portfolio flows on stock market index, which is considered as one of the macroeconomic prices.

1.1 Motivation

The impact of short term capital flows into an economy is felt based on how it affects the stability of macroeconomic prices and by extension, the conduct of monetary policy. Since short term capital flows are easily reversible, it affects the stability of interest rates and exchange rates, thus monetary policy management. Portfolio flows to equity of firms also has an impact on firm returns, hence the stock market. Inflow of capital can either lead to an increase in net foreign assets in the form of foreign currency or to growth in domestic credit through the net domestic assets in the form of short-term debt. In both cases, money supply growth is affected given that money supply is specified as a combination of net foreign and net domestic assets.

Short term capital flow volatility may lead to volatility in macroeconomic prices[8] and cause macroeconomic instability. Monetary authorities are concerned with maintaining price stability, and this is done through macroeconomic management. If short term capital flow causes instabilities in macroeconomic prices, then appropriate monetary policy is necessary to restore stability as it makes it possible to carry out monetary and fiscal policy in a more effective way and helps to forecast macroeconomic variables on the state of the economy.

Given an open capital account and a liberalised stock market, short term capital flows are bound to have an effect on how the central bank manages monetary policy. The central bank, in its quest to maintain price stability and promote growth, responds to exchange rate changes caused

[8] "Macroeconomic prices" is used in this study to refer to exchange rate, interest rate and stock market index. It would have been more preferable to use "asset prices" instead, but that would have been a general term referring to all assets in the economy.

by short term capital flows by taking the necessary monetary policy action. The policy reaction of the central bank, however, impacts on the economy via the monetary policy instruments. It is therefore important for monetary policy makers to understand how short term capital flow affects macroeconomic prices, that is stock market index, exchange rate and interest rate, hence the conduct of monetary policy.

At the stock market, an increase in foreign portfolio flows lead to changes in information flow, efficiency and liquidity, thereby affecting stock market returns. The change in stock market returns may, however, not be reflected at the firm level. Volatility or rapid reversal of foreign portfolio flow increases risk and uncertainty in the stock market, leading to high macroeconomic instability. Thus, it affects the value of the firm by pushing share prices up when they come in, but down when they offload. The effect on share prices when offloading depends on the ability of domestic investors to buy back the equity held by foreign investors. It is therefore important to determine the effect of foreign portfolio flows on stock market performance as this will assist in establishing the impact of foreign investors in the market.

1.2 Statement of the Research Problem

The growth in the world economy has led to the need for integration as countries strive to promote trade, investment and meet financing gaps. This has resulted into economies such as Kenya removing capital controls to allow for free movement of capital and liberalising the stock markets. The result has been increased inflow of foreign capital in the economy. For instance, World Bank statistics show that foreign direct investment (FDI) inflows as a percentage of gross domestic product (GDP) increased from 0.22 per cent in 1990s to 0.58 per cent in 2000s, while data from the stock market shows that foreign investor turnover at the stock market increased

from Kshs.1,766 million in 1997 to Kshs.78,765 million in 2012. Despite the benefits derived from liberalisation and opening up of the capital account, the country is faced with certain drawbacks. First, Kenya is a small economy and thus no domestic decision can influence the world economy. Secondly, structural characteristics such as reliance on imports of mostly food and fuel, and exposure to supply shocks make the country uncompetitive. While the country has been attracting more long term capital in the form of FDI, the level of short term capital has been growing.

Short term capital is more volatile than long term capital and is easily reversible. Hence, despite their provision of capital for investment and their role in development of domestic capital markets, large and sudden inflows of short term capital have negative macroeconomic effects – including rapid monetary expansion, inflationary pressures, exchange rate appreciation and widening current account deficits. If short term capital flows are volatile and unpredictable, they have an effect on macroeconomic prices, that is, stock prices, exchange rate and interest rates, and hence on monetary policy management. The effect of the financial crisis, for instance, was manifested through depreciation of the exchange rate and net outflow of foreign portfolio investment from the stock market.

At the stock market, the ease of reversibility of portfolio flows has an impact on the capital of firms and therefore investment. For instance, the share of foreign trade at the stock market in early 2011 accounted for over 70 per cent of total trade, despite the challenges of liquidity faced by the market. When foreign investors move out of the market, they offload their holdings to domestic investors, thus depressing the value of equity, especially if domestic demand cannot match supply. The behaviour of foreign investors and thus portfolio flows is therefore not easily

predictable at the domestic level. And since they cause such instabilities, monetary policy management becomes a challenge.

Kenya, like most developing countries, has a small proportion of capital flows, but the economies have been growing. Hence, flow of capital is changing and focusing on these economies to take advantage of increasing returns and for diversification. Data from the balance of payments statistics for Kenya shows that short term capital has been recording a surplus, increasing from Kshs.28.5 billion in 2002 to Kshs.157.2 billion in 2011, about 54 per cent of net capital and financial account. Inflow of short term capital is expected to increase further as the economy expands. With instabilities in short term capital flow, maintaining monetary and economic stability is becoming a bigger challenge. Despite this, there is limited evidence on how short term flows affect macroeconomic prices in Kenya and how monetary policy can be managed in the phase of short term capital flow volatility. A better understanding of how short term capital affects domestic interest rate, exchange rate and stock market index is useful in coming up with appropriate measures to ensure macroeconomic stability and for better management of monetary policy. This study addresses these issues by establishing how short term capital flows affect stock market returns, interest rate and exchange rate, and how monetary policy reacts to such flows in the economy.

1.3 Research Questions

The main research question is: what are the effects of short term capital flows on macroeconomic prices and monetary policy management? In light of this, this thesis intends to answer the following questions:

a) What is the effect of portfolio flows on stock market performance?

b) What is the impact of short term capital flows on interest rate and exchange rate?

c) How does short term capital flows affect monetary policy?

1.4 Objectives of the Study

The main objective of this thesis is to examine the impact of short term capital flows on macroeconomic prices and on the conduct of monetary policy. The specific objectives are to:

a) Determine the impact of portfolio flows on stock market performance;

b) Determine the impact of short term capital flows on interest rate and exchange rate;

c) Establish how short term capital flows has affected monetary policy and thus the reaction of the monetary authorities to short term capital flows.

1.5 Significance of the Study

Despite the need to promote capital flows across countries, understanding how short term capital flows affect economic variables is important for a country to restore macroeconomic stability. The effect of short term capital flows to Kenya has not been given much prominence in the past despite the growing volume of such flows. This study establishes the impact that short term capital flows have on the economy, focusing specifically on macroeconomic prices. This is done by establishing the impact of short term capital flows on the stock market, exchange rate and interest rate, and establishing the response of monetary authorities to short term capital flows.

The study introduces portfolio flows to the stock market as one of the determinants of stock market returns to establish how both the expected and unexpected portfolio flows affect stock market returns in Kenya. One of the novel contributions of this study is to link short term capital flows to exchange rate in Kenya, which is important in a frontier market setting where

macroeconomic price stability is a concern. The analysis is extended by developing a monetary policy rule that targets monetary aggregate using short term interest rate as an instrument, to establish the effectiveness of this rule in monetary policy management. Thus, response variables are derived that show the direction and magnitude of monetary policy.

Previous studies have considered two variants of literature; those looking purely at the effect of financial liberalisation on the stock markets, concentrating on returns, investment and the determinants of portfolio flows. Another strand of literature looks at instability of macroeconomic variables and the causes of such instabilities. This has been extended further to consider monetary policy management and how monetary authorities go about managing monetary policy. Studies on exchange rate, for instance, have focused on exchange rate determination, exchange rate volatility and the major causes of such volatility, but no research has gone into establishing how, in the face of financial liberalisation, short term capital flows affect nominal exchange rates in developing countries like Kenya.

The literature is linked by first establishing the effect of short term flows on three main macroeconomic prices, that is, stock market index, interest rate and exchange rate. The study then considers the way monetary policy can be managed in a small open economy which records some level of short term flows that have been growing over time. In this case, monetary policy links short term flows and macroeconomic prices. The argument is that monetary policy cannot be carried with no consideration of capital flows in a small open economy since these capital flows bring about instabilities in the economy, thus affecting the conduct of monetary policy. This implies that though the stock market is endogenous to the economy, it may be necessary to be cognisant of a more vibrant stock market which attracts huge levels of portfolio flows when setting monetary policy.

1.6 Justification

Monetary policy management is central for stability of any economy. While opening of the capital account and subsequent liberalisation of the stock market is seen as a positive move, the impact that short term capital flows has on macroeconomic prices and monetary policy management needs to be clear. For instance, the share of foreign to total trade at the stock market has been high of late, depicting an increased level of foreign participation despite the challenges of liquidity faced by the market. Given this state of affairs, it is necessary to understand how foreign trade has affected macroeconomic variables and monetary policy, especially given the depreciation of the currency in early 2010s that increased uncertainty in the market. Despite the increased levels of short term capital flows in Kenya, especially portfolio flows, these issues have not been looked at.

On the monetary policy front, the debate is still on whether countries should fully liberalise their capital accounts and thus allow full capital mobility or partial mobility. This debate has been driven by the fact that short term capital flows are easily reversible and thus pose a risk in the management of monetary policy. Short term capital flows are therefore of more concern to monetary policy management due to the impact it has on interest rates and exchange rate. This is even more important following the instability experienced in the exchange rates since short term capital flows change the net foreign assets of a country and can therefore affect interest rates and exchange rates, hence a concern for monetary policy. This thesis provides empirical evidence on these aspects, which while important for an economy, are few in emerging and frontier markets. The work of O'Connell et al. (2010) is further extended by incorporating the stock market and then considering monetary authority's reaction that may be used to address instabilities caused by short term capital inflows.

Unlike previous studies, this study only considers short term capital flows, focusing on portfolio flows in the first empirical chapter, to establish its relations to monetary policy variables. At the same time, the study establishes how the monetary authorities have responded to short term capital flows. This study is mainly concerned with short term flows for two reasons. First, the volume of short term capital flows to African countries has been growing over time to take advantage of the high return in these markets, though the proportion of short term capital flows to Africa compared to that of the world is still small. This implies that there are more opportunities for substantial growth of short term capital flows to Africa, especially portfolio flows, as reforms in the stock markets are intensified and better macro-management policies are put in place. Second, African countries are faced with the challenge of maintaining stability in a globalised world given their small sizes, which is important for performance of monetary and fiscal policies. With the expected increase in short term capital flows, macroeconomic stability is poised to play a bigger role than before. It is thus important to understand how such stability can be achieved.

There are cases when monetary policy needs to be adjusted to deal with special factors (Taylor, 1993), and one of these special factors may be unprecedented short term capital flows, which has an impact on macroeconomic variables. For instance, Taylor (1993, 1995) calls for more research on monetary policy rule so as to establish the size of the reaction coefficients and the role of discretion in implementing the policy rule, especially within a flexible exchange rate system, as there is no consensus about the size of the coefficients of policy rules; hence it is important to establish what these coefficients are in the Kenyan case.

1.7 Structure of the Thesis

This thesis is structured into six chapters, starting from the introductory chapter, then specific empirical chapters. Chapter two summarises the background by considering first the macroeconomic framework of Kenya, then monetary policy and finally at the Kenyan stock market. Chapters three, four and five provide empirical evidence of the study.

Chapter three presents empirical evidence on the effect of portfolio flows on stock market performance, focusing mainly on stock market returns. Using monthly dataset capturing foreign investor trade at the Nairobi Securities Exchange following the period after stock market liberalisation, a multi-factor asset pricing model framework is specified to investigate the effect of foreign participation on stock market returns. Chapter four employs the same data set but includes additional macroeconomic indicators to investigate the relationship between interest rates and exchange rates in the presence of short term capital flows. A dynamic multivariate econometric model is specified, while controlling for other macroeconomic variables such as domestic credit.

Chapter five then builds from the last two empirical chapters by examining how short term capital flows have affected monetary policy management. This is motivated by the fact that short term capital flows are volatile and unpredictable and affect the stability of macroeconomic variables. Hence, they affect monetary policy and thus should be considered in making monetary policy decisions. A generalised method of moment (GMM) estimation is used while controlling for other factors that affect monetary policy management. This enables the study to separate the effect of short term capital flows on monetary policy management. Chapter six provides conclusions drawn from the thesis and makes some policy suggestions based on the findings.

CHAPTER TWO

MACROECONOMIC FRAMEWORK, MONETARY POLICY AND STOCK MARKET PERFORMANCE IN KENYA: AN OVERVIEW

2.0 Introduction

This chapter presents an overview of the performance of the Kenyan economy, focusing on macroeconomic indicators and composition of capital flows. The overview covers macroeconomic growth and traces the trends of major macroeconomic indicators. Capital account liberalisation and composition of capital flows in Kenya is then considered and comparisons made to other Sub-Saharan African (SSA) countries. The aim of the chapter is to give an exposition of macroeconomic developments over time. This enables the study to establish, though in a more general sense, the relationship between capital flows and macroeconomic performance.

2.1 Kenya's Macroeconomic Performance: A Perspective

2.1.1 Trends in macroeconomic indicators

Kenya's macroeconomic performance has shown mixed results over time. The country experienced high growth rates in the 1970s,, with an average growth rate of about 8 per cent supported by the increase in real resources, favourable terms of trade due to increase in international prices of coffee and tea (Table 2.1). Some of the gains made were however reversed due to oil price shocks of 1973 and 1978, especially at the second half of the decade. The negative shocks which continued in early 1980s were caused by severe drought in 1983-4, resulting in economic growth declining by half, on average, in the following decade.

Table 2.1: Evolution of Key Macroeconomic Indicators, 1971 - 2011

	1971-80	1981-90	1991-00	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
GDP growth (annual %)	8.18	4.08	1.88	3.78	0.55	2.93	5.10	5.91	6.33	6.99	1.53	2.74	5.76	4.38
Inflation, consumer prices (annual %)	12.09	12.20	16.64	5.74	1.96	9.82	11.62	10.31	14.45	9.76	26.24	9.23	3.96	14.02
Exchange rate (per US$, period avg.)	7.51	15.80	54.79	78.56	78.75	75.94	79.17	75.55	72.10	67.32	69.18	77.35	79.23	88.81
Total short-term debt (% of total external debt)	15.82	10.90	10.87	10.82	12.08	13.13	10.54	7.70	9.01	12.82	11.97	11.78	11.42	15.53
Domestic credit to private sector (% of GDP)	22.78	30.49	30.16	25.22	25.86	24.60	26.79	25.93	26.08	26.93	29.85	30.29	33.83	38.15

Source: World Development Indicators/Global Development Finance, World Bank online database.

In 1990s, growth was not impressive, with multiple shocks arising from drought in 1992-3 and 2000, El Nino in 1997-8, increase in international oil prices in 1991 due to Gulf crisis, and political instabilities following 1992 and 1997 elections (Government of Kenya, 1991; Mwega and Ndung'u, 2008). The world coffee prices fell in 1990 and the terms of trade worsened. Drought experienced during the end of the decade led to power rationing in 2000, which increased the costs of production. Uncertainties regarding general elections coupled with low domestic credit, poor infrastructure and low output and prices of major agricultural exports led to a decline in GDP to the lowest rate of 0.6 per cent in 2002 (Government of Kenya, 2003).

The rebound in growth between 2003 and 2007 was hinged on the Economic Recovery Strategy for Wealth and Employment Creation (ERS) which provided a framework for development plan that focused on, among other things, improvement in investment and savings, infrastructure development, judicial and regulatory reforms, and reforms and enhancements in the financial sector, which ensured stability in exchange rates. Implementation of ERS improved the investment climate, leading to increased private sector investment. Hence, the projected growth rate of 7 per cent was achieved in the fifth year of the plan, that is, by the end of the recovery program 2003 - 2007. This state of the economy could however not be sustained following the outcome of 2007 elections which disrupted food supply and increased political risk levels, leading to a dismal growth of 1.6 per cent in 2008 compared to 7 per cent recorded the previous year.

The year 2008 also experienced the effects of the global financial crisis which started in developed countries in 2007, hence partly contributing to low levels of growth recorded in 2008. These factors may also have resulted in inflation rising to 26.2 per cent in 2008 from 9.8 per cent

in 2007. The recovery experienced up to 2010 was however reversed in 2011, with growth declining from 5.6 per cent to 4.5 per cent.

Inflation was relatively high in the 1970s and 1980s at an average of over 12 per cent driven mainly by supply shocks emanating from the oil shocks of 1970s and the coffee boom of 1976-7 (Table 2.1). This was compounded by drought in early 1980s. Inflation increased to an average of 16.6 per cent in the 1990s, with the highest level of inflation of about 46 per cent recorded in 1993 due to devaluation of the shilling, excessive growth in money supply in 1992 and early 1993, decontrol of prices and poor weather conditions (Government of Kenya, 1994). Efforts were made on the monetary and fiscal policy fronts that drastically reduced inflation levels to below 10 per cent, using tight credit controls in early 1990s to restore macroeconomic instability and increased reforms in the financial sector. Inflation, however, increased again in 2006 to 14.5 per cent and in 2008 to 26.2 per cent due to high oil prices, food price increase following drought of early 2006 and post poll violence of 2008, and depreciation of the currency (Government of Kenya 2007; 2009).

The domestic currency also constantly depreciated for most of the period 1971 to 2011, except between 2005 to 2007 when it slightly appreciated. The currency was stronger in 1970s and 1980s supported by favourable economic performance at the time, with the local currency priced at Kshs.15.80 to the US dollar (Table 2.1). However, it depreciated from 1990s going forward following aid embargoes, increased import bills, especially on food items and oil. The highest depreciation was however experienced in 2011 when the average exchange rate rose to Kshs.88.8 to the US dollar; mainly due to increase in international oil prices and Euro crisis that affected the country's export market.

Despite this, stability of the currency was maintained in 2000s, hence reducing the level of exchange rate risk. Reliance on short-term debt has however been maintained at manageable levels with the proportion of short-term debt to total external debt declining from an average of 15.8 per cent in the 1970s to 11.97 per cent in 2010. The level of domestic credit to GDP has also been stable, increasing from an average of 22.7 per cent in the 1970s to 38.15 per cent in 2011.

Table 2.2 presents the trend of main monetary aggregates from 1975 to 2011. The proportion of broad money as a percentage of GDP increased over time from 28.2 per cent in 1975-84 to 37.2 per cent in 2005, following increased credit to private sector, before slightly declining the following year and picking up again to stand at 42.7 per cent in 2009. Given the variation in GDP growth over the period, it is evident that the growth of broad money was not stable either. Broad money growth increased from an average of 17.2 per cent in 1975-84 to an average of 20.1 per cent in 1985-94, driven by increase in foreign assets and credit growth before declining to 9.9 per cent in 2005, and then picking up again following general reduction in interest rates and growth in private sector credit. The ratio of broad money to total reserves has been kept at an average of about 5 per cent, with high ratios averaging 10.8 per cent recorded in 1985-94.

Table 2.2: Trend of Main Monetary Variables, 1975 - 2011

	1975-84	1985-94	1995-2004	2005	2006	2007	2008	2009	2010	2011
Broad money (% of GDP)*	30.36	31.68	37.49	38.91	39.71	42.32	42.54	44.14	50.08	50.98
Broad money growth (annual %)	17.19	20.10	12.96	9.91	16.97	20.42	15.55	16.46	22.36	19.15
Broad money to total reserves ratio	4.77	10.80	5.60	4.05	3.70	3.43	4.50	3.51	3.73	4.02
Total reserves in months of imports	2.37	1.33	2.22	3.12	3.48	3.89	2.70	4.01	3.75	3.08
Total reserves (% of total external debt)	15.96	5.61	14.69	27.75	36.17	44.60	37.84	44.82	49.09	41.58
Short-term debt (% of total reserves)	104.32	295.17	86.10	27.75	24.91	28.74	31.62	26.28	23.27	37.34
Deposit interest rate (%)	7.75	6.88	10.27	5.08	5.14	5.16	5.30	5.97	4.56	5.63
Lending interest rate (%)	11.78	19.93	23.43	12.88	13.64	13.34	14.02	14.80	14.37	15.05
Interest rate spread (%)	4.03	13.05	13.16	7.80	8.50	8.18	8.71	8.84	9.81	9.42

Source: World Development Indicators/Global Development Finance, World Bank online database.

* Broad money is given by M3 (sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveller's checks; and other securities such as certificates of deposit and commercial paper).

The amount of total reserves in the economy has always been low, declining to as low as 1.3 months of imports cover against a requirement of about 4 months of import cover[9] (Table 2.2). This has been occasioned by the need to continuously intervene in the foreign exchange market to restore stability of the currency and over reliance on imports, hence constraining the stock of reserves. The amount of reserves sufficient to cover 4 months of imports was however recorded in 2009. Reserves are important as a stabiliser, especially when the exchange rate is facing threats that can make it depreciate drastically.

Total reserves as a proportion of external debt has increased over time, while short-term debt as a proportion of total reserves has declined over time. Thus depicts that the country has tried to accumulate enough reserves to cover unexpected capital volatility. It also points to the fact that debt levels might have increased over time, but the import needs of the country have drastically increased such that the amount of reserves needed to cover for months of imports has substantially grown. Hence, when reserves are considered in relation to debt, the reserves seem to be improving.

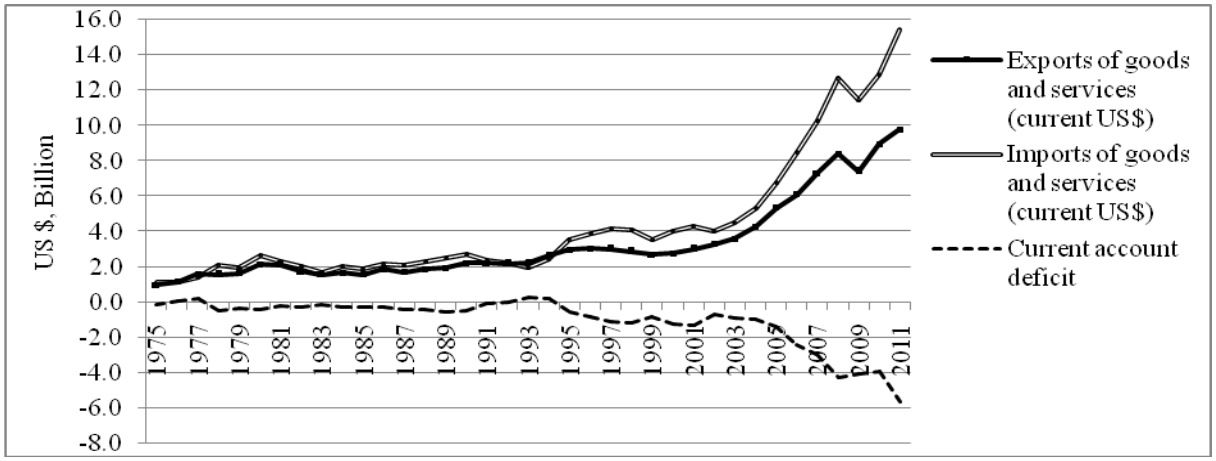
Interest rates, both lending and deposit rates, increased initially from 1975-84 rates to higher average values in the period 1995-2004, where deposit rate and lending rate were 10.3 per cent and 23.4 per cent respectively, with a spread of 13.2 per cent (Table 2.2). Increase in interest rates in early 1990s was due to high yields on treasury bills which pushed other rates upwards. Thereafter, both deposit and lending rates declined up to 2008, when the trend changed following

[9] The requirement of holding reserves enough to cover 4 months of imports has been replaced by the need to hold adequate reserves to cover all short-term foreign debt, referred to as the "Guidotti rule" in the literature (see Frankel, 2011). This requirement was borne out of the fact that short-term foreign debt are volatile and when such volatility occurs, it can only be contained when a country holds enough reserves. However, this requirement may not be very practical in developing countries which always face unfavourable terms of trade, thus affecting their capital account.

prudent monetary policy pursued by the Central Bank. Deposit rate declined faster than the lending rate as lending institutions kept the rate higher; hence the spread increased from 7.8 per cent in 2005 to 9.81 per cent in 2010.

Figure 2.1 shows the trend of trade and current account deficit from 1975 to 2011. The value of trade shows that Kenya has continued to rely much on imports compared to exports. According to the World Bank statistics, the value of imports and exports were almost the same in 1975 amounting to US$ 1.12 billion and US$ 0.97 billion, respectively. With the expansion of the economy, imports increased faster than exports driven by domestic demand of food items, intermediate and manufactured goods and energy.

Figure 2.1: Trend of Imports, Exports and Current Account Deficit, 1975 – 2011



Source: World Development Indicators/Global Development Finance, World Bank online database.

The value of trade has also been affected by international prices and the strength of the currency, resulting into an increase in the value of imports at a faster rate than export earnings. For instance, despite the decline in quantity of crude petroleum imports in 2006, its import value increased by 6.8 per cent due to 15.3 per cent increase in its import price (Government of Kenya, 2007). What is evident is that import growth has been higher than export growth over the period, resulting into an increase in current account deficit over time, which peaked at US$ 4.27 billion

in 2008. This deficit has largely been financed using short term financial flows (World Bank, 2011b). However, current account surplus was experienced in 1976/77 and 1993/94 following the coffee boom which resulted into high export earnings (Ndung'u, 2002). The surplus balance of payments, however, remains vulnerable to external shocks and outflows of short term capital (World Bank, 2011b).

Imports as a ratio of GDP has grown from an average of 33 per cent in 1975-84 to about 46 per cent by 2011, however, exports as a ratio of GDP declined from 29 per cent to 27 per cent over the same period (Table 2.3).

Table 2.3: Movements in Trade and Current Account Balance, 1975 - 2011

	1975 -84	**1985 -94**	**1995-2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Current account balance (% of GDP)	-5.74	-4.34	-8.10	-1.35	-2.27	-3.79	-6.50	-5.52	-7.36	-9.91
Exports of goods and services (% of GDP)	29.13	27.28	24.16	28.51	27.11	26.78	27.61	24.15	27.80	29.11
Exports of goods and services (annual % growth)	-0.68	8.17	2.23	9.38	3.06	6.65	7.20	-9.31	17.66	6.67
Imports of goods and services (% of GDP)	32.97	29.89	31.67	35.97	37.83	37.70	41.75	37.48	40.06	46.02
Imports of goods and services (annual % growth)	-2.75	8.90	5.54	14.94	17.81	11.06	6.64	2.80	6.05	15.58

Source: World Development Indicators/Global Development Finance, World Bank online database.

The current account balance as a ratio of GDP has also mostly been on the deficit side for the entire period from 1975 to 2011 due to widening trade deficit, except in 1977 and 2003 when it recorded surplus due to high tourism earnings and increased grant inflows. Most of the goods imported by Kenya are composed of intermediate inputs, capital machinery and oil (World Bank, 2011b), which are essential in driving the economy.

2.1.2 Composition of capital flows

Capital flows can be categorised as either long term or short term depending on the duration and nature of the flows; or as direct investment[10] or portfolio investment depending on the interest of the investor. Short term flows are easily reversible compared to long term flows. Short term flows come in the form of commercial bank loans or portfolio flows, while long term flows consist of foreign direct investment, long term debt and remittances.

The volume of capital flows in relation to the size of the economy has been low as given by foreign direct investment (FDI) and private capital flows as proportions of gross domestic product (GDP) (Table 2.4). Foreign direct investment net inflows were high in 1970s supported by high economic growth and favourable market size, but this declined in 1980s mainly due to uncertainty caused by policy reversals, especially implementation of structural adjustment (Mwega and Ngugi, 2007). The proportion of FDI inflows however declined in the 1980s and 1990s due to challenges in the investment climate such as infrastructure, policy environment and political risks which made the country unattractive. In 2000, FDI flows increased mainly due to new investments in the mobile phone sector and in financing private electricity generation activities (Ngugi and Nyang`oro, 2005; Mwega and Ngugi, 2007). Foreign direct investment net outflows as a proportion of GDP, however, increased marginally from an average of 0.10 per cent in 1975-84 to 0.15 per cent in 2009, driven by expansion of the East African countries which formed the main destination areas for Kenya's FDI.

[10] Direct investment represents a lasting interest in an entity in another economy and may be in the form of equity capital, reinvested earnings or intercompany debt transactions, while portfolio investment involves transactions in equity securities and debt securities (IMF, 2011a).

Table 2.4: Foreign Direct Investment and Private Capital Flows to GDP, 1975 – 2011*

	1975-84	1985-94	1995-2004	2005	2006	2007	2008	2009	2010	2011
Foreign direct investment, net inflows (% of GDP)	0.72	0.58	0.44	0.11	0.23	2.68	0.31	0.38	0.55	1.00
Foreign direct investment, net outflows (% of GDP)	0.10	0.06	0.06	0.05	0.11	0.13	0.14	0.15	0.00	0.03
Private capital flows, total (% of GDP)	0.60	0.48	0.14	0.22	0.21	2.64	0.26	0.30	0.64	1.14

Source: World Development Indicators/Global Development Finance, World Bank online database.
* Net inflows are new investment inflows less disinvestment from foreign investors to acquire a lasting management interest (10 per cent or more of voting stock) in a local enterprise. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. While net outflows shows net outflows of investment from the reporting economy to the rest of the world.

The level of total private capital flows to GDP have also been low recording a negative value (of -0.10 per cent) in 2005, before rising to the highest value of 2.45 per cent in 2007. The effect of the crisis on FDI inflows and outflows is evident as inflows recorded only 0.31 per cent of GDP while outflows increased to 0.14 per cent of GDP in 2008. However, a rebound on FDI inflows and private capital flows was recorded in 2009[11]. What is evident is that though capital flows are very low, the inflows improve when the economy is growing, that is, when GDP is growing at higher levels. Therefore in order for developing countries like Kenya to attract more long-term capital such as FDI, economic growth levels have to be improved, as this might be a reflection of the size of the market, hence possible returns on investments.

Table 2.5 gives a comparative view of the proportion of FDI inflows to Kenya versus other regions over time. The proportion of FDI inflows as a percentage of GDP has not changed much in the last decade compared to the 1970s, but shows an improvement from the 1980s and 1990s.

[11] External capital inflows and trade financing declined after the global crisis, but official development assistance did not (UNECA, 2011). Recovery of capital inflows to emerging markets, on the other hand, has been dominated by portfolio and bank flows and a falling share of foreign direct investment inflows (IMF, 2011b). This might explain the dismal increase in the proportion of FDI inflows as from 2009.

However, FDI inflows have been below 1 per cent of GDP on average, showing that the country has not fully attracted FDI which is important for growth. FDI inflows as a proportion of total FDI inflows in the East African Community (EAC) depict a case where Kenya has lost FDI inflows to her neighbours, with the share of FDI to Kenya falling from about 90 per cent in 1970s to less than 10 per cent within the last decade. This kind of trend is also depicted when a comparison of the share of FDI inflows into Kenya to that of Sub-Saharan Africa (SSA) countries and developing economies, respectively, is done. For instance, the proportion of FDI inflows to Kenya to that of developing economies declined from 0.53 per cent to 0.03 per cent.

Table 2.5: Comparative Trend of Foreign Direct Investment, 1971 – 2011

FDI Inflow (% of)	1971 - 1980	1981 - 1990	1991 - 2000	2001 - 2011
Gross Domestic Product (GDP)	0.65	0.30	0.22	0.58
East African Community (EAC)	89.69	53.15	15.55	8.64
Sub-Saharan Africa (SSA)	3.63	2.17	0.46	0.55
Sub-Saharan Africa (excl. S. Africa)	3.32	2.10	0.58	0.64
Developing economies	0.53	0.13	0.02	0.03

Source: UNCTAD online database.

What is inferred from Table 2.5 is that generally, while gross FDI inflows to Kenya may have increased, the share of FDI inflow to that of the region has declined over time, implying that the country has not benefited from the FDI boom that has occurred in many developing countries. For instance, from Table 2.6, average FDI inflows to Kenya increased from US$37.2 million in 1970s to US$133.1 million in 2000s, while that for Uganda and Tanzania increased from US$ 0.7 million to US$ 504.2 million and US$ 4.4 million to US$ 525.6 million respectively, over the same period.

Table 2.6: Average Foreign Direct Investment Inflows at Current Prices, 1971 – 2011 (US$ million)

FDI Inflows	1971 - 1980	1981 - 1990	1991 - 2000	2001 - 2011
Kenya	37.2	28.2	26.4	153.2
Uganda	0.7	-0.5	98.8	514.4
Tanzania	4.4	4.5	148.9	799.3
Rwanda	5.4	15.9	4.0	48.3
Burundi	0.6	2.3	2.3	0.9
East African Community (EAC)	48.3	50.4	279.6	1,516.1
Sub-Saharan Africa	884.6	1,453.7	5,331.0	24,330.2
Sub-Saharan Africa excluding South Africa	826.8	1,446.4	4,384.0	20,393.5
Developing economies	6,283.0	23,355.7	141,651.6	435,851.1

Source: UNCTAD online database.

Table 2.7 shows the proportion of average remittances to Kenya from 1971 to 2011. From the table, remittances to Kenya have grown over time with the ratio of remittance inflows to GDP increasing from an average of less than 1 per cent in 1980s, to an average of 4.7 per cent in 2000s. The increase in remittances may be due to improved channels through which remittances can be made that has increased both efficiency and reduced costs of remittances. At the same time, government has put in efforts to encourage domestic investment by citizens abroad.

Table 2.7: Comparative Trend of Remittances, 1971 - 2011

Migrants Remittances Inflow (% of)	1981 - 1990	1991 - 2000	2001 - 2011
Gross Domestic Product (GDP)	0.80	2.33	4.84
East African Community (EAC)	94.67	89.28	65.14
Sub-Saharan Africa (SSA)	5.16	7.79	8.72
Sub-Saharan Africa (excl. S. Africa)	5.43	8.24	9.23
Developing economies	0.31	0.44	0.53

Source: UNCTAD online database.

However, remittances to Kenya as a proportion of total remittance to East African Community (EAC) countries declined from about 95 per cent to 65 per cent over the same period. As a proportion of remittance to Sub-Saharan Africa (SSA) countries, Kenya's remittance inflows have increased from 5 per cent to about 9 per cent, while as a proportion of remittances to

developing countries, they increased from 0.3 per cent to 0.5 per cent. What is evident from these trends is that the importance of remittance flows has grown over time. However, it still forms a small proportion of the total GDP, thus enhancing remittance flows will further improve consumption and help spur production due to increased demand[12].

2.2 Summary

This chapter has provided the overview of historical movements of a number of macroeconomic indicators in Kenya. It links the movements to developments in the economy over time. What is evident is that the economy is susceptible to a number of factors, mainly emanating from structural shocks to the economy. Some of these shocks are local such as political uncertainties, while most are external factors, meaning the economy is more exposed to developments in the global stage. Most of these are international price changes of commodities and oil due to supply at the global stage and global financial market developments. These impacts are felt most because of more reliance on imports compared to exports, limiting the source of foreign exchange for the country and the small size of the economy. The inflow of international capital is therefore likely to affect the domestic economy.

[12] Despite increased remittances to Kenya, investment has not changed at the same rate pointing to the fact that a large proportion of these remittances are used for consumption rather than development, and this may result into increased production to meet the growing demand. Though no study can be cited on this, it is our view that if most of the remittances could be channelled to finance development projects, then the country could develop faster.

CHAPTER THREE

FOREIGN PORTFOLIO FLOWS AND STOCK MARKET PERFORMANCE

3.0 Introduction

This provides an empirical analysis of the impact of portfolio flows on stock market performance in Kenya. The aim is to establish how foreign portfolio flows have impacted the stock market returns, given the unpredictable nature of foreign investors. The level of portfolio flow is introduced as a determinant of stock market returns. Most studies have overlooked the effect of opening up the emerging markets for foreign participation, despite the fact that these markets have low liquidity and order flow. While opening emerging markets is expected to enhance liquidity and order flow, the result is that a higher proportion of market capitalisation is from foreign participation, unlike in the developed economies. This state of facts has been evident in Kenya where the average participation by foreign investors increased to over 50 per cent of total equity turnover in 2011[13]. Hence, any variation or sudden reversal of foreign portfolio highly affects these markets. In such a case, foreign portfolio is important as a determinant of market returns.

3.1 Foreign Investor Participation in the Nairobi Securities Exchange

Participation of foreign investors in the Nairobi Securities Exchange (NSE)[14] can be traced back to 1954, when trade in shares was confined to the resident European community. Africans and Asians were only permitted to trade in shares after the country attained independence in 1963.

[13] The level of net foreign investor participation to total equity turnover, for instance, increased from 64.5 per cent to 71.4 per cent from October to November 2011 (CBK Monthly Economic Review, November 2011).

[14] As part of the demutualisation process, the Nairobi Stock Exchange (NSE) was renamed Nairobi Securities Exchange (NSE) in October 2011.

Before establishment of NSE, shares were traded informally[15]. The presence and dominance of foreign investors[16] in the market declined after independence when the country adopted the Kenyanisation policy. In spite of this, the Government still aimed at protecting the interest of foreign investors, and thus the Foreign Investment Protection Act (1964) was passed. The Act focused on foreign direct investors and it allowed for repatriation of earnings and capital by foreign firms.

Several institutional changes have been implemented to strengthen the market and to improve its efficiency among other factors. These include establishment of the Capital Markets Authority (CMA) in 1990 with amendments of the Act in 1995, making it possible for foreign portfolio investors to buy government securities; repealing of the Exchange Control Act in December 1995 which ensured the removal of all exchange controls; introduction of Central Depository System (CDS) in November 2004; and Automation of Trading System in September 2006, inter alia. Opening of the NSE to foreign portfolio investment may have led to improvement in trading volumes, enhanced levels of service to stockbrokers and increased volume of capital raised. The capital market is, however, still small in size with limited listings, relatively low liquidity and is faced with significant structural and regulatory weaknesses (Ngugi et al., 2010). In the Kenya Gazette Supplement of January 1995, foreign investors were permitted up to 20 per cent of equity for inward portfolio investment, this was revised upwards in July 1995 to 40 per cent and in 2002 to 75 per cent (Ngugi, 2003).

[15] See Ngugi (2003) for a historical perspective on the development of Nairobi Stock Exchange.
[16] A foreign investor is defined as any person who is not a local, an East African investor or a body not incorporated in Kenya or in East African Community Partner State (Government of Kenya, 2002). Before this regulation was passed, the definition referred to people, entities or bodies that are not locals or not incorporated in Kenya.

The volume of shares traded increased due to these reforms (Table 3.1). Downturns were however experienced in 2001-02 and 2009 mainly arising from low foreign turnover resulting in net outflow, the impact of political instability in 2008 and global financial crisis. The highest shares volume of 7,546 million was recorded in 2010. Based on data, the shares traded jumped from 62.2 million in 1995 to 141.6 million in 2000, following the opening of the market for foreign participation and has consistently remained at a considerably higher level thereafter. Turnover increased from a low of Kshs.0.2 billion in 1990 to Kshs.3.3 billion in 1995, reaching a high of Kshs.110.3 billion in 2010. The same trend was also followed by the market capitalisation, with the highest level of Kshs.13,070 billion being recorded in 2010.

Table 3.1: Gross Market Statistics, 1990 – 2011

Year	1990	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Shares Volume (Mn)	11.0	62.2	141.6	381.2	625.3	874.2	1454.7	1938.2	5856.5	3160.0	7545.8	5721.8
Shares Turnover (KShs. Bn)	0.2	3.3	3.6	15.3	22.3	36.6	95.0	88.6	97.5	38.2	110.3	78.1
Market Cap. (KShs. Bn)	10.9	1230.5	1306.0	2446.3	3629.2	4826.9	7540.4	9133.9	11026.7	9101.2	13070.3	12429.6

Source: Data extracted from Nairobi Securities Exchange and Capital Markets Authority Annual Reports.

The level of foreign trade in the NSE picked up immediately after the market was opened with foreign purchases of equity recorded at Kshs.1,644 million and sales amounting to Kshs.101 million in 1997 (see Appendix Table A1). Overall, the total foreign turnover increased over time from a low of Kshs.695 million in 1996 to the highest of Kshs.78,765 million by the end of 2011 following reforms that were taking place in the market. Data on net inflows, however, show that there are periods when foreign sales were higher than foreign purchases hence showing net outflows. This shows a pull by foreign investors out of the domestic equity market. This is evident in 1999 and 2000 after a period of foreign inflows. Without drawing any conclusion, this may have been due to the fact that the foreign investors, who had no prior knowledge of the

market, were able to get information of the market and started pulling out immediately they realized that they could not get the returns they expected or due to high operation costs.

The lowest net foreign inflow of negative Kshs.8,189 million was recorded in 2008, the period when the financial crisis hit the world and thus may explain the large volumes of outflows by foreign investors from the domestic market (see Appendix Table A1). The proportion of foreign turnover to total turnover declined from the 1990s after stock market liberalisation, with the lowest values recorded in 2004 and 2006. The falling values of foreign portfolio inflows are attributable to the fact that investors come into the market assuming superior information, thereby pushing up prices by demanding more, but after factoring in the information held by these investors, the prices self-correct themselves forcing investors out of the market. Though with variability, the proportion of foreign investor to total turnover rose to the highest of 51.9 per cent in 2011.

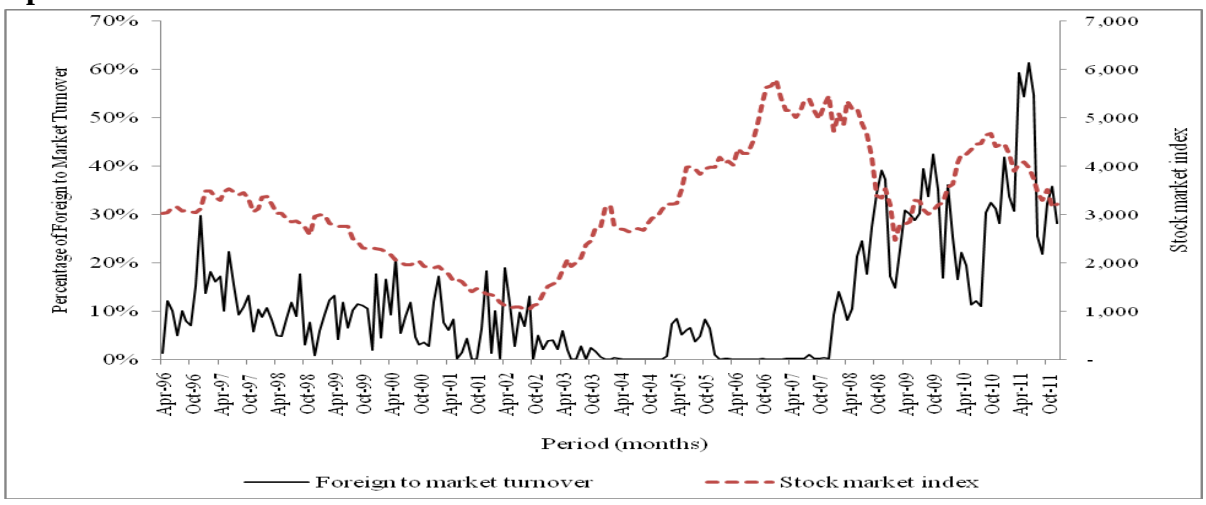
However, since 2006, the proportion of foreign turnover has been increasing. High foreign participation recorded in 2008-2011 may have been driven by the global financial crisis which started around 2008. Foreign investors were then either moving to emerging markets to hedge against risks and to reap high returns, or moving out of the market due to uncertainty in the global market. During this period, the activity of foreign investors constituted about 95 per cent of the overall foreign investor activity between April 1996 and December 2011.

The increase in foreign purchases may be attributed to a number of factors both in the domestic and international market. They include: reduction in political risk following the political agreement after post-election violence in early 2008, the increased activity of stock brokers with dealers trying to create contacts with foreign investors, issuance of Safaricom initial public offer

(IPO) billed as the largest in Sub-Saharan Africa in June 2008 which attracted foreign investor participation, improvement in domestic stock market returns relative to returns in neighbouring countries mainly African countries, and the international financial meltdown which started in 2008 leading to a fall in international returns compared to returns in emerging markets. The increased participation of local investors with commercial banks financing local investors to purchase IPOs, and the shares acting as collateral, may also have propped up the market and sent a signal of reduced risk levels to foreign investors.

Figure 3.1 presents the proportion of foreign to market turnover and the stock market index. In the initial period, the proportion of foreign turnover in the market was low though volatile. The general trend, however, shows that the proportion of foreign flows and stock market index moved almost in the same pattern up to the end of 2002. The movement of the stock index, however, was less volatile during this period. This trend changed with the stock market index rising at a faster rate and peaking at 5,774 in January 2007, while the influence of the foreign investors in the market fell to almost less than 1 per cent of the market turnover.

Figure 3.1: Proportion of Foreign Turnover to Market Turnover and Stock Market Index, April 1996 to December 2011



Source: Nairobi Securities Exchange data.

The growth in the stock index was not sustainable and was reversed in 2008. The bull-run in equities market prior to late 2008 before the financial crisis was also evident within the Sub-Saharan African (SSA) countries, owing to sustained high economic growth and increased foreign investor participation, but this subsequently declined following uncertain economic prospects and exit of non-resident investors (Lukonga, 2010). In this period the index fell faster than it rose to the lowest value of 2,474.8 in February 2009, before attaining an upward trend. This upward trend may have been due to the foreign portfolio investment which was growing as a proportion of market turnover as from late 2007.

The unprecedented growth in the stock market index, despite the negligible participation by foreign investors, may be attributed to the initial public offers (IPOs) hype which gained prominence with local retail investors during this period[17]. Most IPOs issued at the NSE since 2000 have been oversubscribed, and this momentum seems to have died off in late 2008 after the Safaricom IPO which was huge, but whose share price has been below the offer price following listing of its shares (see Appendix Table A2).

3.2 Literature Review

Foreign portfolio flows have been encouraged as a way of improving market activity and providing access to foreign capital. Liberalisation of the stock market opens the domestic market for foreign trade, allowing risk sharing among foreign and domestic investors, which reduces the risk premium in the market. The reduction or fall in risk premium reduces the cost of capital and

[17] The number of retail investors participating in the market increased substantially with accounts opened by local individual investors increasing from 70 per cent new accounts in 2004 to 95 per cent new accounts in 2009 (see CMA *Quarterly Statistical Bulletin*, March 2010). The growth in retail investors in the market was supported by the institutional reforms in the capital markets that led to establishment of the Central Depository System Corporation (CDSC) and the high gain in share price following trading of the IPO shares in the market.

makes some projects which had negative net present value (NPV), to have positive NPV (Henry, 2000a; 2000b)[18]. Liberalisation also leads to stock price appreciation when the cost of capital falls, changing the expected return and the source of systematic risk for pricing stocks from the local stock market index to a world stock market index (Chari and Henry, 2004). However, the level of volatility in emerging and frontier markets creates an element of risk in these markets, since investors cannot make informed decisions.

The market factors in these risks by accounting for systematic risk through change in stock prices and diversifying unsystematic risk. However, stock market liberalisation is gradual and involves subsequent liberalisations together with favourable unanticipated macroeconomic events (Henry, 2000b). Hence, news of future liberalisation increases the equity price index, if aggregate cost of equity capital is reduced.

Foreign investors enter emerging markets for diversification and also to maximize their returns. Financial market theory suggests that, over the long run, higher returns should compensate for the higher risks of emerging markets (Tokat, 2004). For foreign investors, return depends on capital gain at the end of the period and the exchange rate. Thus, the return is approximately equal to the sum of domestic return on the security and the return on foreign currency (Sharpe et al., 2003). This means that the rate of return of a country's currency has an impact on the pricing of equities in the domestic market.

Literature on foreign participation has focused on the choice of market for investment and the impact of market liberalisation on emerging markets. On the microstructure characteristics of the

[18] Stock market liberalisation might cause a fall in the cost of equity capital by increasing net capital inflows and stock market liquidity; all of which reduce the equity premium. However, it could also increase the cost of capital by increasing the risk-free rate (Henry, 2000a).

market, studies have looked at liquidity-return relationship, liquidity and price discovery, volatility, and market efficiency (for example, Hassler, 1999; Coppejans and Domowitz, 2000). Since risk is priced highly locally than globally, that is, the variance of risk exceeds the covariance of risk, equity premium is expected to fall when an emerging country liberalizes its stock market, resulting into permanent fall in the aggregate cost of equity capital and an increase of the aggregate equity price index (Henry, 2000b). The risk may be associated with politics or simply with uncertainty about the exchange rate (Dornbusch, 1988). However, prices rise and expected returns decrease if a country moves from segmented to integrated market (Bekaert and Harvey, 2000).

While this is the case, there are possibilities that the benefits derived from integrated market vary depending on the policies embraced in domestic markets and the level of stock market development. For instance, Senbet and Otchere (2010) note that though integration of African stock markets with the rest of the world has increased following periods of reforms, these markets remain thin and illiquid, causing a barrier to financial globalisation, despite the high returns they record. The major challenges affecting these stock markets are trade in few stocks, which also form a larger proportion of total market capitalisation and inadequate supervision by regulatory authorities (Senbet and Otchere, 2010).

Another focus is on the impact of foreign flows on returns. Foreign flows increase prices when they come in and decrease them when they leave, thereby making prices more volatile (Stulz, 1999). Hence, capital flows have an impact on valuations only if they are undertaken because of information with foreign investors that is not yet incorporated in prices[19]. This literature

[19] See Easley et al. (2002) for evidence on the role of information risk in determining asset returns.

introduces information asymmetry that exists between foreign and domestic investors, which may be due to the fact that foreign investors are less informed about a country and its firms and thus process information differently due to intellectual or emotional biases, hence creating aversion towards international investments (Brennan and Cao, 1997; Dahlquist and Robertsson, 2001).

Foreign investors will therefore discount share prices relative to domestic investors whose actions depend on adverse information they hold, but not factored in asset prices (Stulz, 1999). On the other hand, investors prefer firms that have high past returns as this is an indicator of performance, and overweight firms with relatively high risk (Dahlquist and Robertsson, 2001). They argued that the preference among foreign investors for large firms can be seen as a proxy for firm recognition and information asymmetries. However, foreign investors will only hold domestic assets, if returns on these assets are attractive compared with those abroad (Dornbusch, 1988). This is because investors are concerned about inherent risks such as macroeconomic and political instability, depreciation and currency fluctuations, and crisis such as war, famine, and corruption (Senbet and Otchere, 2010). Hence, global financial market volatility and international exchange rate fluctuations may lead to the benefits of capital flows not being realised, especially in African stock markets that face a challenge of providing buffers to volatility of external flows due to low depth (Senbet and Otchere, 2010).

A number of hypotheses have been advanced to explain the correlation between foreign purchases and stock returns depending on how foreign portfolio flows affect domestic stock prices. The *base-broadening hypothesis* suggests that foreign inflows cause emerging equity market prices to rise. By broadening the investor base, diversification and risk sharing is

increased, thereby lowering the required risk premium. Besides, the resultant influx of new investors can lower the perceived liquidity risk of stocks (see Clark and Berko, 1997; Narag, 2000). In this case, investors invest only in stocks which they are informed (Merton, 1987). Stocks with narrow investor bases exhibit higher expected returns because the variance of the returns on the stocks is more systematic to the holders of the shares than it appears from the perspective of the market as a whole. Net purchases of foreigners create substantial shocks to net investor demand, as foreign inflows may be based on their perception that the shares are undervalued or that there are other portfolio benefits that may be derived in emerging markets (Richards, 2004).

The *price pressure hypothesis* suggests that the rise in prices associated with inflow surges are due to temporary illiquidity meant to absorb demand from foreign entry. Thus, inflow induced price increases would be reversed subsequently. Hence, prices initially increase based on expectations and information asymmetry, and due to the learning process, the prices revert to their original level. Here, entry of foreign investors in the market is seen as an indication of good performance and new information. According to Warther (1995), flows may move security prices due to information revelation and price pressure, and that flows will be positively correlated with security returns due to market response to information.

Bekaert et al. (2002) found equity flows to increase after liberalisation and argue that this is due to portfolio rebalancing. Their study supports price pressure hypothesis, with equity flow shocks initially increasing returns. Pavabutr and Yan (2007) showed that exposure to foreign flows is associated with a reduction in risk premium, which diminishes among stocks favoured by foreign investors and decreases over time as the market becomes more liberalised. Warther (1995), on

the other hand, found no evidence that returns are negatively related to past flows, but find a positive relation between flows and subsequent returns and a negative relation between returns and subsequent flows, which is inconsistent with price pressure hypothesis.

The *positive feedback hypothesis* argues that there is a significant correlation between inflows and contemporaneous returns; and a positive price response to capital market liberalisation would hold if foreign investors are positive feedback traders[20] (Choe et al., 1999; Narag, 2000; Bohl and Siklos, 2008); and since the trades of foreign investors are highly correlated, they buy and sell as a herd[21]. Positive feedback trading may lead to prices exhibiting momentum such that prices will keep on falling as foreign investors sell, but rising as they buy.

Positive feedback trading may not be destabilising as trading may be due to information about fundamentals (Choe et al., 1999). However, Bohl and Siklos (2008) hold the opposing view that feedback traders do not base their asset decisions on fundamental values, but react to stock price changes. If this is the case, then trading by positive feedback traders will be destabilising. Evidence on positive feedback hypothesis has been found to hold in Korea (Choe et al., 1999), by foreign institutional investors in India (Batra, 2003), and in six Asian emerging markets which is argued to be due to behavioural factors or foreigners extracting information from returns rather than portfolio-rebalancing effects (Richards, 2004). Positive feedback trading has also been found to hold by Bohl and Siklos (2008) in a sample of developed and emerging markets.

[20] A positive feedback trader is one who buys when the market increases and sells when market falls (Narag, 2000).
[21] Herding can be the outcome of investors using the same information to trade or the product of irrational psychological factors.

Gazioglu (2008), in a study of the effects of capital inflows and outflows on real exchange rates and the real stock market returns before and after the financial crisis in Turkey, found an asymmetric impact of capital on exchange rate and stock market returns. The study decomposed foreign flows into capital outflows and capital inflows, to capture the possible long-term effects of inflows and outflows. Using a structural VAR, they found that capital inflows lead to real exchange rate appreciation and a fall in stock market prices in the long term, while capital outflows had weaker impact. The impact was, however, much stronger in real exchange rate than in stock market returns. The study concluded that this confirms the asymmetric impact of capital inflows and capital outflows. However, the impact of capital flows in the market could have best been established by considering the net effect using net capital flows, since capital inflows and outflows have different effects which tend to offset each other.

In a study on the relation between aggregate stock market returns and cash flows (net purchase of equity) from an array of investor groups, Boyer and Zheng (2009) found quarterly flows to be autocorrelated for each of the different investor groups and a significant and positive contemporaneous relation between stock market returns and flows of Mutual Funds and foreign investors in U.S. They found that investors are driven by unexpected flows component rather than expected flows, but little evidence that investor flows followed past stock market returns. Use of expected and unexpected flows enables the study to capture the uncertain flows in the market. However, they use a VAR framework, which is limited to establishing the relationship among variables due to a shock in one of them. They also point to a drawback in their work that lead-lag relation between market returns and investor flows are best estimated using high frequency data such as monthly or daily data.

Kim and Yang (2009) investigated the effect of capital inflows on domestic asset prices in Korea from January 1999 to September 2007. The study identified three channels by which capital inflows might result in increased asset prices; these are, by directly affecting the demand for assets, through money supply and liquidity which, in turn, might boost asset prices, and by generating economic booms in capital receiving economies leading to increase in asset prices. However, other factors such as improved economic performance, monetary expansion and low interest rates could also affect asset prices in emerging markets. They used the end-of-period data for asset prices to control simultaneity between asset prices and capital inflows and treated capital inflows as contemporaneously exogenous to asset. They found the influence of capital inflow shocks to be more significant on the stock market, but limited in other parts of the economy. Capital inflow shocks led to an increase in stock prices, but limited effects on nominal and real exchange rates due to accumulation of foreign exchange reserves.

In emerging markets, stock price is the main indicator of risk as investors are more concerned about share price movements (Twerefou and Nimo, 2005). Hence, foreign entry has an impact on market return through its effect on the portfolio risk premium. But based on efficient markets hypothesis, security prices should respond to the unexpected announcement since the expected part of the announcement should already be embedded in stock prices (Pearce and Roley, 1984). This argument is supported by other studies such as Warther (1995), who note that it is the unpredictable component of flows that has an impact on returns.

A multifactor model, such as Arbitrage Pricing Theory (APT), has been used to estimate market returns as it allows for incorporation of a number of factors, and allows for inclusion of macroeconomic variables as determinants of returns. Asset-pricing models are based on two

central concepts; no arbitrage principle which states that market forces tend to align prices so as to eliminate arbitrage opportunities, and financial market equilibrium where investors' desired holdings of financial assets is based on optimisation principle (Ferson, 2003). Both concepts have a feature that expected asset returns are determined by a linear combination of their covariances with variables representing the risk factors.

The APT gives no evidence as to what might be an approximate multi-index model and says nothing about the size or the signs of the λ_js (Elton et al., 2011), and is silent on the number and identity of the factors to be included with no consensus reached on this aspect (Middleton and Satchell, 2001; Fifield et al., 2002). However, there are suggestions that considerations be given to use of reference variables (that is, proxies) for the true factors (Middleton and Satchell, 2001). For instance, Middleton and Satchell (2001) showed that the APT still holds when there are more reference variables than the true factors, but does not hold when there are fewer reference variables than the true factors.

There are three main approaches that are used in specifying the empirical factors (Campbell et al, 1997; Ferson, 2003). The first is by using statistical factor analysis or principal components method, where the right factors are the ones that capture all the pervasive risk leaving only non-systematic risk in the residuals. The second approach is where the risk factors are macroeconomic and financial market variables thought to capture systematic risk of the economy and are chosen by economic intuition. The third approach is where factors are chosen using cross-sectional empirical relation of stock returns to firm attributes. In the third approach, characteristics of firms which are likely to explain differential sensitivity to the systematic risk are specified and portfolio of stocks formed based on these characteristics. The first approach is

purely statistical in nature and has little economic intuition, while the third approach is appropriate when carrying out a firm-level study, hence may not be relevant in this study.

Studies of APT on emerging markets have not come up with uniform factors that may affect returns, however there are factors which are common in most studies. Fifield et al. (2002) found that for emerging stock markets, domestic variables can be summarized by GDP, inflation, money supply and short-term interest rates, while global variables can be described by world industrial production and world inflation. Twerefou and Nimo (2005) found short-term interest rate risk, inflation risk and the term structure of interest rate as the main factors determining industrial asset prices in Ghana. As Fifield et al. (2002) argued, international factors influence returns as long as they have an impact on the domestic economy, even when financial markets are segmented. This emphasises the need to include international or global factors in the specification of APT. Based on these studies and the background information which has shown the performance of the economy and the stock market, the variables the study includes in the indices are short-term interest rates, exchange rates, market capitalization, stock price volatility, foreign interest rates, inflation and world stock returns. Hence, though the market returns may be determined by the economic performance, the relationship is not direct.

The literature has shown that foreign trade can either increase or decrease prices of stocks depending on the motive of investment and the market conditions. Most of the studies have focused on how foreign trade affects developed markets and have majorly used the VAR framework. In cases where asset pricing models have been used, no consideration of foreign trade has been taken into account as a factor that determines market returns. This shows a gap in literature on asset pricing and those looking at the impact of foreign trade in domestic stock

markets. The study fills this gap by using an asset pricing model that incorporates foreign flows as one of the determinants in a developing market, hence bridging literature on effects of foreign participation and asset pricing.

3.3 Methodology

3.3.1 Model specification

3.3.1.1 Theoretical framework

To estimate the impact of portfolio flows on the stock market, the arbitrage pricing theory (APT) is used. APT specifies a relationship between expected return and risk and depends on the assumption that a rational equilibrium in capital markets precludes arbitrage opportunities (Bodie et al., 2002). APT is a model of security pricing that generates the pricing relation in the capital asset pricing model and also builds on the intuition of separating distributions (Dybvig and Ross, 2003; Obere, 2009)[22]. It is based on the law of one price and requires that the returns on any stock be linearly related to a set of indexes (Elton et al., 2011).

The principal strength of the APT approach is that it is based on the no-arbitrage condition which holds for any subset of securities, hence removing the need to identify all risky assets or a "market portfolio" to test the APT. Hence it can be tested over a class of assets such as common stocks or a small set such as the stocks making up the index (Elton et al., 2011). According to the fundamental theorem of asset pricing, absence of arbitrage, existence of a constant positive linear pricing rule, and existence of an optimum for an agent who prefers more to less are the same

[22] Obere (2009) looked at statistical distribution of returns and focused, on firm returns other than market returns. APT was used in the study to predict normal returns of firms.

(Dybvig and Ross, 2003). This means that the asset pricing model can be expressed as a linear function of factors, which are the determinants of the return of the asset.

From a single-factor model, uncertainty in asset returns comes from a common or macroeconomic factor and a firm-specific cause, where the common factor has zero expected value. Hence, for firm *i*, the actual return is given by the initial expected return and a random component due to unanticipated economy wide and firm-specific events with zero expected values expressed as:

$$R_i = \overline{R_i} + b_i I + e_i$$

where $\overline{R_i}$ is the expected return on stock *i* and *I* is the deviation of the common factor from its expected value. All the non-systematic returns, the e_is, are uncorrelated among themselves and uncorrelated with the factor *I*.

If a portfolio is well diversified, its firm-specific or non-factor risk can be diversified away, leaving only the systematic risk. Hence, for an *n*-stock portfolio with weights w_i, $\sum w_i = 1$, the rate of return on a portfolio is given by:

$$R_p = \overline{R_p} + b_p I + e_p \qquad (3.1)$$

where $b_p = \sum w_i b_i$ is the weighted average of b_i of the *n* securities. The portfolio non-systematic component (which is uncorrelated with *I*) is $e_p = \sum w_i e_i$, which is the weighted average of e_i of the *n* securities.

The one-factor model can be extended to a multifactor model by considering other factors driven by the business cycle that might impact expected stock returns by affecting its risk, for example interest rate fluctuation and inflation rates. Hence, a *k*-factor model can be represented as:

$$R_i = a_i + b_{i1}I_1 + b_{i2}I_2 + ... + b_{ik}I_k + e_i \qquad (3.2)$$

where each security will have *k* sensitivities (b_{i1}, b_{i1},……, b_{ik}).

Investors are assumed to create arbitrage portfolios and this continues until equilibrium is reached, that is, all possible portfolio adjustments that require no additional funds and have zero factor exposures, will all have zero expected returns (Sharpe et al., 2003). However, this occurs when there is a linear relationship between expected returns and sensitivities. Hence:

$$\overline{R_i} = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2} + ... + \lambda_k b_{ik} \qquad (3.3)$$

which gives a linear equation in *k*+1 dimensions, $\overline{R_i}$, b_{i1} , b_{i2} ,….., and b_{ik} .

For a pure factor portfolio (that is, having unit sensitivity to one factor, no sensitivity to any other factor, and zero non-factor risk), the expected return of this portfolio, denoted $\overline{R_1}$, will be equal to $R_f + \lambda_1$. Since $\overline{R_1} - R_f = \lambda_1$, Equation (3.3) can be written as:

$$\overline{R_i} = R_f + \left(\overline{R_1} - R_f\right) b_{i1} + \lambda_2 b_{i2} + ... + \lambda_k b_{ik}$$

Now, for a portfolio that has zero sensitivity to the first factor and unit sensitivity to the second factor, the expected return, denoted by $\overline{R_2}$, is equal to $R_f + \lambda_2$, hence $\overline{R_2} - R_f = \lambda_2$. Equation (3.3) is therefore expressed as:

$$\overline{R_i} = R_f + \left(\overline{R_1} - R_f\right) b_{i1} + \left(\overline{R_2} - R_f\right) b_{i2} + ... + \lambda_k b_{ik}$$

Continuing the process up to the *k*-th factor, Equation (3.4) is expanded as:

$$\overline{R_i} = R_f + \left(\overline{R_1} - R_f\right)b_{i1} + \left(\overline{R_2} - R_f\right)b_{i2} + ... + \left(\overline{R_k} - R_f\right)b_{ik} \quad (3.4)$$

Hence, a stock's expected return is equal to the risk free rate plus *k* risk premiums based on the stock's sensitivities to the *k* factors.

In this case, the study focuses on the market index. It is assumed that the market index forms a portfolio and is the basis investors make their investment decisions[23]. Hence, in the spirit of Equation (3.1) and Equation (3.2), the *k*-factor model for a portfolio is given by:

$$R_p = a_p + b_{p1}I_1 + b_{p2}I_2 + ... + b_{pk}I_k + e_p . \quad (3.5)$$

Hence, the expected return of the portfolio (in this case, the market return) can be expressed as;

$$\overline{R_p} = R_f + (\overline{R_1} - R_f)b_1 + (\overline{R_2} - R_f)b_2 + ... + (\overline{R_k} - R_f)b_k \quad (3.6)$$

3.3.1.2 Empirical model

The model is developed in two stages. First, an APT model is specified that captures returns as a function of the risk factors that affect returns. Then portfolio flows is added as a determinant of returns together with these risk factors to capture the effect of portfolio flows on returns. To do this, an expectation model is used incorporated in an APT framework to test for the impact of new economic information on market returns. The model capturing returns and risk factors is specified as:

$$R_t = \beta_0 + \beta_i Z_t + \varepsilon_t \quad (3.7)$$

[23] This assumption was made given that the NSE 20-share index is constructed out of the 20 large and best performing firms listed on the Nairobi Securities Exchange. Hence, it was expected that any decision to invest in the market was most likely based on the performance of these firms as reflected by the index.

where R_t is the stock market return measured as the log difference in monthly stock price index in month t [$R_t = Ln(P_t / P_{t-1})$] and P_t is the price level of the index in month t. Z_t is a set of i risk factors (or variables) that may determine returns. The variables are included based on economic influence that might affect stock market return and at the same time considering factors used in previous studies, especially those focusing on emerging markets[24] (for example, Chen et al., 1986; Oyama, 1997; Karanikas et al., 2006; Wei, 2009). These include stock price volatility (*NSEVOL*), change in market capitalisation (*DMCAP*), change in treasury bill rate (*DTBILL*) to capture the ex-ante nominal return, contemporaneous change in exchange rate (*DEXCH*) to control for macroeconomic effects, foreign interest rates (*DTBILUS*), inflation rate (*INFL*) and world stock market returns (*MSCIW*). *NSEVOL* is the conditional volatility of monthly stock returns, *DMCAP* is the change in natural logarithm of market capitalisation, *DTBILL* is the change in monthly Treasury bill rate and *DEXCH* is the change in monthly exchange rate to the dollar.

Equity prices co-vary negatively with their own variance, and to capture this, the within-the-month stock price volatility is used. Market capitalisation is included to capture the size effect, and we expect returns to be positively correlated with size. The rate of discount of a stock consists of the risk premium and the risk free rate, which give the nominal return of the market. To control for this, the study includes the Treasury bill rate to capture the market's ex-ante expected nominal return. Exchange rate of a country is related to the currency return, hence contemporaneous change in exchange rate is used to capture the exchange rate policy during the month.

[24] Studies typically focus on particular factors and may mix the three approaches to factor selection (Ferson, 2003). Given this scenario, it is expected that the approach used in selecting the factors will be appropriate enough.

Other than the normal risk factors, portfolio flows are also important in determining returns, given that stock markets have been liberalised and allow for foreign participation. However, the market is more likely to react to a surprise change in portfolio flows, relative to expected portfolio flows. Hence, following Warther (1995), the predictable (anticipated) component of flows is separated from the unpredictable (unanticipated) component to see if the market reacts differently to the expected and unexpected portfolio flows. The expanded model is specified as:

$$R_t = \beta_0 + \beta_i Z_t + \gamma_1 PFCAP_t^e + \gamma_2 PFCAP_t^u + \gamma_3 IFCAP_t + \varepsilon_t \quad (3.8)$$

where $PFCAP_t^e$ is the anticipated portfolio flows in month *t,* given as the difference between actual portfolio flows and surprise flows, that is, $PF_t^e = PF_t - PF_t^u$, as a ratio of market capitalisation. $PFCAP_t^u$ is the unanticipated or surprise component of portfolio flows in month *t* to market capitalisation and $IFCAP_t$ is internal flows to market capitalization.

To establish whether the impact of foreign flows on stock prices is maintained for some time, lagged values of foreign participation are included in the model above (Equation 3.8). This is because temporary change in prices is brought about by flow of foreign portfolio, hence this can be captured through the lags. If the price-pressure hypothesis is true, then the lagged surprise inflows have significant negative coefficients. This means that the model of estimation becomes:

$$R_t = \beta_0 + \beta_1 DMCAP_t + \beta_2 NSEVOL_t + \beta_3 DEXCH_t + \beta_4 DTBILL_t + \beta_5 DTBILUS_t + \beta_6 INFL_t +$$
$$\beta_7 MSCIW_t + \gamma_1 PFCAP_t^e + \gamma_2 PFCAP_t^u + \gamma_3 IFCAP_t + \gamma_4 PFCAP_{t-1}^e + \gamma_5 PFCAP_{t-1}^u + \varepsilon_t \quad (3.9)$$

Two tests are conducted; the *base-broadening* where H_0: $\gamma_1 + \gamma_2 = 0$ is tested against H_1: $\gamma_1 + \gamma_2 > 0$, and the *price-pressure* where H_0: $\gamma_5 = 0$ is tested against H_1: $\gamma_5 < 0$.

3.3.2 Definition and measurement of variables

Return (*NSE_RET*): Return is measured as the log difference in monthly stock market price index. Boyer and Zheng (2009) measure market returns as the value-weighted market returns including dividends.

Market capitalisation (*DMCAP*): *DMCAP* is the change in monthly stock market capitalization. Market capitalisation measures the size of the stock market with higher market capitalization showing a bigger size. A highly capitalised market indirectly reflects the level of investor participation and thus the activity within that market. A market that is highly capitalised is expected to have higher returns compared to one that is not. Hence a positive relationship is expected between this variable and returns.

Volatility (*NSEVOL*): This is the volatility in monthly returns, measured as the conditional volatility of stock returns. It is given by the generalised autoregressive conditional heteroskedasticity (GARCH). Moving average of standard deviation can also be used to proxy market volatility; however they are only accurate where a variable is normally distributed. Since stock market returns are not normally distributed, we use GARCH to estimate volatility as it is expected that the standard error in one period will also affect subsequent periods. When the returns are highly volatile, then there is uncertainty as to returns investors will get from their investment.

Change in exchange rate (*DEXCH*): It is measured as the change in monthly exchange rate to the US dollar. Change in exchange rate and exchange rate volatility creates uncertainty about the stability of macroeconomic policy. In this case, the uncertainty will reduce confidence in the market and thus affect prices, either because of uncertain future return or investors will be

pulling out of the market. Change in exchange rate is thus expected to be negatively related to market returns.

Treasury bill rate (*DTBILL*): It is measured as the change in 91-days Treasury bill rate. Treasury bill rate captures the risk free rate, thus a higher Treasury bill rate is expected to increase returns. Hence, a positive relationship is expected between this variable and market return. Boyer and Zheng (2009) use the relative bill rate which they measure as the difference between three month Treasury bill rate and its one-year backward moving average. Relative Treasury bill rate captures part of the time-varying dynamics of the risk premium and hence controls for changes in market conditions (Boyer and Zheng, 2009). However, increase in Treasury bill can lead to reduction in the stock market returns as investors shift portfolio to government securities from the stocks.

World Treasury bill rate (*DTBILUS*): This is proxied by the change in 3-month US Treasury bill rate. An increase in US Treasury bill rate means that the risk free rate in the foreign market has increased, resulting into an increase in interest rate differential between foreign and domestic market, assuming the domestic interest rates remain the same. Investors will therefore be attracted to foreign markets, which will command higher returns, compared to the domestic market. This will result into less portfolio flows than before, and may lead to net outflows which will cause a reduction in market returns. Hence, a negative relationship is expected between this variable and market returns.

Inflation (*INFL*): This is the monthly inflation rate measured as the monthly change in consumer price index (CPI). When inflation increases, the real value of money is eroded, and the value per share declines. An increase in inflation will also lead to an increase in prices of commodities, which may, in turn, lead to investors liquidating their positions in the market, thereby pushing

share prices down. Hence, an increase in inflation will reduce market returns. A negative relationship is therefore expected between inflation and market returns.

World stock market return (*MSCIW*): The world stock market return is proxied using returns in Morgan Stanley Capital Investment (MSCI) World Index. The return is meant to proxy for developments in world stock markets. It is thus an indirect measure of integration of the domestic market and the world market. If the level of integration is low, for instance, then a high world stock return is expected to lead to foreign investors investing more in the foreign markets thus a reduction in portfolio inflows domestically (which, at times, may be accompanied by increase in portfolio outflows). In such a case, the price of stocks in the domestic market is expected to fall resulting into a negative effect in returns. The fall in stock in this case is attributed to the fact that domestic stock market prices either do not move in the same direction as the world stock index or they move less marginally due to low integration. Overall, this may have a negative coefficient. However, if the world stock return leads to an increase in local returns, then the returns in the foreign and domestic market may move in the same direction, thus showing some level of integration. Domestic stock market is most likely to move in the same direction, with the same or slightly higher magnitude as the world stock market, given that the market is integrated with the rest of the world resulting into a positive relationship. The relationship between this variable and returns can either be positive or negative.

Foreign portfolio flows (*PFCAP*): Foreign portfolio flows is decomposed into monthly expected and unexpected portfolio flows, both standardised by the monthly stock market capitalisation. The anticipated portfolio flows in month *t* is given as the difference between actual portfolio flows and surprise or unexpected flow. Since the behaviour of portfolio flow variable is not

known, the anticipated flows is estimated by modelling actual flows using an autoregressive integrated moving average (ARIMA) framework, and taking the residuals of the resulting model as the unanticipated flows. The same approach was taken by Wei (2009) in estimating the unexpected component of inflation by including lagged unemployment to predict inflation. When expectation of portfolio flows by foreign investors increase, or when there is an increase in unexpected portfolio flows by foreign investors, the market return is expected to go up according to the positive feedback and price pressure hypothesis. Hence, a positive relationship is expected between these variables and market return. Boyer and Zheng (2009) however decompose total flows into expected flows and unexpected flows, using the predictive regressions for flows of the VAR model. The expected flows are the fitted values of the predictive regressions, while the unexpected flows are the residuals.

Internal flows (*IFCAP*): It is measured as local turnover as a ratio of market capitalisation. It captures the level of participation in the market by local investors. It is expected that as the level of participation by local investors increase, prices of stocks will go up, thus driving market returns upwards. A positive relationship is expected between this variable and market return.

3.3.3 Time series properties

The presence of non-stationarity in the data is tested using the standard unit root tests, the Augmented Dickey-Fuller (ADF) test, the Phillips and Perron (PP) test and the Kwiatiwski-Phillips-Schmidt-Shin (KPSS) test. The equation describing the ADF test is specified as:

$$\Delta y_t = m + \beta t + \varphi y_{t-1} + \sum_{i=1}^{n} \delta_i \Delta y_{t-i} + \varepsilon_t \qquad (3.10)$$

where Δ is the difference operator, β is the coefficient of time trend, δ_i are coefficients of change in lagged difference of the variable, φ is the coefficient of the lagged first difference of the variable, and ε_t is white noise error term. From the equation, if $\beta = 0$ and $\varphi < 1$, then the series is stationary; if $\beta \neq 0$ and $\varphi < 1$ then the series is trend-stationary; and if $\beta = 0$ and $\varphi = 1$ then the series is non-stationary. The ADF test, however, does not take care of structural breaks in the data. Hence, Phillips-Perron (PP) test, which takes care of any structural breaks in the data, is also conducted. The PP test modifies the ADF test and is represented as:

$$y_t = m_0 + m y_{t-1} + u_t \tag{3.11}$$

where u_t is white noise error term. Both ADF and PP account for serial correlation in the data. The PP test also allows for weak dependence and heterogeneity in the error term (Syriopouls, 2011).

For the KPSS, the series is assumed to be stationary under the null hypothesis and this is tested against an alternative hypothesis of non-stationarity. The KPSS uses a frequency zero spectrum estimation of the residuals in the equation:

$$y_t = \alpha_0 + \beta t + \varepsilon_t \tag{3.12}$$

The Lagrange Multiplier (LM) statistics is defined as:

$$LM = \sum_{t=1}^{T} \frac{\left(\sum_{r=1}^{t} \varepsilon_t\right)^2}{T^2 f_0} \tag{3.13}$$

where f_0 is the estimator of the residual spectrum at frequency zero.

3.4 Data and Sources

Analysis is done using monthly data from April 1996 to December 2011. Use of monthly data was based on the fact that to model performance using return, high frequency data is necessary as this can easily be used to model the interaction between frequency of trade by foreign investors and how this has affected the stock market prices. Daily data would have been appropriate in this case, however, given the low levels and frequency of foreign trade in small markets such as the Nairobi Securities Exchange (NSE), daily data has a lot of data gaps. The choice of period of analysis was based on availability of data on foreign trade which was not available for earlier periods. It is also due to the fact that the stock market was liberalised in 1996 hence it is appropriate to capture the period after restrictions on foreign trade have been reduced.

Data from the Nairobi Securities Exchange (NSE) that enlist the foreign portfolio flows in the domestic equity market was used. Data on foreign trading in NSE gives an indication of the purchases and sales between foreign and local investors. Other data was sourced from Kenya National Bureau of Statistics (KNBS), Central Bank of Kenya (CBK), United States Treasury[25], and Morgan Stanley Capital Index (MSCI) World indices are from Datastream.

3.5 Estimation and Empirical Results

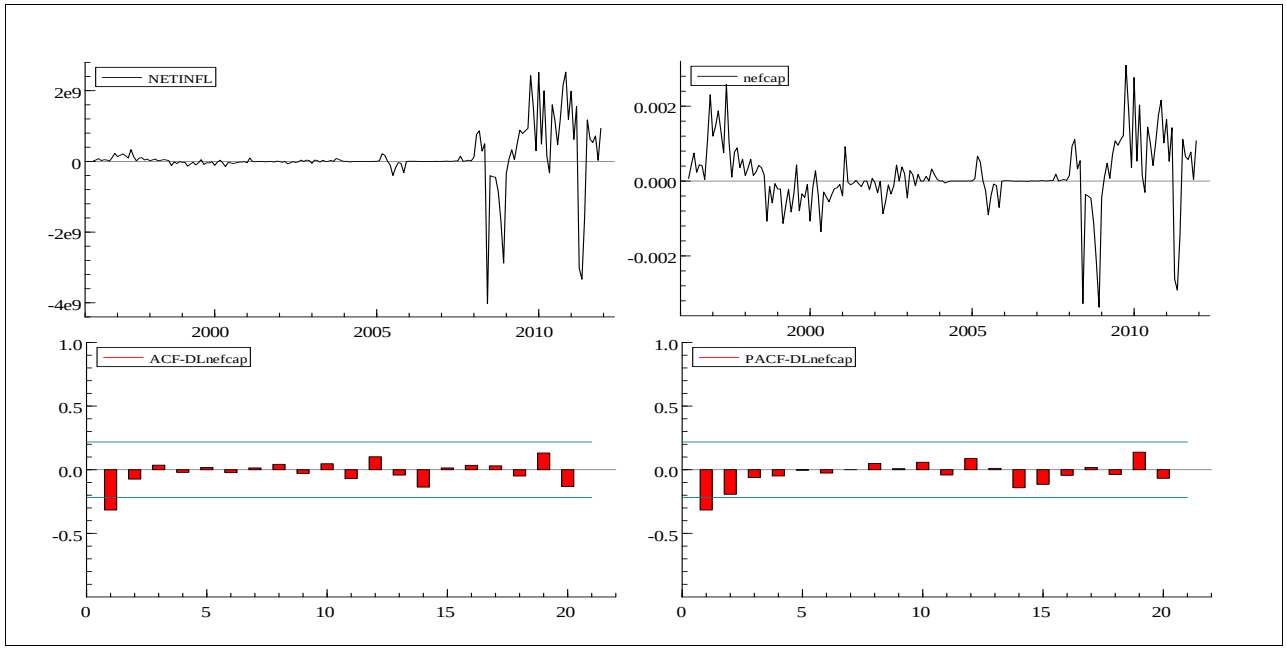
3.5.1. Estimating portfolio flows

To model the behaviour of portfolio flows in the stock market, the net foreign inflows were standardised with market capitalisation. Given that the nature of portfolio flows is not known, ARIMA framework is used to model portfolio flows. A graph of the trend of net inflows,

[25] Data on US 3-month Treasury bill rates was obtained from United States treasury website, www.http://research.stlouisfed.org/fred2categories/116/downloaddata, on 14th March 2012.

standardised net inflows and the autocorrelation function (ACF) and partial autocorrelation function (PACF) of standardised flows is presented in Figure 3.2. From the graph, both the ACF and PACF have a cut-off at the first lag, giving an indication of an ARIMA (1,1) process for the portfolio flow series.

Figure 3.2: Trends of Net Foreign Inflows, Standardised Net Foreign Inflows and Time Series Graphs for Standardised Net Foreign Inflows.



Source: Analysis based on data from Nairobi Stock Exchange

Table 3.2 shows the results for ADF unit root test for standardised flows. The test results show that the standardised flows are stationary at levels, implying that the variable is not integrated into the ARIMA framework. Seasonality was tested on the standardised flows using the excludability criteria to establish whether there are seasonal effects to be controlled. However, we failed to reject the null that the seasonal coefficients are zero, implying that the presence of seasonal effects was rejected with $F(11,177) = 0.68815$ [*0.7487*].

Table 3.2: ADF Unit Root Test for Standardised Net Foreign Portfolio Flows

D-lag	Constant, Trend and Seasonals	Constant and Trend	Constant
8	-3.523*	-3.625*	-3.569**
7	-3.672*	-3.729*	-3.685**
6	-3.965*	-4.012*	-3.976**
5	-3.605*	-3.788*	-3.753**
4	-3.824*	-3.974*	-3.935**
3	-4.142**	-4.337**	-4.297**
2	-4.668**	-4.980**	-4.939**
1	-5.380**	-5.768**	-5.727**
0	-7.274**	-7.637**	-7.598**

Note: The significance is tested at 5%=-3.44, 1%=-4.01 for Constant, Trend and Seasonals, and Constant and Trend, while 5%=-2.88, 1%=-3.47 are for Constant only.

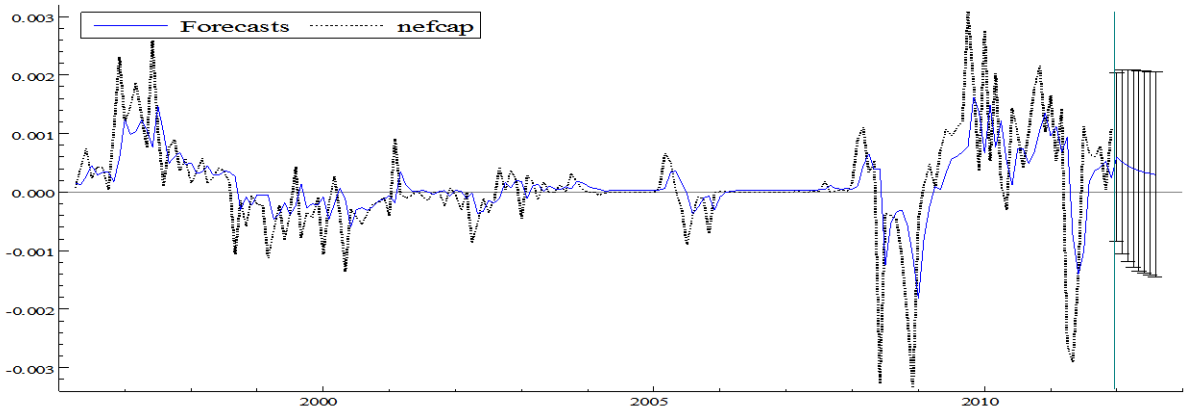
To establish the nature of the variable, both the autoregressive (AR) and moving average (MA) frameworks were tested separately. This started with 8 lags, and then reducing the number of lags while considering the significance of the lags in a model that minimises information criterion, and meeting the white noise property. Tests for the AR term resulted into AR(2) with AIC of -11.341, while that of MA term resulted into MA(3) with AIC of -11.295, higher than that of AR model. Given that the AR model has the lowest information criterion, it is the most preferred. However, the study went a step further to test whether ARMA model would be best suited for the portfolio flow series. From the results summarised in Table 3.3, ARMA (1,1) has the lowest information criterion for all tests of information criterion, and is best suits modelling portfolio flows. This is consistent with the autocorrelation function (ACF) and partial autocorrelation function (PACF) graphs presented in Figure 3.2.

Table 3.3: Summary of ARMA Model Selection for Portfolio Flows

Model	Observations	Parameters	Log-likelihood	SC	HQ	AIC
AR(2)	189	4	1075.7680	-11.273	-11.314	-11.341
MA(3)	189	5	1072.3880	-11.209	-11.260	-11.295
ARMA(2,3)	189	7	1078.6316	-11.220	-11.291	-11.340
ARMA(2,2)	189	6	1076.8946	-11.229	-11.291	-11.332
ARMA(2,1)	189	5	1076.8927	-11.257	-11.308	-11.343
ARMA(1,1)	189	4	1076.5624	-11.281*	-11.322*	-11.350*

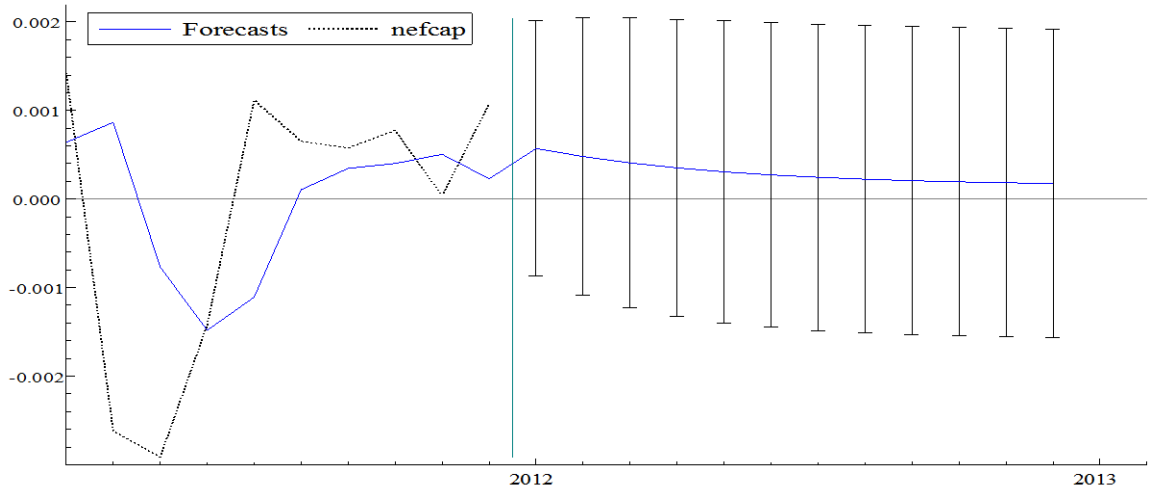
The ARMA(1,1) model was used to forecast the trend of portfolio flows. The forecast shows that investors make their decisions based on observed or actual flows and therefore the movement of expected flows lags behind that of actual flows. This is evident both in Figure 3.3 which shows the expected values for the pre-forecast period and Figure 3.4 which focuses mainly on the forecast period. Actual values varied with higher magnitudes compared to forecasts, reflecting the fact that the forecasts are made rationally (Figure 3.4). The standardised portfolio flows, however, stabilise within the next four months for a twelve month forecast (Figure 3.9).

Figure 3.3: Actual and Forecasted Standardised Net Inflows



Source: Analysis based on data from Nairobi Stock Exchange

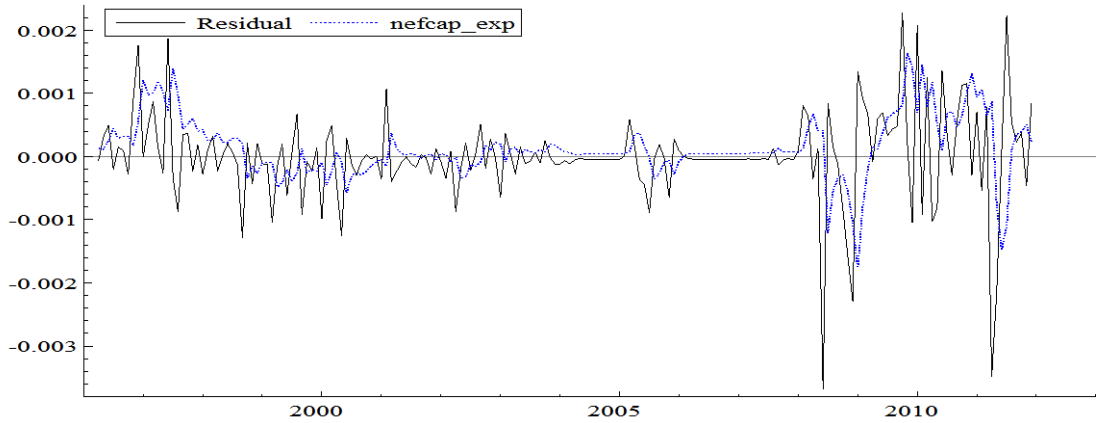
Figure 3.4: Forecasted Standardised Net Inflows



Source: Analysis based on data from Nairobi Stock Exchange

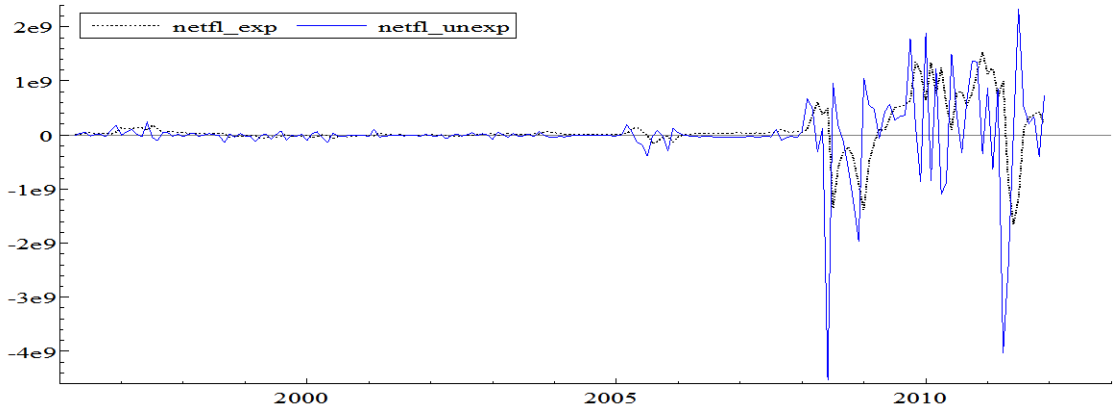
The residuals recovered from the ARMA (1,1) forms the unexpected standardised flows. The standardised expected flows are obtained by subtracting the residuals from the standardised flows (see Figure 3.5). To recover the expected and unexpected net foreign portfolio flows, the standardised expected and unexpected flows were, respectively, multiplied by the market capitalisation (which was initially used to standardise net foreign inflows) (Figure 3.6).

Figure 3.5: Trends of Standardised Flows and Residual Flows



Source: Analysis based on data from Nairobi Stock Exchange

Figure 3.6: Levels of Expected and Unexpected Flows



Source: Analysis based on data from Nairobi Stock Exchange

Table 3.4 gives the descriptive statistics of the variables used in estimations. The mean of the variables are positive, while those for the expected and unexpected flows are zero. The variables are not very highly dispersed from the mean, as seen from the standard deviation, with the highest dispersion being that of world Treasury bill rate (*DTBILUS*) of 0.317 compared to those of other variables. Most of the variables are positively skewed except stock market return (*NSE_RET*), world stock market return (*MSCIW*) and unexpected portfolio flows (*NETFCAP_UNX*) which are negatively skewed.

Table 3.4: Descriptive Statistics

	NSE_RET	*NSEVOL*	*DEXCH*	*DTBILL*	*DTBILUS*	*DMCAP*	*INFL*	*MSCIW*	*IFCAP*	*NETFCAP_EX*	*NETFCAP_UNX*
Mean	0.000	0.004	0.002	0.010	0.001	0.015	0.085	0.003	0.005	0.000	0.000
Median	0.000	0.003	0.000	0.000	0.000	0.011	0.080	0.009	0.003	0.000	0.000
Maximum	0.160	0.021	0.170	0.674	3.333	0.342	0.197	0.143	0.019	0.002	0.002
Minimum	-0.257	0.001	-0.081	-0.487	-0.842	-0.213	-0.004	-0.217	0.001	-0.002	-0.004
Std. Dev.	0.059	0.003	0.025	0.153	0.317	0.075	0.048	0.052	0.003	0.000	0.001
Skewness	-0.253	3.321	1.485	0.777	6.524	0.701	0.423	-0.689	1.672	0.010	-1.006
Kurtosis	5.282	18.237	13.682	7.975	67.972	5.800	2.310	4.804	5.925	5.441	10.211
Jarque-Bera	43.04	2175.55	968.02	213.94	34584.06	77.18	9.376	40.59	155.41	46.92	441.42
Probability	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.009*	*0.000*	*0.000*	*0.000*	*0.000*
Sum	0.052	0.705	0.454	1.799	0.210	2.744	16.042	0.479	0.862	0.025	0.000
Sum Sq. Dev.	0.665	0.001	0.122	4.386	18.930	1.056	0.431	0.513	0.002	0.000	0.000
Obs.	189	189	189	189	189	189	189	189	189	189	189

NSE_RET is stock market return, *NSEVOL* is conditional volatility of stock market returns, *DEXCH* is change in exchange rate to the US dollar, *DTBILL* is change in 91-days Treasury bill rate, *DTBILUS* is change in 3-month US Treasury bill rate, *DMCAP* is the change in monthly stock market capitalisation, *INFL* is monthly inflation rate measured as the monthly change in CPI, *MSCIW* is return in world stock market index proxied by log difference of Morgan Stanley Capital Investment (MSCI) World Index, *IFCAP* is turnover of internal investors as a ratio of market capitalisation, *NETFCAP_EX* is the expected portfolio flows standardised by market capitalisation, and *NETFCAP_UNX* is unexpected flows standardised by the market capitalisation.

However, all the variables have relatively peaked distributions as shown by the positive kurtosis, though the highest peaked distributions are evident for stock market return (*NSE_RET*) and world Treasury bill rate (*DTBILUS*). The Jarque-Bera statistics for all the variables are significant as shown from the probabilities, meaning that the null of normality of the variables cannot be rejected.

3.5.2. Correlations

Table 3.5 gives the correlation statistics of the variables. Stock market return (*NSE_RET*) is positively correlated to internal flows (*IFCAP*), market capitalisation (*DMCAP*), Treasury bill rate (*DTBILL*) and stock market volatility (*NSEVOL*). Increased local participation in the stock market is likely to push up share prices and result in increased returns. An increase in growth of market capitalisation implies that the market is expanding and is more active, hence returns are likely to increase. While it is expected that volatility of market return will create uncertainty in the market and reduce return, it is positively correlated to returns. This may be because for a small market, volatility reflects the activity of the investors and the inefficiency in the market.

When domestic Treasury bill rate increases, the expected return will rise if this is interpreted by investors as an increase in the risk free rate, thus pushing up returns in the market. However, in most cases, investment in equities competes with Treasury bills and bonds; hence an increase in Treasury bill rate increases the returns on Treasury bills, leading to an increase in investment in Treasury bills and a reduction of investment in equity as bills and bonds become more attractive to investors.

Table 3.5: Correlations of the Variables

	NSE_RET	*NSEVOL*	*DEXCH*	*DTBILL*	*DTBILUS*	*DMCAP*	*INFL*	*MSCIW*	*IFCAP*	*NETFCAP_EX*	*NETFCAP_UNX*
NSE_RET	1.000										
NSEVOL	0.131	1.000									
DEXCH	-0.187	-0.065	1.000								
DTBILL	0.014	-0.080	-0.025	1.000							
DTBILUS	-0.089	-0.057	0.042	-0.053	1.000						
DMCAP	0.818	0.115	-0.108	-0.058	-0.087	1.000					
INFL	-0.019	0.218	-0.034	0.286	0.014	-0.019	1.000				
MSCIW	0.100	-0.107	-0.227	-0.018	0.164	0.118	-0.113	1.000			
IFCAP	0.243	-0.028	-0.060	-0.034	0.011	0.258	-0.133	0.108	1.000		
NETFCAP_EX	0.208	-0.086	-0.101	-0.102	-0.175	0.175	-0.047	0.186	-0.063	1.000	
NETFCAP_UNX	-0.001	-0.066	-0.108	-0.116	0.207	-0.148	-0.013	0.118	-0.068	-0.010	1.000

NSE_RET is stock market return, *NSEVOL* is conditional volatility of stock market returns, *DEXCH* is change in exchange rate to the US dollar, *DTBILL* is change in 91-days Treasury bill rate, *DTBILUS* is change in 3-month US Treasury bill rate, *DMCAP* is the change in monthly stock market capitalisation, *INFL* is monthly inflation rate measured as the monthly change in CPI, *MSCIW* is return in world stock market index proxied by log difference of Morgan Stanley Capital Investment (MSCI) World Index, *IFCAP* is turnover of internal investors as a ratio of market capitalisation, *NETFCAP_EX* is the expected portfolio flows standardised by market capitalisation, and *NETFCAP_UNX* is unexpected flows standardised by the market capitalisation.

The world stock return (*MSCIW*) is positively correlated with domestic returns, implying that as foreign or world stock market performance improves, most likely, the performance of domestic stock markets will also improve. However, stock market return (*NSE_RET*) is negatively correlated to change in exchange rate (*DEXCH*), world Treasury bill rate (*DTBILUS*) and inflation (*INFL*). Increases in changes in exchange rate and inflation are expected to create uncertainty in the market. High foreign Treasury bill rate reduces the risk levels in foreign markets, making them more attractive than before. Hence, these variables have a negative correlation to return.

The correlation of stock market return (*NSE_RET*) to the expected and unexpected foreign portfolio flows is, however, mixed. Expected portfolio flows are positively correlated to returns, while unexpected portfolio flows have a negative correlation to returns. An increase in expected portfolio flows show that foreign investors have a reasonable level of confidence in the domestic market, and this pushes market return up. However, unexpected portfolio flows are negatively correlated to returns which may be because increase in unexpected flows are experienced when the prices are declining from their highest levels, leading to decline in returns. No high correlation exists between any of the explanatory variables, other than between stock market return which is the dependent variable and change in market capitalisation (*DMCAP*), hence there is no problem of multicollinearity.

3.5.3. Unit root tests

Table 3.6 presents the results for stationary tests. Stationarity of the variables is tested using both Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. From the ADF and PP tests, most of the variables are stationary at

levels (that is, they have no unit roots) except internal flows (*IFCAP*), which attains stationarity after the first difference using ADF but is stationary using PP. In cases where a variable is not stationary using ADF but stationary using PP, the PP test results are used to make judgment as PP has higher power than ADF in the presence of structural breaks. The results of ADF and PP are also supported by those of KPSS, where only internal flows (*IFCAP*) attain stationarity at very low significance levels.

Table 3.6: Results for Stationarity Test

	ADF		PP		KPSS	
	(1)	(2)	(1)	(2)	(1)	(2)
NSE_RET	-11.304	-11.332	-11.866	-11.893	0.116	0.123
NSEVOL	-4.026	-3.800	-6.509	-6.202	0.056	0.347
DEXCH	-10.585	-10.617	-10.585	-10.617	0.075	0.081
DTBILL	-7.932	-7.854	-7.864	-7.772	0.047	0.165
DTBILUS	-11.361	-11.388	-11.903	-11.937	0.054	0.063
DMCAP	-12.292	-12.324	-12.361	-12.392	0.153	0.155
INFL	-3.902	-3.524	-2.860	-2.770	0.053	0.121
MSCIW	-11.998	-12.008	-12.086	-12.100	0.051	0.075
IFCAP	-1.881	-1.992	-4.330	-4.154	0.213	0.431
NETFCAP_EX	-4.807	-4.817	-4.819	-4.829	0.151	0.157
NETFCAP_UNX	-13.359	-13.390	-13.355	-13.389	0.112	0.127

Notes: (1) with trend; (2) without trend. ADF-PP critical values - with trend: -4.008 (1% level); -3.434 (5% level); -3.141 (10% level); ADF-PP critical values - without trend: -3.465 (1% level); -2.877 (5% level); -2.575 (10% level); KPSS critical values - with trend: 0.216 (1% level); 0.146 (5% level); 0.119 (10% level); KPSS critical values - without trend: 0.739 (1% level); 0.463 (5% level); 0.347 (10% level).

NSE_RET is stock market return, *NSEVOL* is conditional volatility of stock market returns, *DEXCH* is change in exchange rate to the US dollar, *DTBILL* is change in 91-days Treasury bill rate, *DTBILUS* is change in 3-month US Treasury bill rate, *DMCAP* is the change in monthly stock market capitalisation, *INFL* is monthly inflation rate measured as the monthly change in CPI, *MSCIW* is return in world stock market index proxied by log difference of Morgan Stanley Capital Investment (MSCI) World Index, *IFCAP* is turnover of internal investors as a ratio of market capitalisation, *NETFCAP_EX* is the expected portfolio flows standardised by market capitalisation, and *NETFCAP_UNX* is unexpected flows standardised by the market capitalisation.

3.5.4. Model selection

Tables 3.7, 3.8 and 3.9 summarise the process of model selection. Having established that stock market returns and net foreign capital flows are stationary at levels, the Granger non-causality test on the variables is then done to establish the relationship between them. Using excludability test at two lags, the null that net foreign portfolio flow standardised by market capitalisation

(*NETFCAP*) does not Granger cause stock market return (*NSE_RET*) was rejected at 1 per cent (with a chi-square of 9.36 (*0.009*)). However, the null that stock market return (*NSE_RET*) does not granger cause net foreign portfolio flows (*NETFCAP*) at 5 per cent (with a chi-square of 5.744(*0.057*)) could not be rejected. These results are confirmed by an *F*-test of Granger non-causality of the variables presented in Table 3.7. The Granger causality in this case establishes whether there is any feedback effect between returns and standardised flows[26]. These show that investment by foreigners may be for hedging rather than for return purposes. The implication of the results from the test is that when modelling the determinants of returns in the multifactor model, there should be no concern about double causality when foreign flow is used as one of the determinants of return.

Table 3.7: Granger Non-Causality Test between Foreign Flows and Return

Sample: 1996M04 2011M12 Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Prob.
Net foreign flows does not Granger Cause *Return*	186	2.923	*0.0354*
Return does not Granger Cause *Net foreign flows*	186	1.252	*0.2925*

Table 3.8 provides the results from testing the significance of lagged return in explaining returns. From the table, the coefficient of lagged returns is significant in explaining return, especially when it is lagged one period. Adding the second lag of return does not affect significance of the coefficient of the first lag, but that of the second lag is insignificant while using three period lags of return does not affect the first period lag, but the coefficient of the third lag is significant at 10 per cent. It is also noted that additional lags do not result into much improvement of R^2. Hence, it can be inferred that it is most appropriate to use the first period lag in capturing the dynamics of return.

[26] The feedback effect in this case is on standardised net return and does not disintegrate returns into expected and unexpected component.

Table 3.8: Testing for the Significance of Lagged Returns in Explaining Return

	1	2	3
Return(-1)	0.183(*2.539*)	0.178(*2.410*)	0.174(*2.373*)
Return(-2)		0.029(*0.385*)	0.004(*0.054*)
Return(-3)			0.129(*1.723*)
Cons.	0.000(*0.066*)	0.000(*0.004*)	0.000(*0.002*)
R-sq.	0.033	0.034	0.050
Adj. R-sq.	0.028	0.024	0.034

Note: *t*-values are in parentheses.

Table 3.9 provides the results from testing the significance of flows and lagged flows in explaining market return. Only the coefficients of expected portfolio flows and internal flows are significant in this case. The significance of the coefficient of portfolio flows is, however,, affected when lagged values are added. Coefficients of internal flows, on the other hand, are highly significant both in contemporaneous form and in lags, showing their importance in explaining return. Adding contemporaneous flows to a model with only lagged return does not improve the power of estimation as seen in both panels. Inclusion of lagged flows also leads to a marginal improvement in the power of estimation.

Table 3.9: Testing for the Significance of Flows and Lagged Flows in Explaining Return

	1	2
Return(-1)	0.084(*1.132*)	0.073(*0.989*)
Expected portfolio flows	0.257(*2.954*)	93.806(*0.714*)
Unexpected portfolio flows	0.012(*0.208*)	0.017(*0.305*)
Internal flows	0.041(*3.192*)	0.075(*3.611*)
Expected portfolio flows(-1)		-73.387(*-0.712*)
Unexpected portfolio flows(-1)		-39.785(*-0.714*)
Internal flows(-1)		-0.041(*-2.025*)
Cons.	-0.022(*-2.962*)	-0.313(*-0.759*)
R-sq.	0.116	0.151
Adj. R-sq.	0.096	0.118
DW stat	1.975	1.987

Note: *t*-values are in parentheses. Portfolio flows and internal flows are standardised by market capitalisation.

From the tables, the results suggest that much of the returns cannot be explained by a regression, including lagged return and flows only. The use of lags in the regression is to test the efficiency

of the market. An efficient market will incorporate all factors in pricing such that the effect of a lag on current prices will be insignificant. The significance of contemporaneous flow shows that an increase in the investor base leads to stock prices rising, thus positively affecting return.

3.5.5. Empirical results

This section extends the analysis of section 3.5.4 by estimating a market return model with the inclusion of macroeconomic variables and proxies for world variables as control variables that are necessary in explaining returns. The results for the estimated model are presented in Table 3.10 where estimation is based on logarithm of the level variables. The stock market return has however not been logged, since in calculating return, the log difference in market index is used, implying that the variable is already in log form.

To get the logarithm of foreign flows, a positive value is added equivalent to the minimum value of the variable to rationalise the variable into positive values. Such transformation only has a scaling effect on the variable and does not affect its reliability in estimation. Impulse dummies have also been included to control for outliers where they exist. The dummies capture certain occurrences that affected the stock market, for instance, Safaricom listing in June 2008. The estimation process involves moving from a general model and getting a parsimonious model by removing variables that show high levels of insignificance, while ensuring that the information criterion is minimised. This enables movement from model A to B in Table 3.10. As is evident, removing highly insignificant variables does not affect the value of R-squared much.

Table 3.10: Results of Regressing Returns on Net Foreign Flows and Other Control Variables

	A		B	
	Coefficient	*t*-values	*Coefficient*	*t*-values
Return(-1)	0.045	0.666		
Return(-2)	0.042	0.657		
LnExpected portfolio flows	0.726	1.120	0.201***	2.660
LnExpected portfolio flows(-1)	-0.174	-0.205		
LnExpected portfolio flows(-2)	-0.306	-0.600	-0.103*	-1.750
LnUnexpected portfolio flows	0.015	0.530	0.024	0.909
LnUnexpected portfolio flows(-1)	-0.298	-1.150	-0.097**	-2.510
LnUnexpected portfolio flows(-2)	-0.082	-0.319		
LnInternal flows	0.005	0.910	0.006**	2.150
LnInternal flows(-1)	0.012*	1.870		
LnInternal flows(-2)	-0.013**	-2.290		
LnMarket capitalisation	0.808***	25.700	0.787***	28.100
LnMarket capitalisation(-1)	-0.042	-0.784		
LnMarket capitalisation(-2)	0.008	0.153		
LnVolatility	-0.004	-0.650		
LnVolatility(-1)	0.003	0.405		
LnVolatility(-2)	0.003	0.472		
LnExchange rate	-0.202**	-2.460	-0.151**	-2.060
LnExchange rate(-1)	0.186**	2.120		
LnExchange rate(-2)	0.015	0.166		
LnTreasury bill	0.032**	2.070	0.033***	2.760
LnTreasury bill(-1)	0.000	0.016		
LnTreasury bill(-2)	0.019	1.230		
LnWorld Treasury bill	0.010	1.200	0.008	1.120
LnWorld Treasury bill(-1)	-0.011	-1.290		
Ln World Treasury bill(-2)	0.019**	2.310	0.015**	2.020
LnInflation	0.008	0.057		
LnInflation(-1)	-0.120	-0.531		
LnInflation(-2)	0.128	0.910		
World stock market return	-0.034	-0.856	-0.041	-1.130
World stock market return(-1)	-0.026	-0.630		
World stock market return(-2)	0.002	0.044		
D2008.6	-0.222***	-7.340	-0.214***	-7.750
D2004.11	0.134***	5.210	0.132***	5.440
D2004.12	-0.157***	-5.520	-0.134***	-5.400
D2006.5	-0.106***	-4.130	-0.108***	-4.390
Constant	0.005	0.191	-0.001	-0.407
R^2	0.874		0.858	
F test	28.74 [*0.000*]		68.75 [*0.000*]	
AR 1-7 test	0.674 [*0.694*]		0.834 [*0.561*]	
ARCH 1-7 test	0.464 [*0.859*]		0.518 [*0.820*]	
Normality test	3.542 [*0.170*]		4.840 [*0.089*]	
Hetero test	0.547 [*0.994*]		1.061 [*0.395*]	
RESET test	0.053 [*0.818*]		0.0196 [*0.889*]	
N	186		186	

Significance levels are given by *** 1%, ** 5% and * 10%, respectively.

The results show that expected flows significantly affect stock market return with an elasticity of about 0.201. However, unexpected flows only have significant effect on stock market return with a first lag and not contemporaneously. The responsiveness of stock return due to lagged unexpected flows is -0.097 at 5 per cent significance level. In this case, stock market return is inelastic to both expected portfolio flows and lagged unexpected flows. A 1 per cent increase in expected flow leads to 0.201 per cent increase in stock market return, while a 1 per cent increase in one-period lag of unexpected flows lead to stock return declining by 0.097 per cent. Lagged expected flows have a negative relationship to stock market return, with a percentage increase in the second lag of expected flows resulting to stock return declining by 0.103 per cent.

The stock return also respond significantly to changes in internal flows with a coefficient of 0.006, showing inelastic response of return to internal flows. The results support a positive contemporaneous relation between foreign expected portfolio flows and stock market returns as found in studies by for instance, Brennan and Cao (1997), Bohl and Siklos (2008), Boyer and Zheng (2009) and Kim and Yang (2009). The presence of positive and significant relation between contemporaneous foreign flows and stock market return depicts existence of positive feedback trading and a positive autocorrelation between foreign flows and returns (Boyer and Zheng, 2009).

The stock market returns are also inelastic to the change in market capitalisation and change in Treasury bill at 0.787 and 0.033 respectively, with the coefficients being highly significant. This implies that activity in the stock market, hence the market return, will improve with improvements in stock market capitalisation and increase in Treasury bill rate. Twerefou and Nimo (2005) however find a negative relation of unexpected short term interest rate to stock

market returns using industry level data in Ghana. This was not the expected sign, but they attribute it to inefficiency in the market. While the increase in Treasury bill rate is expected to increase demand for government securities which compete against investment in the stock market, such increases may also be viewed as reduction in risk levels, hence some investment may be channelled into the stock market. However, the level of investment attracted into the stock market is likely to be much lower than to government securities.

Change in exchange rate, however, has a negative and significant coefficient of -0.151 at 5 per cent level of significance. Depreciation of the currency is expected to attract more foreign portfolio flows as local assets become cheaper for foreign investors. However, depreciation reduces the market dollar value of domestic assets and erodes investors' wealth at the stock market, thereby resulting to a fall in stock returns. It also increases uncertainty in the market.

Based on the empirical results, the coefficient of expected flows is positive indicating that as expected flows increase, the market return is adjusted upwards by the value of this coefficient. This supports the base-broadening hypothesis that as the size of the investor base broadens, market prices rise. However, contemporaneous unexpected foreign flows have no significant effect on returns.

Lagged unexpected flows were used to check whether unexpected flows have a memory effect on returns. The results tend to support the price-pressure hypothesis that surprise flows will initially increase prices, but the prices are expected to revert back reflecting the state of the market once the surprise flows have been factored in. The result that coefficient of expected foreign flows are significant while only coefficient of lagged unexpected foreign inflows are significant shows that while current expected flows are used in valuation of shares, the surprise

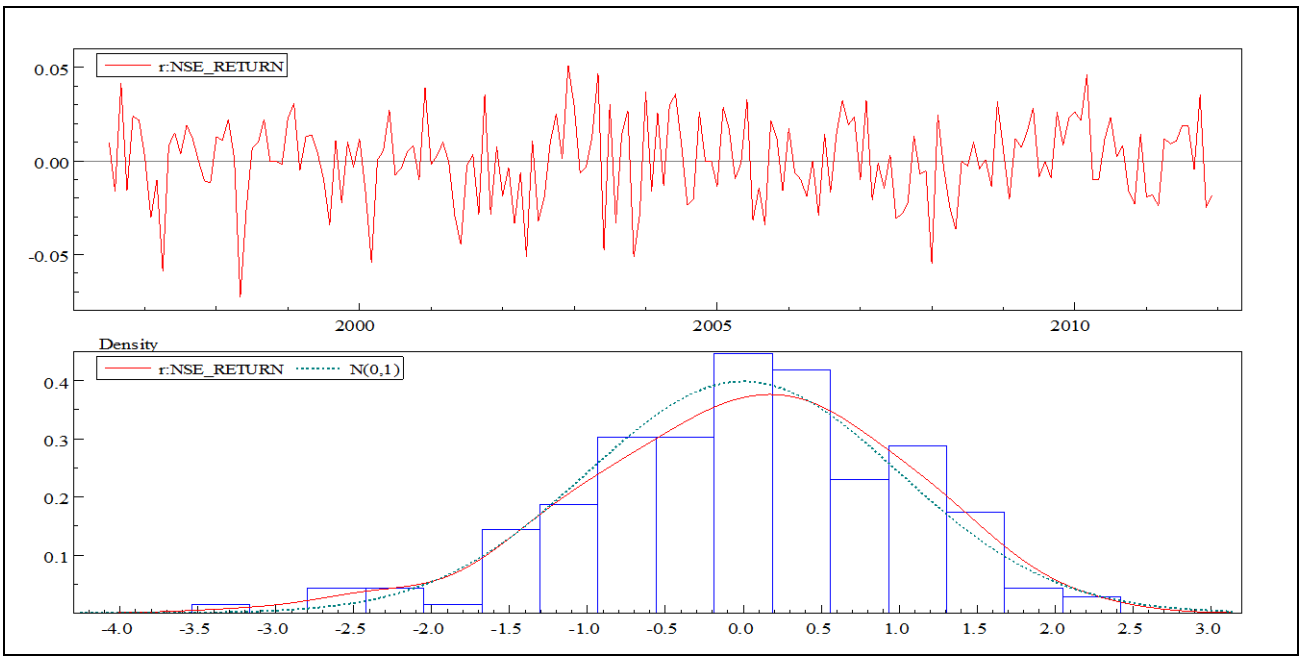
flows from previous period are important in valuation, and not that which the market has not received. While past returns are expected to significantly affect current returns, this is not the case from the results presented. This may be explained by the fact that information on past returns are already taken into account by foreign investors making their actual investment decisions. In this case, past returns do not directly affect current returns.

The returns are not determined by world stock market index, showing a low level of integration to the world market. This supports the argument that the effect of the global crisis of 2009 was not felt in Kenya because of low integration to the world market. The study also failed to establish the effect of certain macroeconomic variables known to affect returns, for instance inflation. This may be explained by the fact that aggregated individual stock returns are used, that is, market return rather than returns for each stock. Wei (2009), for instance, notes that aggregation of individual stock returns with different sensitivities to unexpected inflation results in a weaker aggregate response to inflation news.

Several tests were carried out to evaluate the statistical properties of the model. From the F-test and RESET test, it is concluded that the models are well specified and the variables explain close to over 85 per cent of the dependent variable in the models as indicated by the R^2. Serial correlation was checked using the Breusch-Godfrey serial correlation LM test (the error autocorrelation test from lags 1 to 7) and we failed to reject the null of no autocorrelation.

Figure 3.7 presents the regression residual and its distribution. The residual graph depicts a stationary series, thus stability of the residual series. The histogram and density graphs depict a normal distribution and support the normality test from the regression results. The residual distribution has a skewness of -0.382, kurtosis of 0.090 and a mean of 0.

Figure 3.7: Graphs of Residual and its Density Distribution



Additional tests were carried out in the final model to test base-broadening hypothesis and price-pressure hypothesis. To test base-broadening hypothesis, restrictions were out on coefficients of expected and unexpected flows, that is H_0: $\gamma_1 + \gamma_2 = 0$ against H_1: $\gamma_1 + \gamma_2 > 0$; by testing that the sum of coefficients of expected and unexpected flows is equal to zero. Using general restrictions, a Chi^2(1) = 7.8585 [*0.0051*] was found. The null was therefore rejected and it is concluded that the sum of the coefficients is not equal to zero. This is supported by F-test of restricted and unrestricted model, giving F(2,170) = 3.9298 [*0.022*], implying rejection of restricted model at 5 per cent level. Therefore the base-broadening hypothesis holds.

To test the price-pressure hypothesis, the study tested if the coefficient of lagged unexpected flows is zero or negative, that is H_0: $\gamma_5 = 0$ was tested against H_1: $\gamma_5 < 0$. The results established a Chi^2(1) = 6.2934 [*0.0121*], and therefore rejected the null concluding that price pressure exists and is highly significant at 5 per cent level. This was supported by an F-test of restricted against

unrestricted model with an F(1,170) = 6.2934 [*0.013*], implying rejection of restricted model at 5 per cent level. The results imply that an increase in the number of foreign investors will tend to push stock prices up as demand grows, thereby increasing stock market returns. However, the price increase due to foreign portfolio inflows is later revised when the impact of foreign entry in the market has been factored in stock prices.

3.6 Summary and Conclusion

3.6.1 Summary

This chapter analyses the impact of short term capital flows on the stock market, focusing on the effects of foreign portfolio flows to the stock market. A multifactor asset pricing model is developed with foreign portfolio flows as one of the determinants of asset return, while controlling for the effect of other factors. This is done by modelling foreign portfolio flows into expected and unexpected components, using an ARIMA framework to capture both the expected and uncertain portfolio flows. The major theories on foreign portfolio flows are also tested to determine whether they hold in the domestic stock market. From the analysis, the study established the following results.

First, stock market return is affected by lagged unexpected flows and not by contemporaneous unexpected flows. Hence, uncertain portfolio flows affect stock market return since this is what has not been factored in asset prices.

Second, both the price pressure hypothesis and base broadening hypothesis on foreign portfolio flows are supported. The price pressure hypothesis is supported weakly, with security prices revised downwards, and a lag in unexpected portfolio flows. The base-broadening hypothesis

also holds as the coefficients of expected flows are positive, hence the amount of foreign investment in the market drives up returns leading to the performance of the market. The implication is that foreign portfolio flows push stock prices up, when they come in, which may be due to increased demand. Returns were also found to respond more to previous period's unexpected flows.

Third, participation of internal or domestic investors has a positive effect on market returns as their participation pushed prices up. Hence, active participation of local investors is necessary to drive liquidity as it has a positive impact on returns. It also reflects confidence in the market in situations where information asymmetry exists between local and foreign investors.

Fourth, macroeconomic factors significantly determine stock market performance. The exchange rate may create uncertainty in the market, as the value of assets is eroded due to depreciations. On the other hand, Treasury bill rate may reflect improvement in asset return levels as it captures risk free rate, thus pushing prices up. Stability of both the exchange rate and interest rate is thus expected to reduce the effect macroeconomic uncertainty in the market.

Fifth, no feedback effect was established between returns and foreign portfolio flows, with the effect only running from portfolio flows to returns. This may point to the fact that foreign investors are mainly attracted in the market for risk diversification purposes, rather than for returns. The expected portfolio flows show a positive and significant relationship to stock market returns, implying that increase in expected foreign portfolio flows will stimulate market performance as it creates confidence among investors in the market.

3.6.2 Conclusion

The results from this chapter suggest that short term capital that comes to the stock market in the form of portfolio flows are important in driving market performance. Foreign portfolio inflows will drive market performance as trade in the shares increase, however, the market is affected more by flows which are not known to the market (that is, unexpected flows). This means that if the unexpected flows are substantial, they may cause instability in the stock market and affect market performance. At the same time, encouraging participation of local investors in the market and ensuring macroeconomic stability will drive up market performance.

Kenya still has low levels of portfolio inflows but this has been growing over time. The concerted effort to encourage local investor participation at the stock market that started in 2006 should be driven further through increased investor education and awareness campaigns by the stock market regulator. Active participation of local investors is necessary to drive liquidity, especially during periods when foreign participation is low and to bring confidence in the market situations where information asymmetry exists between local and foreign investors. This will lead to a stock market that is active and expanded, hence enabling it to act as a buffer to foreign portfolio inflows. At the same time, monetary authorities should ensure macroeconomic stability prevails, especially in the exchange rate and interest rates, as this will reduce uncertainty and improve confidence in the stock market.

CHAPTER FOUR

IMPACT OF SHORT TERM CAPITAL FLOWS ON INTEREST RATE AND EXCHANGE RATE IN KENYA

4.0 Introduction

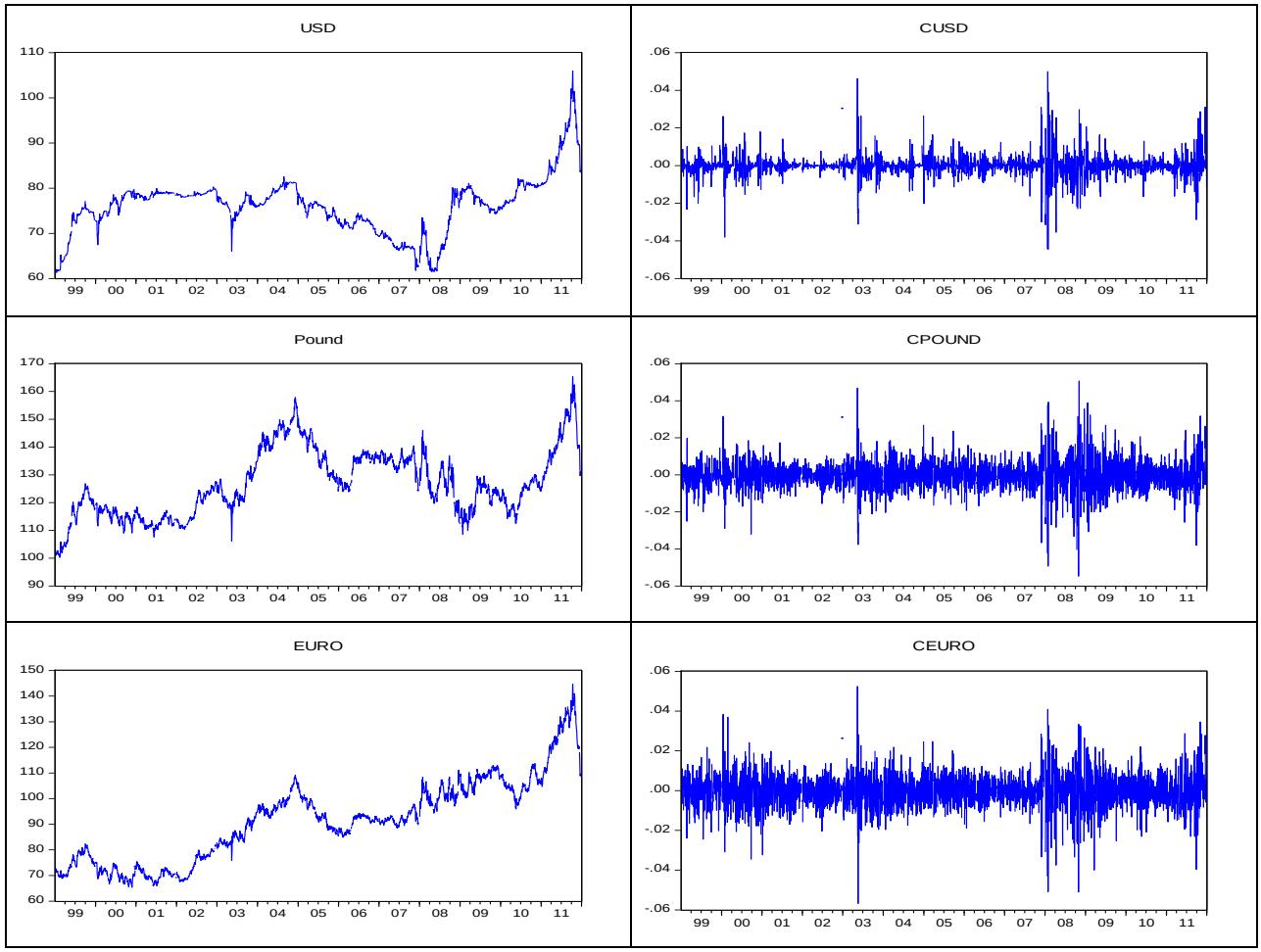
This chapter addresses the second objective of the study. It provides evidence on the impact of short term flows on macroeconomic prices by focusing on interest rate and exchange rate, with a view to establish the relation between interest rate and exchange rate, given short term flows. The aim of the chapter is two-fold. First, to establish whether, given short term flows, the relationship in international finance on interest parity still holds or crashes down. In this case, interest rate parity and exchange rate are considered and short term capital flows are introduced to establish how this affects the relationship between interest rates and exchange rates. Second, to establish the impact of short term capital flows on interest rates and exchange rates using a vector autoregressive (VAR) model, taking into consideration the exchange market pressure. The exchange market pressure is estimated considering central bank intervention in the exchange rate market. Based on the results from the two parts, conclusions are drawn on the behaviour of interest rates and exchange rate.

4.1 Trends of Exchange Rate Movement

The movement in the Kenya shilling against major currencies has been varying over time with no stability experienced. Much of this instability has been attributed to external shocks mainly arising from trade position of the country, structural factors within the economy and the level of economic performance. Much of the instabilities were experienced from the time the currency

was floated and therefore exposed to external factors. A plot of the exchange rate of the Kenyan shilling to major currencies like the US dollar, the Sterling Pound and the Euro shows that the domestic currency has depreciated over time and moved out of trend (Figure 4.1). For example, the graph of exchange rate to the dollar does not depict any particular trend and shows high levels of depreciation in 2011 compared to 1999.

Figure 4.1: Movements in Daily Exchange Rate, 04 January 1999 to 30 December 2011

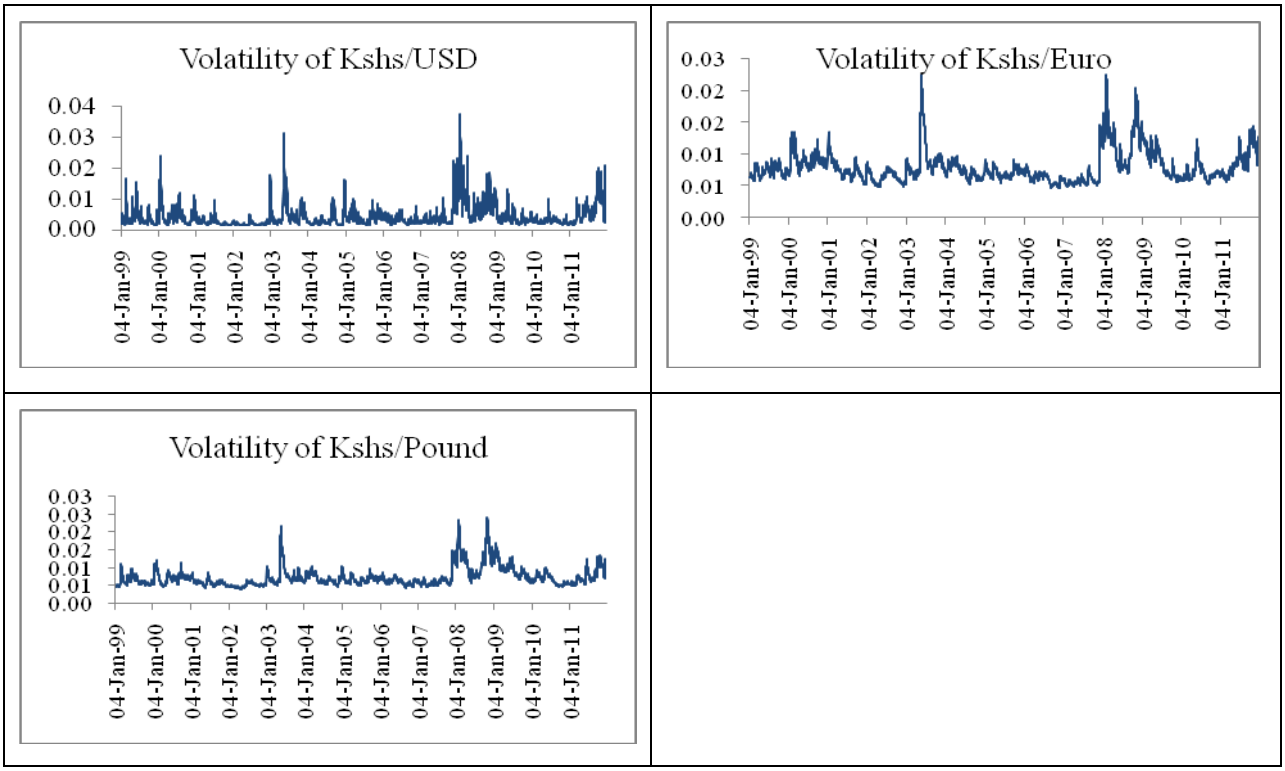


Source: Data from Central Bank of Kenya

At the end of the last decade, the macroeconomic environment was characterised by a number of challenges such as unfavourable weather conditions which affected food supply, high international oil prices, global financial and Euro crises and increase in import prices which

could have led to high depreciations in 2000s. The exchange rate to the dollar, the pound and the euro recorded the highest values of 106, 165 and 145, respectively, on 12th October 2011 caused by the increase in international oil prices that led to a rise in import bill and the Euro crisis which affected the export market. In comparison to the exchange rate of Kshs.62 to the dollar on 7th May 2008, the exchange rate depreciated by about 134 basis points. This movement can be seen from the graph of the change in Kenya Shilling against the three major currencies. There huge variations on a daily basis, depicting the presence of volatility. To drive this further, the volatility of the exchange rates to major currencies is graphed assuming a GARCH (1,1) representation (Figure 4.2).

Figure 4.2: Volatility of Exchange Rate, 04 January 1999 to 30 December 2011



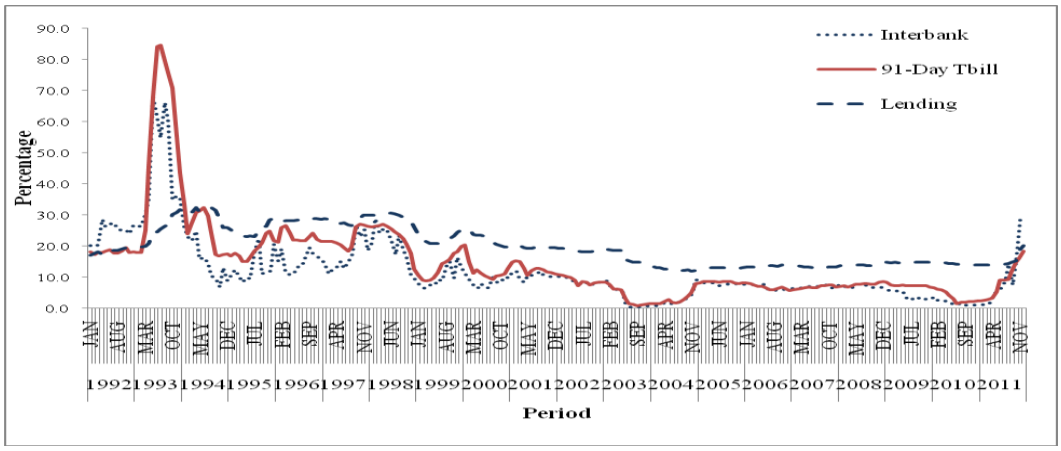
Source: Data from Central Bank of Kenya

The graphs show high levels of volatility on daily exchange rate data and volatility clustering is more prominent for exchange rate to the dollar compared to the pound and the euro. Since high

exchange rate variation creates uncertainty and may influence market sentiments, the movement and stability of exchange rate is very crucial. Other than these, exchange rate also affects domestic competitiveness and by extension international trade, hence the need for a stable exchange rate.

The monthly trend of interest rates over time also shows a general decline from the high interest rate values of early 1990s when the Treasury bill rate was over 80 per cent (Figure 4.3). This was driven by the financial sector reforms that led to reduction in controls. The decline in Treasury bill rate and interbank rate was however much higher than that of the lending rate, which was higher than the other interest rates, most of the time, as lending institutions made little adjustments to the lending rate as interest rates decreased. The interest rates, however, started rising in the second quarter of 2011 following the increase in CBR to contain depreciation of the currency. In 2011, the CBR was raised six times within the year, from a low of 5.75 in February to 18.00 in December.

Figure 4.3: Monthly Trend of Interest Rates, January 1992 to December 2011

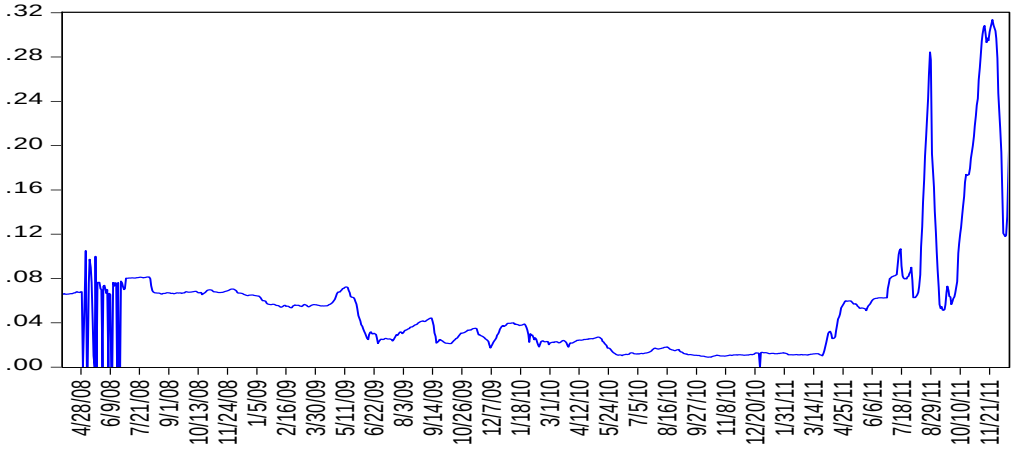


Source: Data from Central Bank of Kenya

The correct picture of movements in interest rates can be seen using daily interest rate data (Figure 4.4). The interbank interest rates fluctuated in the second quarter of 2008, before being

stable and subsequently declining up to March 2011, when it started moving upwards. The high fluctuations in interbank rates in 2008 might be partly attributed to the global financial crisis, which affected the world economy during the same period. The movement of the interbank rate thereafter has seen huge swings moving up to the highest value of 31.4 per cent on 24th November 2011, following tightening of monetary policy to contain depreciation of the shilling and inflationary pressures. The trend of interest rates shows that, just as the exchange rate, they have also moved out of sync over time. The period from 2010 experienced high depreciation of the domestic currency against major world currencies, and there is a possibility that the movement of interest rates is related to the appreciations and/or depreciations during this period.

Figure 4.4: Daily Interbank Rate, 01 April 2008 to 19 December 2011



Source: Data from Central Bank of Kenya

The rapid depreciation of the shilling against major currencies was a concern in the country and led to the issue being taken up by parliament through a select committee to investigate the decline of the currency against major currencies. A number of reasons have been given as the likely cause of the depreciation (World Bank, 2011a; 2011b; Kenya National Assembly, 2012). Despite these, one factor that needs to be explored is whether established relationships in international finance on interest parity hold in explaining the depreciation of the currency.

Under the covered interest parity condition, exchange rates are expected to adjust to equalise interest rates between two countries as interest rate arbitrage opportunities do not exist. In such a case, it is assumed that the forward market eliminates any deviations related to future currency exchanges. In a situation where covered interest parity does not exist, there are opportunities for covered interest arbitrage such that investors will borrow in markets with lower rates and lend to markets with higher rates. This will increase rates in markets with lower rates and reduce rates in markets with higher rates until interest parity is established. Under uncovered interest parity, on the other hand, the difference in interest rates between two countries is equal to the expected change in exchange rates between the countries' currencies. Covered interest parity is estimated in this paper to establish whether it holds in relation to the dollar.

4.2 Literature Review

Capital flows have been a major contributor to growth in most countries as they provide financing for investments[27]. The flow of capital is determined by a number of factors, including the stability of macroeconomic environment. However, smooth flow of capital is hinged first on whether a country has capital controls in place or not, and secondly on macroeconomic stability, which ensures that macroeconomic forecasts can be made by some level of accuracy. However, due to globalisation, ensuring macroeconomic stability has become a major challenge, especially for developing countries. As Frankel (2011) notes, developing countries have certain structural

[27] For instance, Rangasamy and Mihaljek (2011) note that the investment rate in Sub-Sahara Africa increased from 17 per cent to 21 per cent of GDP from 2003 to 2007, when there was a surge in capital inflows. Though they do not attribute the entire increase in investment rate to capital inflows, what this shows is that capital inflows may have played a significant role in financing investments in Sub-Sahara Africa.

characteristics[28] which affect macroeconomic stabilisation, especially when they are integrated to the global world. In an effort to address these structural factors, studies (for example, Adam, 2011; Rangasamy and Mihaljek, 2011) have given prominence to the effect of food and energy price increases in low income countries, especially Africa. These studies argue that food and energy price increases have affected both macroeconomic quantities and prices, and due to the uncertainty about their future movements, they should be considered in the design and conduct of monetary policy. This is because these countries are food-deficient and have to import some of their food requirements; hence their high inflation pressure is driven mainly by food and fuel prices (Adam, 2011)[29].

It has been noted that external shocks to developing countries are worsened by international capital markets, more so if they are from trade shocks (Frankel, 2011). This has been attributed to procyclical nature of private capital flows. Despite this, developing countries have to choose between growth and macroeconomic stability given that foreign capital complements saving and supports growth, however, macroeconomic stability can be achieved by accumulating enough reserves (Calvo, 2001)[30]. The need to find a balance between growth and macroeconomic stability complicates macroeconomic management for these countries, since most of them have had low growth rates over a long period and are vulnerable to shocks, hence experience high macroeconomic instabilities.

[28] Frankel (2011), for instance, argues that developing countries have institutions that are not well developed, with uncompetitive banking system, are exposed to supply shocks, are smaller in size and are dependent on agricultural and mineral exports.

[29] Commodity price shock resulted in CPI inflation rising in SSA from about 6.8 per cent in 2007 to 11.5 per cent in 2008 (Rangasamy and Mihaljek, 2011).

[30] Calvo (2001) defines capital inflow as composed of current account deficit and international reserve accumulation. Hence, increase in capital inflow has to be matched by accumulating international reserves to ensure current account deficit does not increase. In this way, money supply is controlled and sudden appreciation of currency prevented.

Capital flow reversal calls for macroeconomic measures to maintain stability, especially where a sudden stop is accompanied by reduction in current account deficit and international reserves as they may result into output collapse (Calvo, 2001). According to Calvo (2001), sudden stop occurs when a reversal in capital inflow curtails increase in tax revenue, which was being used to finance fiscal deficits and due to change in perception of a country to be of higher risk.

4.2.1 Capital mobility

A number of studies have advanced arguments on whether countries should adopt perfect capital mobility or not. While it seems that full mobility of capital is preferable, some form of capital controls have been advocated for in the literature as a way to limit the effect of volatile capital flows and allow lower and stable interest rates such that volatility in asset prices is reduced (Edison and Reinhart, 2001; IMF, 2011b). However, capital controls should be applied only when flows are expected to be temporary, such that the economy would adjust to changes in capital flow (Ostry et al., 2011; IMF, 2011b).

A factor that has been of concern is effectiveness of capital controls. Calvo (2001), for instance, noted that controls cannot prevent a sharp devaluation of exchange rate during a capital outflow episode. In assessing the extent to which capital controls were effective in three emerging market economies, Brazil 1999, Malaysia 1998, and Thailand 1997, Edison and Reinhart (2001) found that capital controls did not achieve what they were intended for in Brazil and Thailand, while in Malaysia, the controls resulted to improved interest rate and exchange rate stability, and more policy autonomy. The study found little evidence that capital controls were effective in making domestic interest rates and exchange rates independent from foreign interest rates and exchange rates, and that equity markets continued to be internationally linked.

It has been established that capital flows have low persistence but increased volatility over time, which varies by the structural characteristics of the recipient economy and nature of the flow, that is, whether it is short- or long-term (IMF, 2011b; Frankel, 2011; Rangasamy and Mihaljek, 2011). For instance, net flows to emerging market economies have been found to be more volatile than those to advanced economies, and debt-creating flows more volatile and less persistent than other flows (IMF, 2011b).

Capital inflows are favoured since they help finance developing countries. In this case, short term capital flows such as bank borrowings have been preferred to other forms of financing. Evidence also points to the fact that there has been a shift towards non-bank means of financing over time, due to deepening of domestic capital markets and greater financial integration (IMF, 2011b). Though net capital flows to emerging market economies are strongly correlated with changes in global financial conditions, they vary depending on domestic factors (IMF, 2011b). Concerns have, however, been raised regarding how short term capital flow is measured. Willet, Keil and Ahn (2002), for instance, have shown that capital mobility for developing countries may not be high as has been reported in previous studies, due to inappropriate assumptions made on the roles of domestic inflation and stabilisation.

For a country to be able to stabilise the economy following any adverse balance of payments shock from capital inflows, it must maintain adequate stock of international reserves[31]. This is because capital inflows are financed through reductions in official reserves held to smooth out imbalances between foreign receipts and payments or increases in foreign borrowing (Collins,

[31] The rule of thumb has been that developing countries should hold enough reserves to cover at least four months of imports. This was based on the fact that developing countries are net importers, and thus to be able to contain volatilities arising from international trade, they were to hold enough reserves. However, literature (for example, Frankel, 2011) has replaced this requirement by the "Guidotti rule" which provides that developing countries should hold enough reserves to cover all short-term foreign debt due to the "sudden stop" nature of short-term foreign debt.

1988). Reserves are mainly composed of US dollar denominated assets (Williamson, 1988), however, given the developments in the global financial markets, some countries have now diversified their holding of international reserves to other currencies.

International reserve holdings are also viewed as self-insurance since they reduce both the cost of a financial crisis and chances of a crisis for emerging markets (Bar-Ilan and Marion, 2009). This view is based on the fact that central banks address speculative attacks either by selling off their holdings of foreign exchange or by raising interest rates (Edison and Reinhart, 2001). While this calls for build-up of international reserves, high reserve levels are costly as they are difficult to sterilize fully. Besides, they increase the opportunity cost of holding reserves as accumulation of reserves can starve the economy of credit and increase the cost of credit which may affect output growth (Bar-Ilan and Marion, 2009).

Capital inflows also have some drawbacks other than the volatility aspect of short term flows. A sudden surge in capital can lead to high inflation and appreciation of exchange rate. In addition, it can undermine competitiveness, lead to excess foreign borrowing and create foreign currency exposure which may fuel domestic credit booms and asset bubbles, as well as a sudden collapse in capital inflows (Calvo, 2001; Ostry et al., 2011). In developing countries, capital inflows may cause problems arising from currency mismatch brought about by the fact that banks and firms hold foreign currency denominated debts though much of their revenues are in domestic currency, which may result into solvent firms having trouble servicing their debts in the face of a major devaluation (Calvo, 2001; Frankel, 2011).

4.2.2 Interest rate and exchange rate / Interest rate parity condition

4.2.2.1 Capital flows, interest rate and exchange rate

Capital flows have a relation to the monetary policy through its effects on exchange rates and interest rates. This is mainly because short term capital flows, such as portfolio flows, are easily reversible and thus affects the monetary variables. Capital flows can therefore be useful in explaining movements in a currency (Brooks et al., 2001). For instance, Rodrik and Velasco (1999) note that capital account reversal in East Asia caused a collapse in asset prices and exchange rates, while Brooks et al. (2001) found exchange rate movements to be more sensitive to equity portfolio capital flows relative to current account transactions and that capital flows reflected a desire for portfolio diversification and expectations of changing relative rates of return.

The concern with capital flows is that they fluctuate and may lead to economic domestic or financial cycles, if they cannot be predicted (IMF, 2011b). The level of capital flows, however, depends on the degree of market integration. To measure the degree of integration of capital markets, it is better to look at differences in rates of return across countries (Frankel, 1992). As Mohan and Kapur (2010) found, the increasing volume of private capital flows to emerging market economies (EMEs) can be attributed to, among other factors, the growing degree of financial openness, growth in profitability of firms, positive interest differentials and the expected currency appreciation[32]. They argued that capital flows reflect the role of push factors

[32] Openness has been measured in a number of ways, the latest being the Chinn and Ito (2008) index which measures the extent of openness in capital account transactions aimed at addressing lack of proper ways of measuring openness in cross-border transactions. The Chinn and Ito (2008) index reflects the perception that the world is moving steadily towards greater and greater financial openness, meaning that countries that are currently slightly open will be more open in the future.

emanating in the source countries, such as the search for yields in comparatively low interest rates and overall high returns in EMEs.

Despite the effect of monetary policy on capital flows, domestic impact on the capital account is delayed (Branson et al., 1970). Taylor (2001) attributes this to inertia in the monetary-transmission mechanism; hence an appreciation of the exchange rate will decrease the level of output and inflation that is expected in the future. Capital inflows lead to higher domestic demand, push up prices and the domestic currency, hence its impact is captured using the exchange rate (Helmers, 1988; Combes et al, 2011). On the other hand, capital outflows lead to depreciation of the domestic currency, push inflation and increase competitiveness as domestic produce becomes cheaper in the world market (Collins, 1988). Besides, it may lead to large deficits, especially where an economy has unfavourable trade balance.

In a flexible exchange rate regime, monetary policy is independent of capital inflows and is effective if the exchange and capital markets are well developed (Helmers, 1988; Dornbusch and Giovannini, 1990). Large and speculative short term capital movements might lead to overshooting or undershooting of real exchange rate targets, thus affecting monetary policy in a less developed exchange and capital market (Collins, 1988). In a flexible exchange rate regime, money stock is determined by the central banks hence output and exchange rate adjust to accommodate monetary and fiscal disturbances. This leads to the call for models of exchange rate determination to focus on both debt and equity flows (Brooks et al., 2001), showing that consideration of the entire composition of short term capital flows is important when examining the impact of short term capital flows on macroeconomic variables.

In assessing whether exchange rate is affected by monetary policy and whether the effects are permanent or transitory, Kargbo (2006) found excess money supply to predict each other with the cyclical movements of the real exchange rate and that long-run purchasing power parity (PPP) holds in Africa. Nandwa (2006) found that the modified Taylor rule maps the actual movement in real exchange rate except for the period marked by exchange rate volatility.

O'Connell et al. (2010), in a study on Kenya, found that the Central Bank of Kenya (CBK) placed less emphasis in its intervention to smooth exchange rate volatility, when the foreign exchange market is calm compared to periods of great pressure. This is expected given the role of reserves in intervention and exchange rate stabilisation. The study found monetary policy in Kenya to be in an intermediate position, with imperfect but substantial capital mobility. Due to this, the study argued that CBK had a limited scope for pursuing interest rate and exchange rate objectives simultaneously. They noted that monetary policy environment is strongly influenced by the composition of external flows, with liquid short-maturity flows regarded as more constraining to monetary policy than long-term flows.

Interest rates also come into play as far as capital flows are concerned with rising interest rates inducing improvement in the capital account, as they reduce the outflow of capital (Branson et al., 1970). Other studies such as di Giovanni and Shambaugh (2008) have looked at how foreign interest rates affect the economy. The study found annual real output growth to be negatively associated with foreign interest rates, only for countries with fixed exchange rates, through the effect of foreign interest rates on domestic interest rates.

4.2.2.2 Interest rate parity condition

The relation between interest rate and exchange rate in the presence of capital flows can be represented through the exchange market pressure (EMP), which represents the difference between growth rates of domestic money supply and demand, reflected in both exchange rate and reserve movements. Controlling monetary base by setting interest rates has impacts on capital flows and affects the exchange market pressure (Tanner, 2001). Using a VAR model, Tanner (2001) found that contractionary monetary policy helps reduce EMP.

Interest rate parity explains why changes in nominal short term interest rates would affect nominal exchange rates. There are three versions of interest rate parity; covered (closed) parity whereby interest rates across countries are equalized, uncovered (open) parity where expected rates of return are equalised, and real interest parity where real interest rates across countries are equalised by capital flows (Frankel, 1992; 2011).

The implications of portfolio behaviour for monetary policy depend on the time period over which monetary policy can influence the premium (O'Connell et al., 2010). Using interest parity regressions for Kenya, the study found capital movements to be sensitive to relative yields and exchange rates are found to influence interest rates through an expectations channel. Using *ex post* yields with forward looking exchange rate expectations, they found little evidence that private capital movements exert a constraint on monetary policy. Other studies, for instance Willet et al. (2002), have noted that covered interest differential is not a good measure of capital mobility or financial market integration, since it only implies less than perfect capital mobility if it holds and nothing if it does not. They argue that sterilisation lowers estimates of capital

mobility and is the reason developing countries have been able to engage in substantial short-run sterilisation of capital flows.

According to Taylor (2001), an indirect effect of exchange rates on interest rates may explain why monetary policy rules that react directly to the exchange rate, as well as to inflation and output, are not effective in stabilising inflation and real output compared to policy rules that do not react directly to the exchange rate. Ndung'u and Ngugi (1999), for instance, found interest rate differential to decrease with real exchange rate appreciation in Kenya, thus reducing returns from interest rate differential. The study found a weak feedback from real exchange rate movements to volatility in capital flows, but slightly stronger feedback effects between real interest rate differential and the volatility in capital flows. However, Cheng (2006), in a study of monetary policy transmission mechanism in Kenya, found that unexpected and temporary rise in short term interest rate led to a decline in prices and appreciation of the exchange rate, which they argued reflects capital mobility associated with interest rate differentials vis-à-vis other countries.

Aghion et al. (2000) study the conduct of monetary policy following a crisis to address the debate that increasing interest rates lead to strong exchange rate, which improves finances of domestic firms with foreign exchange denominated debt. The study argued that increasing interest rates increases the current debt of firms, thereby exposing them to bankruptcy due to credit constraints which affect the exchange rate negatively. Focusing on flexible exchange rate and assuming full capital mobility and uncovered interest rate parity, they found that tight monetary policy is not desirable after a currency crisis when the proportion of foreign currency debt is not too large or where credit provision is highly sensitive to changes in nominal interest

rates. In their model, expected real output in period 2 influences the nominal exchange rate in period 1, and the domestic currency depreciates after a monetary expansion in the first period due to an excess of liquidity but, depreciates after a monetary expansion in the second period due to an expected increase in inflation.

Kumhof (2001), on the other hand, tested the covered interest parity in emerging markets' banking sector by estimating the cointegrating relationship between interest rate and forward discount components in these markets. The study found that financial market crisis increased the mean differentials and volatility which is attributed to temporarily effective capital controls, large bank default risk premia, and capital market imperfections. Covered interest parity was found to hold as an equilibrium relationship in the long run despite large short-term deviations.

4.2.2.3 Estimating the EMP

Exchange market pressure (EMP) reflects the response of a currency to movements in the financial sector and international trade arising from capital flows and trade across economies. It measures the exchange rate change that is necessary to cover excess demand arising from international trade if exchange market intervention is not used (Weymark, 1998). EMP captures depreciations and pressure on a currency, which may not be observed in the behaviour of nominal exchange rate dynamics (Bertoli et al., 2010).

Measurement of the EMP has to take into consideration a number of factors, such as assumptions used in aggregating information, weighting of the variables, computation of rate of exchange rate variation, and which reserve to use.[33] For instance, Bertoli et al. (2010) have shown that the EMP index is sensitive to some assumptions used in aggregating information, and this may affect the

[33] For a discussion of these issues, see Bertoli et al. (2010).

reliability of EMP index as a basis for economic analysis. The functional forms of the formulae used in calculating EMP and the degree of exchange market intervention are also sensitive to the nature of the intervention activity (Weymark, 1997). These issues are of more concern for emerging markets, for instance, net reserves is preferable since these countries' reserves are supported by large inflows of IMF funds. With no intervention, international excess demand for domestic currency is removed by change in the exchange rate, but with intermediate exchange rate systems by foreign exchange reserves and changes in domestic credit (Weymark, 1998).

The first measures of EMP based on Girton-Roper formula (Girton and Roper, 1977) were argued to be restrictive and model-specific, and did not present a unique formula for exchange market pressure (Weymark, 1997). An improvement to the Girton-Roper model is Weymark (1997; 1998), who develop a model-dependent exchange market pressure indices assuming a well-developed financial market and perfect substitutability between domestic and foreign assets. But this may not be the case for developing countries where financial markets are not well developed such that intermediation is not perfect and where substitutability of domestic and foreign assets is not perfect, that is, where imperfect capital mobility exists.

Hegerty (2009) specifies EMP as change in foreign reserves and changes in the nominal interest differential, leaving out the change in exchange rate, while O'Connell et al. (2010) measure EMP as change in exchange rates and the change in reserves.

4.3 Methodology

4.3.1. Theoretical framework

4.3.1.1 Interest rate parity and exchange rate

Covered interest parity states that, under full integration, capital flows should equalise the returns on any two assets that differ only in their country of issue and currency of denomination, while being identical in terms of maturity, liquidity and default risk. This requires that their interest differential be equal to the forward discount between the two currencies.

Inflows of short term capital will lead to exchange rate appreciation. However, under the covered interest rate parity, exchange rate changes will affect interest rates through the expectation channel. When interest rates increase, interest differential go up as foreign interest rate remains constant, and the forward exchange premium increases. In such a case, the spot exchange rate will highly deviate from the forward exchange rate, which is arrived at using interest rate differentials. Hence, the spot exchange rate is related to forward exchange rate.

To be able to test the covered interest rate parity, it is assumed that capital is mobile and that there is perfect substitutability of assets such that investors will only hold assets with the highest returns, irrespective of whether they are local or foreign. This assumption implies that the default risk (or the risk premium) is assumed to be zero. The assumption may not reflect the correct position on default risk. However, it enables the study to estimate the forward premium using the interest differential, since Kenya does not have a forward exchange market.

Since forward exchange rate is based on the interest rate differential, it is expected that spot exchange rate and forward exchange rate should have a long run relationship if covered interest

rate parity holds. In this case, it is not possible to benefit from interest rate arbitrage opportunities. Introducing short term capital flows will lead to movements in spot exchange rate and reserves to reduce depreciation of the currency. Hence, the relationship between spot and forward exchange rate will depend on the movement in short term capital flows and amount of reserves used.

4.3.1.2 Interest rate, exchange rate and short term flows

The central bank has the responsibility of maintaining interest rate and exchange rate stability. In a situation where movements in the exchange rate is not stable, the central bank, as the institution charged with implementation of monetary policy, has to ensure that stability is attained. Short term capital flows may lead to instability in interest rates and exchange rates, by affecting asset prices. When the interest differential between foreign and domestic interest rate is high, short term capital is attracted into the domestic market. High short term inflows will however lead to exchange rate appreciation, and may result to high exchange rate volatility if short term flows are not stable. In this case, domestic interest rate will be used as a monetary policy tool to restore stability. Hence, tightening of monetary policy will lead to a change in exchange rate. According to the Dornbusch exchange rate overshooting model, an increase in interest rate leads to an instantaneous depreciation of the nominal exchange rate, and then appreciation, in line with uncovered interest parity (UIP).

A structural vector autoregressive (SVAR) model is specified to capture the effects of short term flows on exchange rate and interest rates, and this is related to the response of monetary policy in a Dornbusch (1976) overshooting model framework. The usefulness of structural VAR representation is that it can be used to construct the unobserved exogenous shocks as functions of current and lagged values of the observed variable when the model parameters are unknown. In

addition, it provides a convenient framework for estimating model parameters (Watson, 1994). The exchange market pressure is then constructed and the relationship between interest rates and exchange market pressure is modelled in a VAR framework, taking into consideration short term flows. The argument is that short term capital flow volatility creates shocks to the economy and leads to pressure on the real exchange rate, hence affecting other macroeconomic variables. The use of a VAR framework in both cases is justified by the fact that it provides a systematic way to capture the dynamic structure and movements of the variables without restriction to a specific functional form. Hence, in such a framework, the response of macroeconomic prices to short term capital flow changes can be identified and it can also capture any feedback effects.

Bjornland (2009) suggests identification of VAR by restricting the long run multipliers of shocks by assuming that monetary policy shocks have no long run effect on the level of the real exchange rate, but are free to influence the exchange rate in the short run, that is the neutrality assumption.

4.3.2. Model specification

4.3.2.1 Interest rate parity

To establish whether CIP holds, the study empirically tests the relation between the change in spot exchange rate $(S_{t+1} - S_t)$ and the deviation of spot rate from the forward premium *FS,* defined as $(F_{t+1} - S_t)$, where F_{t+1} is forward exchange rate. This relationship is specified as:

$$(S_{t+1} - S_t) = \alpha + \beta(F_{t+1} - S_t) + \varepsilon_t \qquad (4.1)$$

This is done by first checking for cointegration between change in S_t and *FS*. Existence of cointegration would imply that the spot rate and the forward exchange rate have a long run

relationship, meaning that the covered interest rate parity would hold and there would not be any interest rate arbitrage opportunities. Cointegration test is then carried out with inclusion of reserves and portfolio flows to establish whether the results established will still hold.

4.3.2.2 Relationship between interest rate, exchange rate and short term flows

The VAR model is specified with foreign interest rate (i_t*), log of short term capital flows (SF_t), log of domestic credit (DC_t), log of domestic output (y_t), domestic interest rates (i_t), log of nominal effective exchange rate (ER_t), and log of consumer prices (P_t) using monthly data. Foreign interest rate is USA 3-months Treasury bill rate, short term flows are from the CBK balance of payments (BOP) statistics, domestic credit includes both private and public sector credit, domestic output is captured by GDP interpolated into monthly values, domestic interest rates is captured by the Treasury bill rate and consumer prices by Consumer Price Index. Nominal effective exchange rate and CPI were rebased to December 2001 to attain uniformity in the series.

If Z_t is defined as the (7x1) vector of these macroeconomic variables, that is, $Z_t = [i_t^*, SF_t, DC_t, y_t, P_t, i_t, ER_t]'$, then the VAR is assumed to be stable and can be inverted and written in terms of its moving average as:

$$Z_t = B(L)v_t \qquad (4.2)$$

where v_t is a (7x1) vector of reduced form residuals assumed to be identically and independently distributed, $v_t \sim iid(0,\Omega)$, with the positive definite covariance matrix Ω. *B(L)* is the (6x6) convergent matrix polynomial in the lag operator *L*, that is, $B(L) = B_0 - \sum_{k=1}^{\infty} B_k L^k$. The residuals in v_t cannot give pure innovations because they are contemporaneously correlated across equations

in the VAR. This identification problem is solved by normalising v_t to obtain ε_t. Using a recursive system to identify the model by forming B as a lower triangular, the orthogonal structural disturbances, v_t, can be expressed as $v_t = B^{-1}\varepsilon_t$ or $v_t = S\varepsilon_t$ where $S = B^{-1}$. Hence, the VAR can be expressed in terms of structural shocks as:

$$Z_t = B(L)S\varepsilon_t = C(L)\varepsilon_t \tag{4.3}$$

Applying restrictions on S enables one to move from reduced form VAR to structural VAR (Bjornland, 2009)[34]. Structural VARs can be identified using restrictions on the covariance matrix of structural shocks $\sum_\varepsilon$, the matrix of contemporaneous coefficients B_0, and the matrix of long-run multipliers $B(1)^{-1}$ (Watson, 1994). Restrictions on $\sum_\varepsilon$ take the general form that $\sum_\varepsilon$ is diagonal, hence assuming the structural shocks are uncorrelated. Restrictions on B_0 is based on prior knowledge about the B_0 matrix, which is based on economic theory or institutional knowledge (Stock and Watson, 2001). These restrictions lead to a recursive model with B_0 lower triangular and gives the remaining identifying restrictions. Alternatively, the shocks are identified using long-run restrictions. In this case, restrictions are placed on $B(L) = B_0 - \sum_{i=1}^{p} B_p$.

Since the interest is in establishing the contemporaneous relationship between short term flows and other macroeconomic variables, the study relies on economic theory, and uses structural VAR. Given the variables we have, the uncorrelated structural shocks can be presented as $\varepsilon_t = [\varepsilon_{i^*}, \varepsilon_{SF}, \varepsilon_{DC}, \varepsilon_Y, \varepsilon_P, \varepsilon_{MP}, \varepsilon_{ER}]'$, where ε_{i^*} is foreign interest rate shocks, ε_{SF} is short term

[34] Under theoretical VARs, residuals are separated into orthogonal shocks using Choleski decomposition of the variance matrix of the residuals, while in structural VAR, a reduced-form VAR model is transformed into a system of structural equations using economic theory (see Keating, 1992).

capital shocks, ε_{DC} is domestic credit shock, ε_{Y} is output shocks, ε_{P} is consumer price shock, ε_{MP} is monetary policy shock (from monetary authorities action on the interest rate), and ε_{ER} is the exchange rate shock. Short-run restrictions are then imposed on the structural VAR model as in Enders (2010), Cheng (2006) and Mwega (2012) to draw the relationship.

The monetary policy variables are assumed to react immediately to disturbances while the macroeconomic variables react with a lag. The foreign interest rate is assumed not to be affected by shocks from the domestic economy as is necessary in the small open economy assumption. Short term flows are affected by the foreign interest rates relative to the domestic interest rates and not directly by shocks from the domestic policy variables. Short term capital flows in the economy are expected to increase the amount of domestic credit available to the private sector. Hence, domestic credit responds to shocks from foreign interest rates and short term flows. Since short term flows come in form of foreign currency, the exchange rate is likely to appreciate as stock of foreign currency reserves increase. Exchange rate, therefore, responds to shocks from foreign interest rate, short term capital flows and domestic credit.

Increased output is expected to lead to more domestic investment as residents get more disposable income. At the same time, when prices increase, domestic investors reduce their proportion of equity investment to meet other consumption needs. Increase in short term flows feeds into the domestic output by providing capital for investment, and appreciates the exchange rate, hence inflation increases. The end result is that domestic interest rates will be affected, and the change in domestic interest rate will result into change in exchange rates. The domestic interest rates therefore respond to shocks from all the other variables. The response of interest rates represents a form of modified monetary reaction function, with foreign interest rates

included to capture the foreign effect. The relationship among the variables determines their order in the structural model. In this case, a structural VAR is presented as in Equation 4.4.

$$\begin{bmatrix} \varepsilon_{i*} \\ \varepsilon_{SF} \\ \varepsilon_{DC} \\ \varepsilon_{ER} \\ \varepsilon_{Y} \\ \varepsilon_{P} \\ \varepsilon_{i} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c2 & 0 & 0 & 0 & 0 & 0 & 0 \\ c4 & c5 & 0 & 0 & 0 & 0 & 0 \\ c7 & c8 & c9 & 0 & 0 & 0 & 0 \\ c11 & c12 & c13 & c14 & 0 & 0 & 0 \\ c16 & c17 & c18 & c19 & c20 & 0 & 0 \\ c22 & c23 & c24 & c25 & c26 & c27 & 0 \end{bmatrix} \begin{bmatrix} \varepsilon_{i*} \\ \varepsilon_{SF} \\ \varepsilon_{DC} \\ \varepsilon_{ER} \\ \varepsilon_{Y} \\ \varepsilon_{P} \\ \varepsilon_{i} \end{bmatrix} + \begin{bmatrix} c1 \\ c3 \\ c6 \\ c10 \\ c15 \\ c21 \\ c28 \end{bmatrix} \begin{bmatrix} u1 \\ u2 \\ u3 \\ u4 \\ u5 \\ u6 \\ u7 \end{bmatrix} \quad (4.4)$$

To establish the relationship between short term capital flows, exchange rate and interest rates, a SVAR model that links the exchange market pressure (EMP) and interest rates is specified. The study then models how short term capital flows relate to exchange rates. A monetary policy action that changes short-term domestic interest rates results into a short term capital response manifested as a change in exchange market pressure. At the same time, monetary policy instruments respond to exogenous changes in exchange market pressure, with a view to moderate the impact on the exchange rate and/or reserves (O'Connell et al., 2010).

In this case, a VAR accounts for the interdependence of monetary policy to exchange rate and on capital inflows to credit growth, which has an influence on EMP (Hegerty, 2009). The model is specified as in Equation (4.4), maintaining short term flows (*SF*) and domestic credit (*DC*), but excluding the rest of the variables. Other variables included are excess return (ψ) denoted as *RET*, nominal exchange rate (*ER*) and exchange market pressure (*EMP*). Hence, rather than specify a bivariate VAR as in O'Connell et al. (2010), short term flows and domestic credit are

included to capture the effects of monetary policy on exchange market pressure. This is because it is expected that the central bank will respond to short term flows through the monetary target, hence domestic credit will change with an increase or decrease in short term flows.

The choice of domestic credit is based on the fact that for a long period, domestic credit was used as an intermediate target by monetary authorities (Kinyua, 2001). Growth in credit may serve as a target for monetary policy as it affects the amount of foreign exchange reserves held, hence determining EMP. However, change in current account deficit caused by capital inflows reduces EMP (Hegerty, 2009).

In estimating the EMP, perfect capital mobility is assumed given that the capital account is open. The exchange market pressure is constructed by combining changes in exchange rate movements and net international reserves as in O'Connell et al. (2010). The EMP is defined as:

$$EMP = 100 \times \left(\frac{e_t - e_{t-1}}{e_{t-1}} \right) + 100 \times \left(\frac{r_{t-1} - r_t}{r_{t-1}} \right) \tag{4.5}$$

where e_t is the nominal local currency exchange rate in Kenya shillings (Kshs) per US dollar at time t and r_t denotes the value of net international reserves holdings (excluding gold) at time t. The inclusion of net international reserves in the EMP index is intended to capture those episodes of speculative pressures, driving the central bank to intervene in the foreign exchange spot market in defence of currency (Bertoli et al., 2010).

The excess return is included in the VAR model to capture two things; the interest differential between foreign and domestic market $(i_t - i_t^*)$, and monetary authority's expectation of movements in exchange rate. An increase in domestic interest rates relative to foreign interest

rates will lead to an increase in interest rate differential, implying that the domestic market is having higher returns than before. This will attract foreign investors looking for hedging opportunities and result into increased short term capital inflows, which will result into appreciation of the exchange rate due to increase in net foreign assets. However, if the uncovered interest parity (UIP) holds, the fall in interest rate differential is offset by expected depreciation of nominal exchange rate (Bjornland, 2009). To get the excess return, uncovered interest parity (UIP) relation is used. The interest rate differential reflects the difference in return between the domestic and foreign market. Hence, UIP is given by:

$$i_t = i_t^* + E\Delta e_{t+s} \tag{4.6}$$

where i_t is the domestic interest rate, i_t^* is the foreign interest rate and $E\Delta e_{t+s}$ is the expected change in the spot exchange rate up to maturity of the security, in this case, $E\Delta e_{t+s} = (e_{t+s} - e_t)$. Equation (4.6) implies that interest rate differences must be offset by expectations of exchange rate movements under perfect capital mobility (Romer, 2006). However, due to imperfect capital mobility, this will not hold. Hence, following Bjornland (2009), the excess return, ψ_t, is defined as the ex post difference in return between holding one period foreign or domestic short-term securities, that is:

$$\psi_t = (i_t^* - i_t) + E\Delta e_{t+s} \tag{4.7}$$

However, interest rates on short-term government securities is used instead of interest on bonds since the bond market is thin and not well developed in Kenya and may not reflect the cost of holding bonds. This implies that interest rate differential is estimated as the difference between

91-days Treasury bill rate and the 3-month US Treasury bill rate. In this case, the relationship among the variables is represented by a SVAR as in Equation 4.8.

$$\begin{bmatrix} \varepsilon_{SF} \\ \varepsilon_{ER} \\ \varepsilon_{DC} \\ \varepsilon_{EMP} \\ \varepsilon_{RET} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ c2 & 0 & 0 & 0 & 0 \\ c4 & c5 & 0 & 0 & 0 \\ c7 & c8 & c9 & 0 & 0 \\ c11 & c12 & c13 & c14 & 0 \end{bmatrix} \begin{bmatrix} \varepsilon_{SF} \\ \varepsilon_{ER} \\ \varepsilon_{DC} \\ \varepsilon_{EMP} \\ \varepsilon_{RET} \end{bmatrix} + \begin{bmatrix} c1 \\ c3 \\ c6 \\ c10 \\ c15 \end{bmatrix} \begin{bmatrix} u_{SF} \\ u_{ER} \\ u_{DC} \\ u_{EMP} \\ u_{RET} \end{bmatrix} \quad (4.8)$$

From Equation (4.9), short term flows are independent of the shocks from the variables represented in the model. The nominal exchange rate will be affected by short term capital flows. The level of domestic credit responds to short term capital flows as inflows increase net foreign assets and the exchange rate which works through change in reserves. Domestic credit will vary depending on short term capital that flows into the economy. The exchange rate will also exert pressure on domestic credit as the amount of money supply, and hence domestic credit is affected by exchange rate. Exchange market pressure is expected to respond to shocks from short term capital flows, exchange rate, and domestic credit. Finally, excess return reacts to shocks from all the other variables in the model. The exchange market pressure affects the excess return indirectly through the exchange rate. This is derived from Equation 4.7 where excess return is given as a combination of interest rate differential and expected change in exchange rate. All the variables included in the model affect exchange market pressure, hence no restriction is placed on it.

4.3.3. Data and sources

The relationship between interest rates and exchange rates is investigated using monthly data from January 1995 to December 2011. Data was collected from Central Bank of Kenya, Kenya National Bureau of Statistics and United States Treasury[35]. Choice of the period was meant to cover the liberalisation period and was also attributed to the fact that monthly data for some of the variables was not available before January 1995. Interest rate parity was estimated using data for the entire period. Inclusion of portfolio flows, however, led to start date being April 1996 since portfolio flow data was available only from this date.

The relation between short term flows and macroeconomic variables is estimated using data from January 1999 to December 2011 mainly because monthly data on short term capital flows recorded on the balance of payments was only available from this date. Monthly GDP data was calculated by interpolating quarterly GDP to monthly[36].

4.4 Estimation and Empirical Results

4.4.1 Interest rate parity and exchange rate

To establish the nature of the domestic currency, the study first considers the graphical illustration which gives a picture of the movements of the currency and the interest rate. Figure 4.5 shows the trends of exchange rate (Kshs per US dollar), the forward exchange premium[37] and

[35] Data on US 3-month Treasury bill rates was obtained from United States treasury website, www.http://research.stlouisfed.org/fred2categories/116/downloaddata, on 14th March 2012.

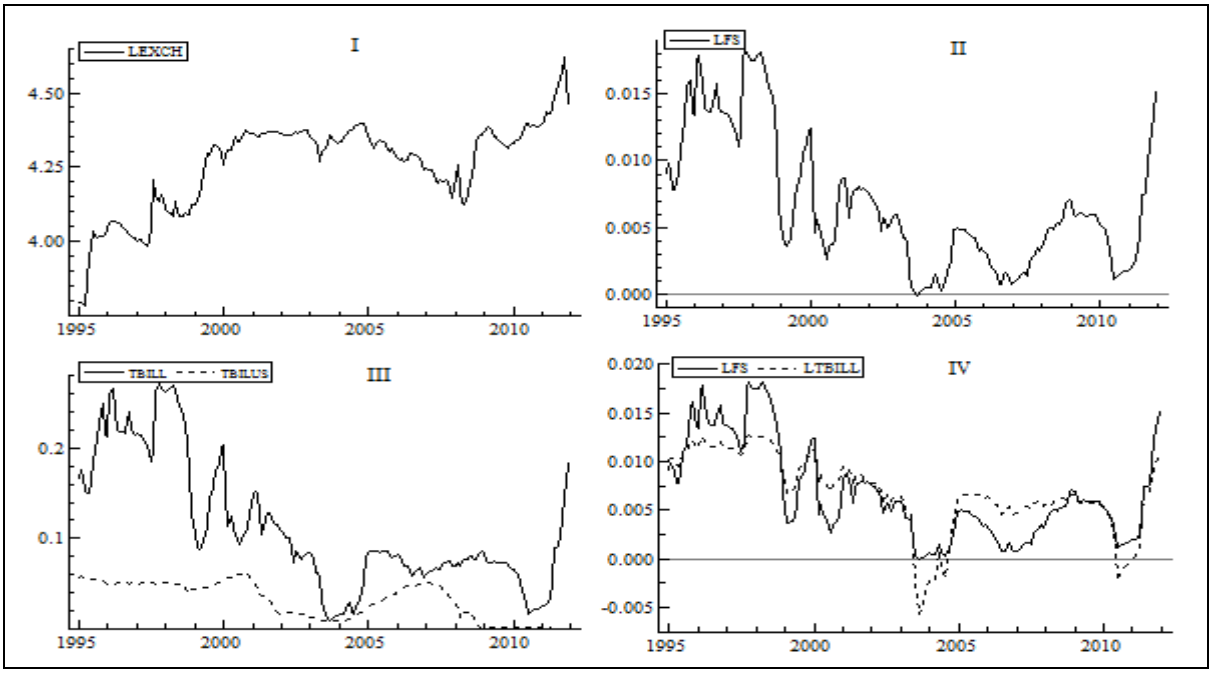
[36] Quarterly GDP was interpolated to monthly data where they were available, that is, since 2006 when they started to be published. In earlier periods, annual GDP data was interpolated to quarterly, and then to monthly. In carrying out the interpolation, the integration method described in Sjo (2012) was used.

[37] The forward exchange premium has been calculated as the ratio of interest rate differential to the domestic interest rate, that is, $[(r-r^f)/(1+ r^f)]x1200$, where r is domestic Treasury bill rate and r^f is foreign Treasury bill rate. The forward exchange rate is then given by [Foreign premium * Spot exchange rate] + Spot exchange rate.

short term interest rates. The exchange rate shows an upward movement, over time, when the natural logarithms are considered (Panel I).

The graph of forward exchange rate less the spot rate (Panel II) shows a declining trend in the early to mid-periods, though with swings, but this picks up abruptly in 2011. The trend of this graph reflects the interest rate differential between Kenya and US, maintaining high levels during periods of high interest rates and coming down during periods of low interest rates. This pattern can be seen in the graph of short term interest rates (Panel III) which shows that the short term Kenyan interest rate (*TBILL*) has moved from high levels in the beginning of the period to lowest levels in 2004-2005, but shot up in 2011. The US short term rate (*TBILUS*) has however, remained below 5 per cent levels, and moved to near zero levels at the end of the period, that is, the end of 2011, when Kenya's short term rates increased to about 18 per cent.

Figure 4.5: Trends in the Currency and Short Term Interest Rates



Key: *Panel 1*: Logarithm of exchange rate (LEXCH); *Panel II*: Logarithm of forward exchange rate less spot exchange rate (LFS); *Panel III*: Short term interest rates, domestic Treasury bill (TBILL) and foreign Treasury bill (TBILUS); *Panel IV*: Logarithm of forward exchange rate less spot exchange rate (LFS) and logarithm of domestic short term Treasury bill (LTBILL).

The movements in the difference between the forward and spot exchange rate, therefore, reflects the monetary policy stance in place, rising during periods of tight monetary policy and declining when monetary policy is relaxed. However, it also reflects risk premium in the Kenyan exchange rate market and this may be due to transaction costs, political risks, and the fact that the assumption of perfect capital mobility made under the covered interest parity does not hold. Hence, these deviations reflect the fact that covered interest rate parity (CIP) does not hold between Kenya and US. The deviations could be due to factors such as the nature of financial markets, which determine the liquidity of the assets, the composition of external sector, and the fiscal structure. To empirically test the relationship, the series were first tested for stationarity using the ADF unit root test.

Table 4.1: ADF Unit Root Test for Nominal and Forward Exchange Rates

	Constant + Trend			Constant		
Lag	3	2	1	3	2	1
LEXCH	-2.209	-1.952	-2.222	-1.898	-1.687	-1.925
LFEXCH	-2.208	-1.937	-2.208	-1.874	-1.647	-1.891
LFS	-5.841**	-6.567**	-9.205**	-5.655**	-6.396**	-9.030**
LRESERVE	-2.979	-2.949	-3.307	0.350	0.358	0.101
LNFINF	-6.575**	-7.585**	-9.028**	-6.542**	-7.559**	-9.010**
DLEXCH	-6.182**	-6.945**	-9.653**	-6.205**	-6.972**	-9.689**
DLFEXCH	-6.141**	-6.896**	-9.553**	-6.163**	-6.922**	-9.5880**
DLFS	-10.140**	-12.420**	-16.560**	-10.170**	-12.45**	-16.590**
DLRESERVE	-7.647**	-8.564**	-10.500**	-7.592**	-8.522**	-10.480**
DLNFINF	-11.760**	-13.050**	-15.720**	-11.790**	-13.090**	-15.760**

Note: The significance levels are 5%=-3.44, 1%=-4.01 for Constant and Trend; and 5%=-2.88, 1%=-3.47 for Constant only. ** shows significance at 1%, and * significance at 5%.
LEXCH is natural log of spot exchange rate to US dollar; *LFEXCH* is natural logarithm of the forward exchange rate, calculated as the spot exchange rate plus the product of sport exchange rate and foreign exchange rate premium (which is given by interest rate differential); *LFS* is the deviation of spot exchange rate in period *t* from forward exchange rate in period *t*+1; *LRESERVE* is the natural logarithm of reserves, and *LNFINF* is the natural logarithm of net foreign inflow.

From Table 4.1, both the spot exchange rate (*LEXCH*), forward exchange rate (*LFEXCH*) and reserves (*LRESERVE*) are not stationary at levels, but are stationary at first difference, hence the

series are integrated of order 1, that is, I(1). However, deviation of spot exchange rate from forward exchange rate (*LFS*) and net foreign inflows (*LNFINF*) are stationary at levels and are therefore I(0).

Since the variables have different levels of integration, a method that considers variables of different integration levels in testing for cointegration is appropriate. To test for cointegration, the autoregressive distributed lag (ARDL) method (known as the bounds test) developed by Pesaran et al. (2001) is used. The method allows for testing the level relationship among variables without taking into consideration the order of integration of a variable, that is, I(0) or I(1). It involves specifying the order of the ARDL and then estimating by ordinary least squares (OLS). The asymptotic critical values for I(0) and I(1) define the critical value bounds, and Wald or F-statistic are used to draw conclusions on the level of relationship with a null hypothesis of nonexistence of a level relationship. If statistics fall outside the critical value bounds then a conclusive inference is reached on the status of integration of variables. However, if statistics falls inside the bounds, then the results are inconclusive.

Using this method, a VAR model is specified with the highest number of lags which are then reduced to the optimal lag that ensures autocorrelation and heteroskedasticity do not exist. This is done while controlling for the presence of outliers using impulse dummies where such outliers exist. The general specification of a VAR of order p, denoted VAR (p), is given as:

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-i} + \varepsilon_t \qquad (4.9)$$

where Y_t is the vector of the dependent variable change in spot exchange rate to the US dollar at time *t* ($LEXCH_t$), and the regressors forward premium at time *t* (LFS_t), reserves ($LRESERVE_t$) and net foreign inflows ($LNFINF_t$) and *t* denotes time. An ARDL model is then developed which

according to Pesaran et al. (2001), gives the vector error correction model (VECM). This is specified as:

$$\Delta Y_t = \alpha + \mu t + \lambda Y_{t-1} + \sum_{i=1}^{p-i} \gamma_t \Delta Y_{t-i} + \varepsilon_t \qquad (4.10)$$

The optimal lag length is established by minimising the Akaike Information Criterion (AIC) and the long run relationship is tested by imposing a restriction that $\lambda = 0$ (no long run relationship) and then tested using an F-statistics. The results of the fitted model are presented in Table 4.2.

Table 4.2: Cointegration Analysis between Spot and Forward Exchange Rate, 1996(4) - 2011(11)

Variable	Coefficient	t-value	Probability
DLEXCH_1	1.431***	22.50	0.000
DLEXCH_2	-0.682***	-6.27	0.000
DLEXCH_3	0.411***	3.94	0.000
DLEXCH_4	-0.205***	-3.46	0.001
LEXCH_1	0.000	-0.17	0.868
LFS_1	0.033**	2.26	0.025
DLFS_1	0.966***	67.60	0.000
DLFS_2	-0.471***	-7.36	0.000
DLFS_3	0.211***	3.20	0.002
DLFS_4	-0.204***	-3.41	0.001
DLFS	0.004**	2.02	0.045
d2000_2	0.004***	5.60	0.000
d1997_9	-0.004***	-5.03	0.000
d1998_12	0.003***	4.09	0.000
Constant	0.000	0.09	0.925

***, ** and * indicate significance at 0.01, 0.05 and 0.10 level, respectively.
AR 1-7 test: F(7,166) = 0.68973 [*0.6806*]; ARCH 1-7 test: F(7,159) = 1.3362 [*0.2365*]; Normality test: Chi^2(2)= 9.3676 [*0.0092*]**; Hetero test: F(20,152) = 0.68784 [*0.8338*]; Hetero-X test: F(65,107) = 1.0102 [*0.4747*]; RESET test: F(1,172) = 1.1344 [*0.2883*].
LEXCH is exchange rate to US dollar; *LFEXCH* is forward exchange rate; *LFS* is forward premium; *LRESERVE* is reserves, and *LNFINF* is net foreign inflow in their natural logarithms.

Starting from a model with 8 lags and using the AIC, the optimal lag length is established to be 4. The specification tests show that the model is well specified and has the correct functional

form (RESET test), the residuals are serially uncorrelated (AR and ARCH test), and is homoskedastic (Hetero test).

In testing for cointegration, the F-statistics for excluding the first lag of spot exchange rate (*LEXCH_1*) and that of deviation of spot exchange rate from forward exchange rate (*LFS_1*) is 5.0403. Given that the model has been estimated with no trend, the F-statistics is tested against the F-critical values of level relationship, with unrestricted intercept and no trend. Table 4.3 shows the bounds for cointegration test in the case of unrestricted intercept and no trend from Pesaran et al. (2001). The results show that the null hypothesis of no cointegration against the alternative is rejected at the 5 per cent significance level. The computed F-statistic of 5.0403 is greater than the upper critical bound value of 4.35 at the 5 per cent level, thus indicating the existence of a long-run relationship between spot exchange rate and forward exchange rate. Without considering portfolio flows, the covered interest rate parity holds.

Table 4.3: Bounds Test for Cointegration Analysis

Critical value	Lower Bound Value	Upper Bound Value
1%	4.29	5.61
5%	3.23	4.35
10%	2.72	3.77

Note: Computed F-statistic: 5.0403 (Significant at 0.01 marginal values). Critical values are cited from Pesaran et al. (2001), Case III: Unrestricted intercept and no trend.

The study investigated further whether CIP still holds by including reserves and portfolio flows. The rationale for this is justified by the argument that the monetary authorities intervene in the market using official reserves to stabilise the exchange rates. This kind of intervention might result in the existence of arbitrage opportunities due to interest rate differentials. In such a situation there cannot be any long run relationship between the spot exchange rate and the forward exchange rate. The central bank uses official reserves to stabilise the exchange market

and to build up the stock of reserves when the market is calm. Since portfolio flows is a variable, they may also cause variability in the exchange rate. Hence, reserves and portfolio flows are included in the CIP relation and test whether CIP holds in such a framework (Table 4.4).

Table 4.4: Cointegration Analysis between Spot and Forward Exchange Rate with Inclusion of Portfolio Flows and Reserves, 1996(4) - 2011(11)

Variable	Coefficient	t-value	Probability
DLEXCH_1	1.467***	20.20	0.000
DLEXCH_2	-0.743***	-5.78	0.000
DLEXCH_3	0.465***	3.59	0.000
DLEXCH_4	-0.260***	-3.56	0.001
LEXCH_1	0.000	-0.54	0.5927
LFS_1	0.056***	2.78	0.006
DLFS_1	0.949***	48.00	0.000
DLFS_2	-0.535***	-7.38	0.000
DLFS_3	0.207**	2.52	0.013
DLFS_4	-0.262***	-3.54	0.001
LRESERVE_1	-0.001*	-1.71	0.090
LNFINF_1	0.000	0.36	0.722
DLRESERVE_1	0.000	0.03	0.979
DLRESERVE_2	0.004**	2.11	0.036
DLRESERVE_3	-0.002	-1.02	0.307
DLRESERVE_4	-0.001	-0.55	0.586
DLNFINF_1	0.000	0.56	0.577
DLNFINF_2	0.000	0.02	0.988
DLNFINF_3	0.000	0.29	0.771
DLNFINF_4	0.000	-0.20	0.840
Trend	0.000*	1.83	0.069
DLFS	0.005*	1.77	0.079
DLRESERVE	-0.003	-1.57	0.118
DLNFINF	0.000	1.34	0.181
d2000_2	0.003***	4.22	0.000
Constant	0.033	1.61	0.109

***, ** and * indicate significance at 0.01, 0.05 and 0.10 level, respectively.
AR 1-7 test: F(7,150) = 1.6117 [*0.1362*]; ARCH 1-7 test: F(7,143) = 1.7071 [*0.1118*]; Normality test: Chi^2(2)= 16.404 [*0.0003*]**; Hetero test: F(42,144) = 1.4786 [*0.0538*]; RESET test: F(1,156) = 10.95317 [*0.3304*].
LEXCH is exchange rate to the US dollar; *LFEXCH* is forward exchange rate; *LFS* is forward premium; *LRESERVE* is reserves, and *LNFINF* is net foreign inflow in their natural logarithms.

The optimal lag length is four using AIC as in the previous case. However, in this model, trend has been included. The specification tests show that the model is well specified and has the correct functional form (RESET test), the residuals are serially uncorrelated (AR and ARCH test), and that it is homoskedastic (Hetero test). However, normality test fails.

The F-statistics for excluding the first lags of spot exchange rate (*LEXCH_1*), deviation of spot from forward exchange rate (*LFS_1*), reserves (*LRESERVE_1*), and that of net foreign inflows (*LNFINF_1*) is 2.1751. Table 4.5 shows the bounds for cointegration test in the case of unrestricted intercept and unrestricted trend from Pesaran et al. (2001). The results show that the null hypothesis of no cointegration against the alternative cannot be rejected even at the 10 per cent significance level. The computed F-statistic of 2.1751 is less than the lower critical bound value of 2.75 at the 10 per cent level, thus indicating the nonexistence of a long-run relationship between spot exchange rate and forward exchange rate.

Table 4.5: Bounds test for Cointegration Analysis

Critical value	Lower Bound Value	Upper Bound Value
1%	3.93	5.23
5%	3.12	4.25
10%	2.75	3.79

Note: Computed F-statistic: 2.1751 (Significant at 0.10 marginal values). Critical values are cited from Pesaran et al. (2001), Case V: Unrestricted intercept and unrestricted trend.

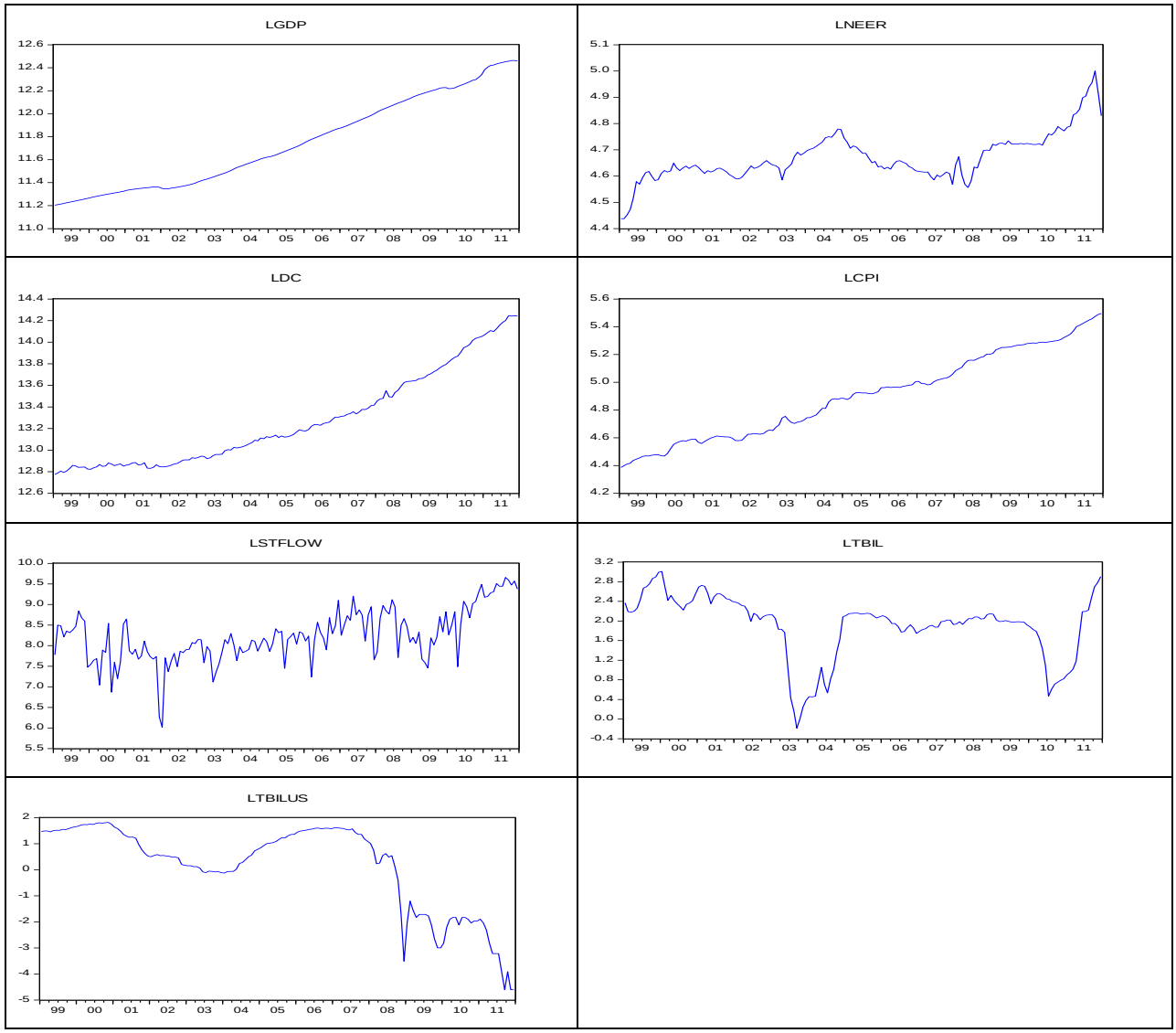
Hence, when reserves and portfolio flows are included as regressors, the covered interest rate parity does not hold between the Kenya shilling and the US dollar. The implication of this is that there is presence of interest rate arbitrage; hence foreign investors can take advantage of return differences between the two countries to diversify the risk existing in their home countries. Since Kenya is a small economy, any change in exchange rate is addressed through sterilisation and by using reserves to stabilise the exchange rate. However, the use of reserves is not instantaneous

and there is a lag in decision making, hence use of reserves in the foreign exchange market. Investors can take advantage of this lag and take positions on the domestic currency.

4.4.2 The relationship between interest rate and exchange rate with short term flows

The graphs of the logged values of the variables are presented in Figure 4.6. Most of the variables have trend and some depict nonstationarity. However, the variables are not differenced to capture the co-movements in the VAR model.

Figure 4.6: Trend of the Variables Used in the VAR Model



Source: Based on data collected from CBK, KNBS and Federal Reserve Bank of St. Louis

4.4.2.1 Portfolio flows and other macroeconomic variables

This section reports results of structural VAR fitted from the model represented by Equation 4.4 with the variables ordered as specified in the equation. To determine the order of the VAR, tests for determining the lag order were carried out. While the various test statistics show selection of lag order 2, the highest lag order 11 given by LR is used since it is unlikely that the interaction between the variables can be best represented with a two-month lag (Table 4.6).

Table 4.6: VAR Lag Order Selection

Endogenous variables: *LSTFLOW LGDP LCPI LTBIL LDC LNEER*
Exogenous variables: C *LTBILUS*
Sample: 1999M01 2011M12
Included observations: 144

Lag	LogL	LR	FPE	AIC	SC	HQ
0	544.16	NA	0.00	-7.39	-7.14	-7.29
1	1822.74	2415.11	0.00	-24.65	-23.66*	-24.25
2	1898.17	136.19	0.00*	-25.20*	-23.46	-24.49*
3	1930.33	55.39	0.00	-25.14	-22.67	-24.14
4	1963.55	54.44	0.00	-25.10	-21.89	-23.80
5	1999.53	55.97	0.00	-25.10	-21.14	-23.50
6	2019.50	29.41	0.00	-24.88	-20.18	-22.97
7	2042.66	32.17	0.00	-24.70	-19.26	-22.49
8	2095.00	68.33	0.00	-24.93	-18.74	-22.42
9	2116.58	26.38	0.00	-24.73	-17.80	-21.91
10	2136.19	22.34	0.00	-24.50	-16.83	-21.39
11	2205.89	73.57*	0.00	-24.97	-16.56	-21.55
12	2247.27	40.24	0.00	-25.04	-15.89	-21.32

* indicates lag order selected by the criterion LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion (each test at 5% level).

The causality between the variables was then tested to examine whether lagged values of one variable helps to predict another variable. Table 4.7 gives the results of Granger-causality tests of the variables, showing the *p*-values associated with the *F*-statistics for testing whether the relevant sets of coefficients are zero, that is, excludability of the regressor (for a complete results with chi-square values, see Appendix Table A3). From the results, domestic credit and nominal

effective exchange rate help to predict short term capital flows at 10 per cent and 5 per cent significance levels, respectively. Consumer prices (*LCPI*) are predicted by domestic output (*LGDP*) and domestic credit (*DC*) at 5 per cent significance level.

Domestic short term interest rate is predicted by exchange rate at 5 per cent significance level, and a reverse causality exists between the two variables. This may imply that domestic short term interest rates only affect short term flows through its effect on exchange rate. The nominal effective exchange rate is also predicted by domestic output (*LGDP*).

Table 4.7: Granger-Causality Tests/Block Exogeneity Test

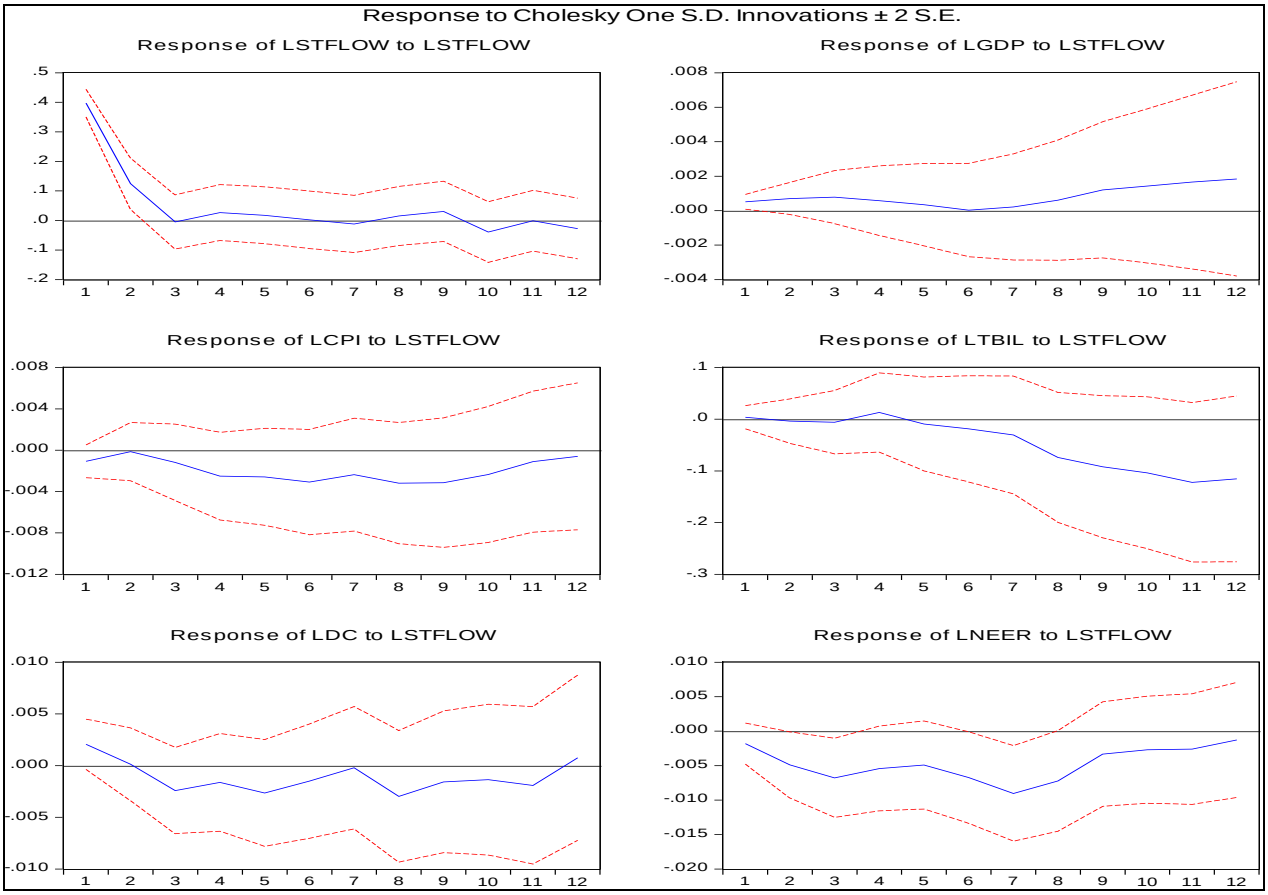
	Dependent Variable in Regression					
Regressor	*LSTFLOW*	*LGDP*	*LCPI*	*LTBIL*	*LDC*	*LNEER*
LSTFLOW	0.00	0.61	0.53	0.58	0.73	0.32
LGDP	0.23	0.00	0.04	0.46	0.56	0.00
LCPI	0.15	0.34	0.00	0.74	0.57	0.88
LTBIL	0.88	0.15	0.54	0.00	0.43	0.02
LDC	0.08	0.70	0.05	0.28	0.00	0.13
LNEER	0.05	0.53	0.25	0.04	0.04	0.00
All	0.01	0.37	0.04	0.15	0.20	0.01

The variables, expressed in natural logarithms are: *LSTFLOW* is short term capital flows as captured in the balance of payments by CBK; *LGDP* is gross domestic product; *LCPI* is monthly consumer price index; *LTBIL* is 3-months Kenya Treasury bill rate; *LNEER* is nominal effective exchange rate.
The table shows *p*-values for *F*-tests that lags of the variable in the row labelled *Regressor* do not enter the reduced form equation for the column variable labelled *Dependent Variable*. The results are computed from a VAR with eleven lags and a constant term over the 1999:01 – 2011:12 sample periods.

The next step is to check stability of the SVAR model. A VAR is said to be stable if its reverse characteristic polynomial has no roots outside and on the complex unit circle (Lutkepohl, 2005). The results for stability test are presented in Appendix Figure A1. The roots of the characteristic polynomial largely have a modulus of less than one and lie inside the unit circle, except for two cases which are on the unit circle; hence it is concluded that the VAR satisfies stability condition. This means that the VAR process as specified is stationary.

The impulse response functions of the variables are presented in Figure 4.7. The impulse response functions trace the response of current and future values of each of the variables to a one-unit increase in the current value of one of the VAR errors. Figure 4.7 and Table 4.9 show the effects of a one-standard deviation shock in short term flows on other endogenous variables. The results show that an increase in innovations in short term flows has no effect on domestic credit. Innovations in short term flows, however, have significant effects on short term interest rates, inflation, growth and nominal exchange rate.

Figure 4.7: Impulse Response to Short Term Capital Flow Shocks in a Structural VAR Model



The results show that short term capital flows respond positively to its own shocks and this persists for about three months. An innovation in short term capital flows significantly affects growth at the 1st period at 5 per cent level and 2nd period at 10 per cent level, with a 10 per cent increase in short term flows leading to GDP growth of 0.01 per cent in either period. Inflation marginally declines with innovations in short term flows. A 10 per cent increase in short term flows leads to consumer prices (*LCPI*), declining by 0.01 per cent at 10 per cent significance level.

Table 4.8: Impulse Response Functions to Short Term Capital Flow (*LSTFLOW*) Transmission

Period	*LSTFLOW*	*LGDP*	*LCPI*	*LTBIL*	*LDC*	*LNEER*
1	0.397	0.001	-0.001	0.004	0.002	-0.002
	17.027	*2.452*	*1.344*	*0.329*	*1.705*	*1.213*
2	0.124	0.001	0.000	-0.004	0.000	-0.005
	2.872	*1.524*	*0.103*	*0.181*	*0.077*	*2.043*
3	-0.005	0.001	-0.001	-0.006	-0.002	-0.007
	0.110	*1.016*	*0.638*	*0.192*	*1.163*	*2.363*
4	0.027	0.001	-0.003	0.013	-0.002	-0.005
	0.567	*0.566*	*1.183*	*0.337*	*0.687*	*1.766*
5	0.017	0.000	-0.003	-0.009	-0.003	-0.005
	0.362	*0.285*	*1.102*	*0.205*	*1.027*	*1.535*
6	0.002	0.000	-0.003	-0.019	-0.002	-0.007
	0.044	*0.021*	*1.211*	*0.365*	*0.543*	*2.039*
7	-0.012	0.000	-0.002	-0.031	0.000	-0.009
	0.248	*0.139*	*0.867*	*0.538*	*0.069*	*2.617*
8	0.015	0.001	-0.003	-0.074	-0.003	-0.007
	0.301	*0.346*	*1.089*	*1.179*	*0.937*	*1.980*
9	0.031	0.001	-0.003	-0.092	-0.002	-0.003
	0.601	*0.608*	*1.003*	*1.340*	*0.459*	*0.881*
10	-0.039	0.001	-0.002	-0.104	-0.001	-0.003
	0.767	*0.638*	*0.715*	*1.413*	*0.374*	*0.695*
11	-0.001	0.002	-0.001	-0.122	-0.002	-0.003
	0.024	*0.658*	*0.326*	*1.586*	*0.502*	*0.649*
12	-0.027	0.002	-0.001	-0.115	0.001	-0.001
	0.536	*0.653*	*0.166*	*1.441*	*0.191*	*0.307*

Cholesky Ordering: *LSTFLOW LGDP LCPI LTBIL LDC LNEER*

t-values are italicised. Absolute values of *t* have been used.

Innovations on short term flows have a strong impact on the exchange rate, which is persistent for up to 8 periods. Within the 1st period, innovations in short term flows significantly affects nominal effective exchange rate at 10 per cent and the significance improves to 5 per cent from the 2nd period onwards. A 10 per cent increase in short term capital flows results in exchange rate appreciating by 0.02 per cent in the 1st period, and between 0.05 per cent to 0.14 per cent in the first 3 periods and up to 0.047 per cent in the first 8 periods. This is in line with studies by Berument and Dincer (2004) which found short term capital inflows to cause real appreciation of domestic currency in the first month and from the seventh month in Turkey.

Innovations in short term flows, however, have weak effect on domestic short-term interest rates, with the effect on Treasury bill rate declining and significant at 10 per cent in the 9th to 12th period. The negative response of interest rates is however not as high as established by other studies (for example, Berument and Dincer, 2004). Hence, the increase in short term capital flows does not lead to reduced risk levels if Treasury bill rates are viewed as risk free. The effect of the innovations on short term interest rate is only experienced when the effect on exchange rate ends; that is, when interest rate starts to respond to innovations in short term flows, the effect on exchange rate becomes insignificant. This may reflect that monetary policy responds to appreciating currency following short term capital flows, through the exchange rate. Hence, such a relationship should be reflected in the monetary policy rule (this is covered in chapter 5 of the thesis).

The response of other variables to innovations in monetary policy, that is, how short term capital flows, economic growth, inflation and exchange rate respond to innovations in Treasury bill rate was also tested (Appendix Figure A2). Innovations in short term interest rate has a lagged effect

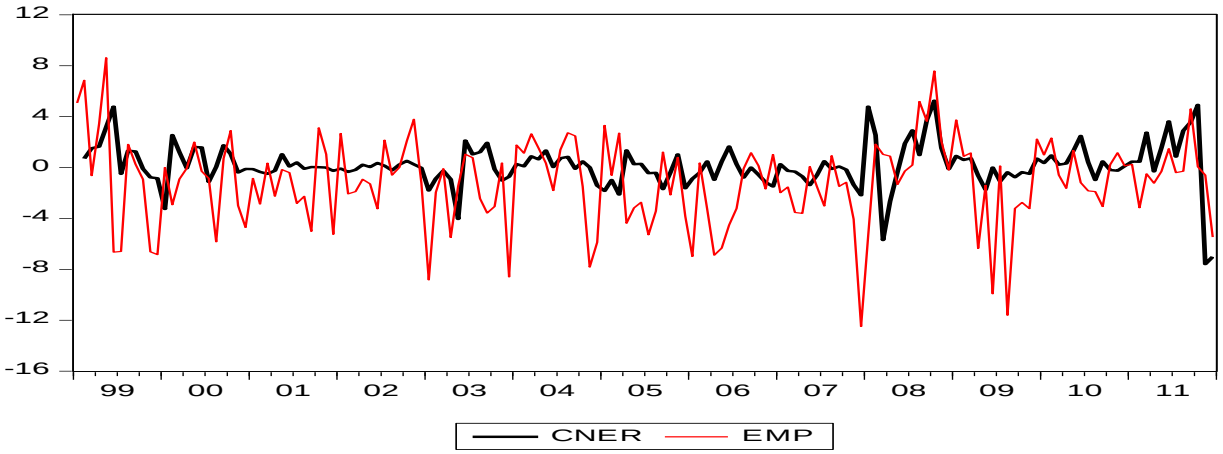
in economic growth, leading to a decline in GDP growth from the 6th period. This is expected since increase in interest rates results into increased cost of credit, thus negatively affecting investment and growth.

The response of domestic credit growth to innovations in short term interest rates is negative and significant from the 1st period. That is, domestic credit declines when interest rates rise and the effect is sustained for up to the 12th period. The innovations also result in decline (or appreciation) of nominal effective exchange rate. This is in line with the findings of Bjornland (2009) that exchange rate appreciates on impact thereafter depreciates back to the base. The study argues that exchange rate is an important transmission channel for foreign shocks that the central bank may respond to. However, there is no response from short term capital flows, which is driven more by global factors rather than domestic factors.

4.4.2.2 Portfolio flows, exchange rate and interest rates

The exchange market pressure (EMP) is estimated taking into consideration the weighted average loss of foreign reserves and depreciation of the currency (Equation 4.5). The relationship between change in exchange rate and exchange market pressure is illustrated in Figure 4.8. The figure shows that the pressure on exchange rate is high during periods of high variations in exchange rate, that is, when the change in exchange rate is high and positive. This means that the reserves held by the monetary authorities to cover exchange rate are constrained, thus exchange pressure builds into the market.

Figure 4.8: Movements in EMP and Change in Exchange Rate, January 1999 to December 2011



A SVAR is estimated to establish the relationship between the exchange market pressure and how it responds to short term capital flows and excess return. The model is fitted and the variables ordered as specified in Equation 4.8. In this case, a SVAR (4) is estimated with the order based on the lag indicated by most selection methods (i.e., LR, FPE and AIC). Table 4.9 presents the results of selection criteria for the lag order of the VAR.

Table 4.9: VAR Lag Order Selection Criteria

Endogenous variables: *LSTFLOW LNER LDC EMP LEXRET*
Exogenous variables: C
Sample: 1999M01 2011M12
Included observations: 144

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-300.07	NA	0.00	4.24	4.34	4.28
1	571.50	1670.51	0.00	-7.52	-6.90*	-7.27*
2	604.60	61.13	0.00	-7.63	-6.50	-7.17
3	632.75	50.06	0.00	-7.68	-6.03	-7.01
4	661.05	48.35*	0.00*	-7.73*	-5.56	-6.84
5	678.61	28.78	0.00	-7.62	-4.94	-6.53
6	685.66	11.06	0.00	-7.37	-4.17	-6.07
7	704.88	28.83	0.00	-7.29	-3.58	-5.78
8	725.23	29.12	0.00	-7.23	-3.00	-5.51
9	737.59	16.83	0.00	-7.05	-2.31	-5.12
10	755.21	22.75	0.00	-6.95	-1.69	-4.81
11	779.11	29.21	0.00	-6.93	-1.16	-4.59
12	795.79	19.24	0.00	-6.82	-0.53	-4.26

* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

Table 4.10 gives the results of Granger-causality tests of the variables, showing the *p*-values associated with the F-statistics for testing whether the relevant sets of coefficients are zero (detailed results are given in Appendix Table A4). From the results, short term flows are predicted by domestic credit at 1 per cent level and excess return at 5 per cent level. Exchange rate is predicted by exchange market pressure at the 5 per cent level. Domestic credit is strongly predicted by exchange rate at 1 per cent level and weakly by excess return at the 10 per cent level, while exchange market pressure is predicted by nominal exchange rate at the 10 per cent level. Excess return is predicted by exchange rate at the 1 per cent level and domestic credit at 10 per cent level. There is a double causality between domestic credit and excess return, and between exchange rate and exchange market pressure. The implication of the causality results is that short term flows are attracted by the performance of the economy in terms of growth of domestic credit, which enhances economic activity and returns from the market.

Table 4.10: Granger-Causality Tests/Block Exogeneity Test

	Dependent Variable in Regression				
Regressor	*LSTFLOW*	*LNER*	*LDC*	*EMP*	*LEXRET*
LSTFLOW	0.00	0.36	0.14	0.30	0.57
LNER	0.18	0.00	0.00	0.08	0.00
LDC	0.00	0.70	0.00	0.64	0.08
EMP	0.14	0.02	0.51	0.00	0.36
LEXRET	0.02	0.37	0.09	0.97	0.00
All	0.00	0.07	0.00	0.32	0.00

The variables, expressed in natural logarithms are: *LSTFLOW* is short term capital flows as captured in the balance of payments by CBK; *LNER* is nominal exchange rate; *LDC* is monthly domestic credit; *LEMP* is exchange market pressure and *LEXRET* is excess return defined as the ex post difference in return between holding one period foreign or domestic short-term securities.

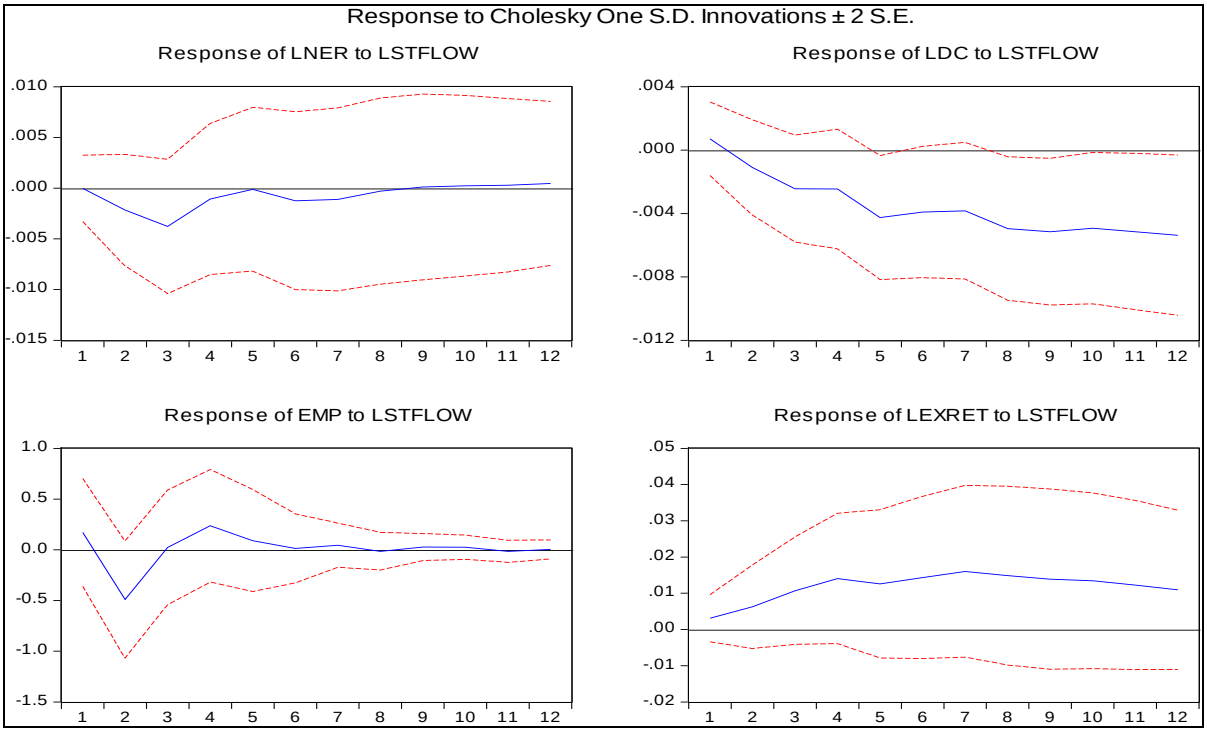
The table shows *p*-values for *F*-tests that lags of the variable in the row labelled *Regressor* do not enter the reduced form equation for the column variable labelled *Dependent Variable*. The results are computed from a VAR with 4 lags and a constant term over the 1999:01 – 2011:12 sample periods.

The stability of the SVAR model is tested by considering whether the roots of the characteristic polynomial lie within a complex unit circle. The results for stability test are presented in Appendix Figure A3. The roots of the characteristic polynomial are largely within the unit circle, hence the VAR satisfies stability condition, meaning that the VAR process as specified is stationary.

The impulse response functions of the variables to innovations in short term flows are presented in Figure 4.9 and Table 4.11. Innovations in short term flows have no significant effect on exchange market pressure and exchange rate. The effect of innovations in short term flows to EMP is only weakly experienced in the 2^{nd} and 12^{th} period at 10 per cent level where the relationship is negative. Hegerty (2009) for instance, found that non-FDI investment helps reduce pressure on the exchange rate in Latvia, Estonia and Bulgaria but not in Lithuania.

The effect on nominal exchange rate is however experienced significantly at 1 per cent level in period 11 and 12. This implies that the concern that short term capital flow volatility results into volatility in exchange rate and thus builds pressure on the exchange rate is not warranted. This may be due to the fact that the volume of short term flows into the country is still small compared to the size of the economy, hence any effect due to these flows can easily be absorbed by the economy. This means that the focus on volatility of the currency should be directed to other areas and not to short term flows.

Figure 4.9: Impulse Response Function



However, innovations in short term flows have a weak effect on domestic credit in the 3rd to 7th period at 10 per cent level, but becomes stronger in the 8th and 9th period. A 10 per cent increase in short term flows results in domestic credit declining by 0.02 per cent in the 3rd and 4th period respectively. This might be due to the fact that short term flows increase short-term rates in the 2nd and 3rd period and appreciation of nominal effective exchange rate as established in the previous subsection. This then results into high cost of credit, which reduces credit in the 4th and 5th period. The same finding was established by Hegerty (2009) in a study of four countries in Central and Eastern Europe; Estonia, Lithuania, Latvia and Bulgaria. The study found that capital inflows lead to growth in domestic credit only in Bulgaria and not the other countries. Innovations in short term flows lead to increase in excess returns from the 3rd to 8th period and in the 11th and 12th period. A 10 per cent increase in short term flows, for instance, leads to excess return increasing by 0.11 per cent in the 3rd period.

Table 4.11: Impulse Response Functions of the Short Term Flows (*LSTFLOW*) Transmission

Period	*LSTFLOW*	*LNER*	*LDC*	*EMP*	*LEXRET*
1	0.387	0.000	0.001	0.172	0.003
	17.433	*0.012*	*0.616*	*0.646*	*0.954*
2	0.133	-0.002	-0.001	-0.490	0.006
	3.906	*0.787*	*0.731*	*1.696*	*1.084*
3	0.049	-0.004	-0.002	0.023	0.011
	1.413	*1.141*	*1.440*	*0.081*	*1.443*
4	0.054	-0.001	-0.002	0.236	0.014
	1.538	*0.287*	*1.300*	*0.850*	*1.561*
5	0.040	0.000	-0.004	0.090	0.013
	1.245	*0.027*	*2.173*	*0.357*	*1.229*
6	0.025	-0.001	-0.004	0.014	0.014
	0.972	*0.284*	*1.887*	*0.082*	*1.279*
7	0.003	-0.001	-0.004	0.045	0.016
	0.153	*0.248*	*1.772*	*0.410*	*1.351*
8	-0.011	0.000	-0.005	-0.016	0.015
	0.572	*0.064*	*2.181*	*0.167*	*1.201*
9	-0.006	0.000	-0.005	0.027	0.014
	0.344	*0.024*	*2.219*	*0.404*	*1.115*
10	-0.014	0.000	-0.005	0.024	0.013
	0.843	*0.053*	*2.060*	*0.408*	*1.106*
11	-0.024	-0.077	0.012	-0.017	-0.049
	1.438	*2.688*	*0.896*	*0.998*	*2.073*
12	-0.020	-0.083	0.015	-0.022	-0.047
	1.158	*2.904*	*1.196*	*1.231*	*1.996*

Cholesky Ordering: *LSTFLOW, LNER, LDC, EMP, LEXRET*
t-values are italicised. Absolute values of *t* have been used.

The response of the other variables to innovations from EMP was also established (Appendix Figure A4). What is evident is that there is no response of short term capital flows and domestic credit to innovations in EMP. However, nominal exchange rate depreciates within the first period and peaks in the 6th period, with a 10 per cent increase in EMP leading to a depreciation of 0.12 per cent before stabilising within 24 months.

4.5 Summary and Conclusion

The chapter has given an analysis of the relationship between short term capital flows to interest rate and exchange rate. To accomplish this, the study first tested whether covered interest rate parity holds both in the absence of short term capital flows and in the presence of short term capital flows and reserves. The idea was to establish whether interest arbitrage exists. The effect of a shock on interest rates and exchange rate due to innovations in short term capital flows was established. The analysis was extended further to establish whether short term capital flows affect the exchange market pressure, which was estimated by weighting both the change in exchange rate and international reserves. This study finds the following results.

First, covered interest rate parity holds only when short term flows and reserves are not considered in the interest parity equation. Hence, with reserves and portfolio flows, there is presence of arbitrage between the Kenya shilling and the US dollar. The implication is that foreign investors can take advantage of return differences between the two countries to diversify the risk existing in their home countries. This is occasioned by the lagged effect of foreign reserves in stabilising the exchange rate. Hence, investors can take advantage of this lag and take positions on the domestic currency.

Second, innovations on short term flows have a strong and significant effect on the exchange rate, which persists for up to 8 periods. Short term capital flows lead to appreciation of the exchange rate from the 1^{st} month up to the 8^{th} month. A 10 per cent increase in short term capital flows results in exchange rate appreciating by 0.02 per cent in the first period and from 0.05 per cent to 0.14 per cent within the first 3 months.

Third, innovations in short term flows, however, have weak effects on domestic short term interest rates, leading to a reduction in Treasury bill rate at 10 per cent in the 9^{th} to 12^{th} period. This effect is experienced when the effect on exchange rate ends showing response of monetary policy currency to appreciation.

Fourth, tightening monetary policy by increasing short term interest rates has a lagged negative effect in economic growth from the 6^{th} period. Increase in interest rates results into increased cost of credit, thus negatively affecting investment and growth. However, there is a negative and persistent effect of monetary policy tightening on domestic credit growth from the 1^{st} period up to the 12^{th} period. Monetary policy innovations also result in appreciation of nominal effective exchange rate, thus providing a transmission channel for foreign shocks that the central bank responds to.

Fifth, innovations in short term flows have no significant effect on exchange market pressure. This shows that short term capital flow volatility does not build pressure on the exchange rate despite the fact that it causes exchange rate to appreciate, which may be due to small volume of short term capital inflows in comparison to the size of the economy. This means that the focus on volatility of the currency should be directed to other areas and not to short term flows.

Sixth, short term capital flows lead results to a decline in domestic credit, but an increase in excess return. This is because short term capital inflows raise domestic interest rates relative to foreign interest rates, raising the cost of credit in the market. Hence, domestic credit declines due to high costs.

The findings show that while short term capital is beneficial as an alternative source of capital, it has a negative impact on the economy, which may be worsened if it is volatile. Short term capital flows into the economy mainly for return and diversification purposes, given that the covered interest rate parity does not hold. However, the resultant effect is appreciation of the currency making the country uncompetitive, rising interest rates which lead to high costs of credit that affects investment. Hence, with the growing volume of short term capital flows into the country, focus should be on how well the inflows can be harnessed to support growth, while at the same time, ensuring macroeconomic stability.

CHAPTER FIVE

MONETARY POLICY REACTION FUNCTION IN KENYA

5.0 Introduction

This chapter analyses the monetary policy reaction function for Kenya, which is a small developing economy and therefore vulnerable to external shocks. Maintaining macroeconomic stability and ensuring a sustained level of economic growth has been a major concern for developing countries. This function is shared by the Central Bank of Kenya (CBK), which is in charge of monetary policy, and the Treasury, which is in charge of fiscal policy. The challenge facing central banks in developing countries, however, is that these economies are vulnerable to external factors given their small sizes. This leads to the question of how monetary authorities react to developments in the economy, so as to attain macroeconomic stability aimed at achieving a given level of growth.

The chapter establishes whether and to what extent the monetary authorities have reacted in a rule-like fashion. The approximate magnitude and direction of monetary policy reaction function is derived using a Taylor-like monetary policy reaction function. A number of studies have looked at the reaction of monetary authorities to economic development (for example, Clarida et al., 1998; 2000; Mehra, 1999; Taylor, 1993; 1999). However, the focus of these studies has mainly been in advanced economies, which in most cases are relatively not vulnerable to external shocks. Only a few studies have focused on developing economies (for example, Sanchez-Fung, 2005).

5.1 Monetary Policy Outcomes in Kenya

5.1.1 Monetary policy formulation and operations

Monetary policy is formulated and implemented by CBK with the aim of achieving and maintaining general stability in the economy. CBK controls liquidity in the economy by regulating the growth rate of money stock, and ensuring that it is consistent with government policy objectives. The formulation of monetary policy is done by the Monetary Policy Committee (MPC) of CBK, whose aim is keeping inflation low and stable. Monetary policy objectives are pursued through open market operations (OMO), Central Bank Rate (CBR), standing facility (overnight borrowing), required reserves, and foreign exchange market operations.

The MPC is charged with the responsibility of setting the CBR[38]. The rate is reviewed by the MPC at least every two months and is a signal[39] of the intended direction of the change in money interest rates, either easing (when it declines) or tightening (when it rises) monetary policy, hence its change shows the monetary policy stance of CBK. For instance, a decline in CBR signals the need to reduce short term interest rates, thus an increase in credit demand. Formulation of monetary policy is based on monetary targeting framework, thus the level of CBR is set to ensure that a given aggregate stock of money supply is achieved.

The evolution of monetary policy in Kenya can be traced back to the early period when fixed exchange rate was in play (see Ndung'u (2008) for a chronology of monetary policy development in Kenya). Monetary policy involved high regulation and price controls meant to

[38] The CBR is the minimum rate of interest that the CBK charges on loans to commercial banks.
[39] In its First Biannual Report of the Monetary Policy Committee of October 2008, the MPC mentioned CBR as a signaling instrument.

manage balance of payment crises in 1970s and respond to shocks such as the oil price shock of 1973 (Kinyua, 2001; Ndung'u, 2008). The crises led to inflation rising, devaluation and pegging of the currency to the US dollar and to special drawing rights, respectively (Ndung'u, 2008).

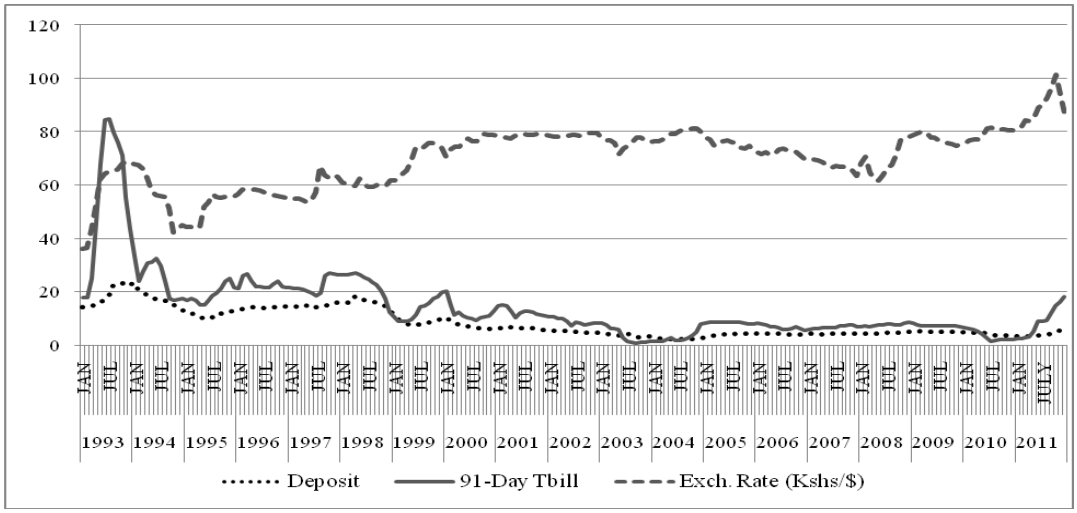
A commodity boom in the major export crops in 1976 and 1977 led to an appreciation of the real exchange rate given the system of fixed exchange rate at the time, growth of domestic credit and money supply aggregates. However, CBK adopted indirect instruments to control monetary policy following liberalisation of interest rates and the exchange rate together with other changes in monetary policy in 1990s meant to address failure of monetary policy to deliver on its inflation objective in the late 1980s and early 1990s (Kinyua, 2001; Ndung'u, 2008).

In the 1990s, economic growth declined, inflation rose rapidly, monetary sector expanded and nominal exchange rate depreciated. Capital flows increased due to rising interest rate differentials following relaxation of restrictions on the capital account and foreign exchange transactions, leading to a challenge in exchange rate and monetary policy management (Ndung'u, 2008; O'Connell et al., 2010). Offshore borrowing was liberalised in 1994 and the remaining restrictions on inward portfolio investment lifted in January 1995, allowing for foreign investment in the stock market of up to 20 per cent of the equity for inward portfolio investment (Ndung'u and Ngugi, 1999). In 2002, there were further reviews allowing foreign investors to invest up to 75 per cent of a local quoted company.

Interest rates have recorded a declining trend, with the Treasury bill rate declining from a high of over 80 per cent in 1993 to about 2.6 per cent in February 2011, while the average deposit rates have declined from about 20 per cent to 3.4 per cent over the same period (Figure 5.1). High Treasury bills rate in 1993 was meant to mop up excess liquidity pushing up inflation and

appreciation of exchange rate, which resulted into speculative capital inflow in 1994 (Ndung'u and Ngugi, 1999; Ndung'u 2002). The appreciation in exchange rate was however short lived with the rate depreciating from an average of Kshs.58 to the US dollar to an average of Kshs.81.5 to the US dollar, peaking at Kshs.105.96 to the US dollar on 12th October 2011. This shows that exchange rate risk has been rising with the rise in the exchange rate over the past 18 years, and the increase in risk is also reflected in the decline in Treasury bill rate, which measures the risk free rate.

Figure 5.1: Trends of Interest Rates and Nominal Exchange Rate, 1993:1 to 2011:12

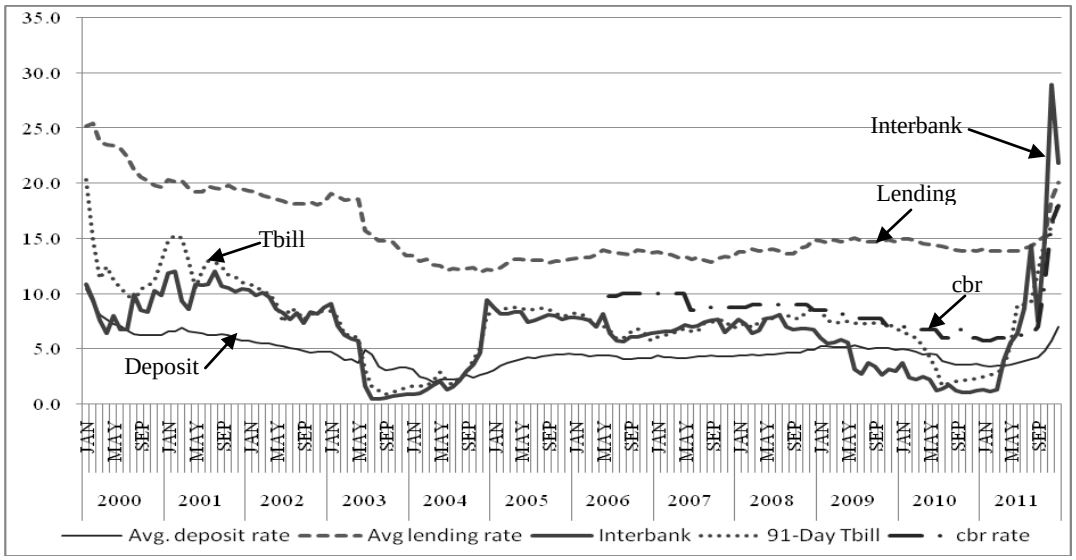


Source: Central Bank of Kenya data

The declining trend of Treasury bill rates is also reflected in other short-term interest rates (Figure 5.2). The interbank rate and the Treasury bill rate have been moving closely together, while the central bank rate (CBR) has slightly been above these rates with the exception of the period from October 2011, when the CBR was raised by over 500 basis points to counter weakening currency and growing inflation. There was however fluctuation in short term interest rates, which reflects the weak relationship between monetary aggregates and GDP (Kinyua, 2001). Loose monetary policy adopted by countries after the global crisis to stabilise financial

systems resulted into low interest rates in 2009, but this raised inflation concerns following a quick recovery in developing countries (UNECA, 2011). The interest rate spread, however, has been high indicating the high cost of borrowing in the domestic economy. Hence, overall, the risk has been rising and this might have affected the market return for investors.

Figure 5.2: Trends in Interest Rates, January 2000 to December 2011



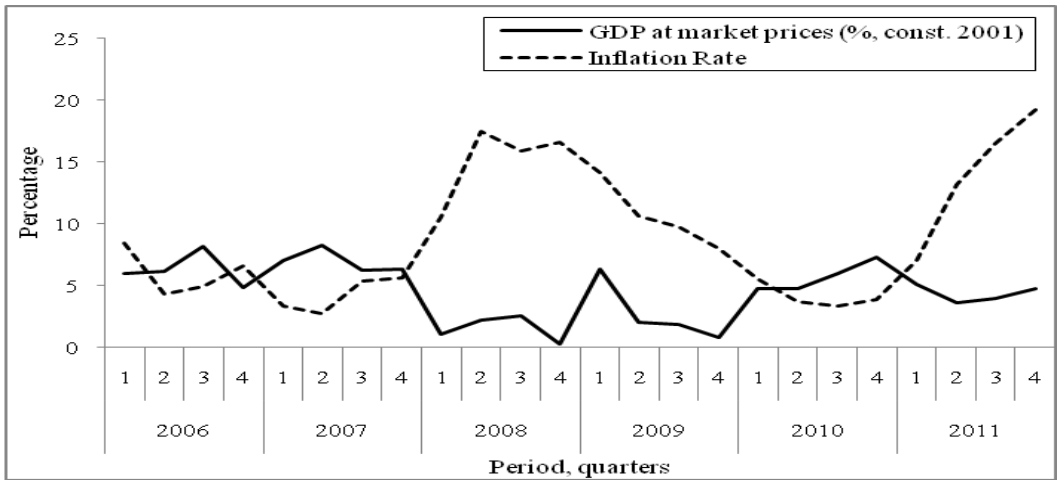
Source: Central Bank of Kenya data

5.1.2 Challenges to monetary policy management

The monetary policy stance stabilised from the beginning of the century following the return to growth and political stability. However, this was not to continue for long as a number of factors resulted into instability and posed a challenge to the management of monetary policy. A pointer to this is the accelerated depreciation of the local currency against major international currencies in early 2010s and the substantial increase in inflation which resulted in general price upshot affecting both consumption and investments.

Inflation levels were initially low in 2007, but rose substantially from the first quarter of 2008 (Figure 5.3). Inflation was highest in early 2008, immediately after the post-election violence which resulted in disruption of supply of basic food items and farming activities. But this situation was later corrected and within a span of six quarters, inflation rate declined from its highest pick in the second quarter of 2008 to below the targeted 5 per cent level in the second quarter of 2010[40].

Figure 5.3: Quarterly Trends of GDP and Inflation, 2006:1 to 2011:4



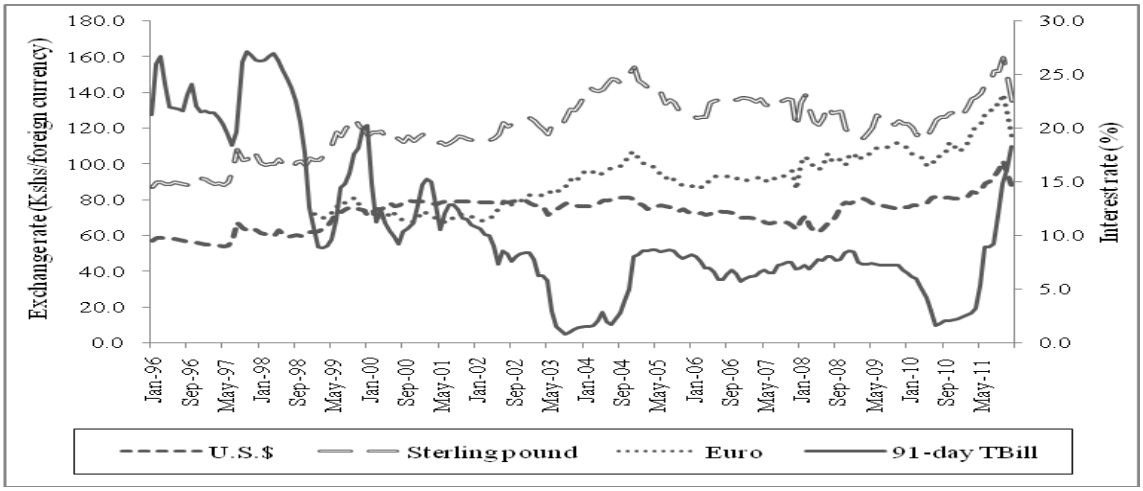
Source: Kenya National Bureau of Statistics data

The stability in inflation was however short lived with price levels rising again from 3.3 per cent in the third quarter of 2010 to 16.5 per cent in the third quarter of 2011. This movement is attributed to among other factors, an increase in world crude oil prices which resulted to increased fuel prices and shortage of basic commodities such as maize and sugar, which further fuelled inflation. What is evident from the figure is that during periods of substantially low inflation (of about 5 per cent), economic growth was also averaging about 5 per cent, while periods of high inflation are accompanied by low economic growth.

[40] The reduction in inflation to below 5 per cent in June 2010 has been attributed to prudent monetary policy, change in the methodology of estimating the consumer price index and revision of the basket of goods used in computation of the consumer price index (KIPPRA, 2010).

The local currency has also relatively weakened from the mid-1990s compared to major currencies such as the US dollar, Sterling Pound and the Euro, depreciating substantially from mid-2010 (Figure 5.4). For instance, the shilling depreciated to a period high of Kshs.106 to the US dollar in October 2011. The movements in exchange rate have been largely attributed to the general increase in international oil prices during this period, and the Euro crisis which affected Kenya's main export market of horticulture and tourism. World Bank (2011b) attributes the underlying reasons for the depreciation of the exchange rate to investors' uncertainty with the economy and negative terms of trade shock, which resulted in a deterioration of the trade balance.

Figure 5.4: Monthly Exchange Rates and Treasury Bill Rate, 1996:1 to 2011:12



Source: Central Bank of Kenya data

During the same period, interest rates, which had been stable, declined substantially to a low of 1.6 per cent in July 2010 from a high of 8.6 per cent in December 2008. These gains were however reversed with interest rates rising to a high of 14.8 per cent in October 2011[41]. The accelerated depreciation of the currency further fuelled inflation, since Kenya is a net importer with a trade balance lying in the negative territory, and thus has been worsening.

[41] The Treasury bill rate increased from 5.4 per cent in May 2011 to 14.8 per cent in October 2011, representing an increase of about 180 per cent within six months.

5.1.3 Monetary authority decisions and implementation

The CBK has adopted a flexible monetary policy aimed at managing stability, while supporting government policy of stimulating growth which was initiated in 2009. This ensured inflation remained at the targeted 5 per cent level, interest rates remained stable and exchange rates competitive and stable. With stability in the monetary system, revitalising growth called for an approach that would ensure credit availability to the private sector, improving consumption growth, reducing information asymmetries in the financial sector, promoting cheaper credit, and formal banking channels. The MPC, therefore, reduced the CBR rate from 8.5 per cent in January 2009 to 6 per cent by the end of 2010, though in a gradual and stable manner. Agency banking and information-sharing mechanisms were also introduced by registering credit reference bureaus to address information asymmetries and promote formal banking.

The stability experienced during this period together with the additional measures, which had been undertaken may have created some confidence among the monetary authorities, resulting into further reduction of CBR in January 2011 from 6 per cent to 5.75 per cent and later increased to 6.25 per cent during the May and July MPC meetings. The period that followed however experienced accelerated depreciation of the currency, prompting an adoption of tight monetary policy to forestall the instabilities. The CBR was subsequently raised from 7 per cent in September 2011 to 18 per cent in December 2011.

The CBK also tried to directly intervene in the foreign exchange market as a means of putting things under control, leading to a partial control by way of imposing some regulatory decisions on currency trade. These instabilities might have increased uncertainty thus affecting investments by the private sector. The level of domestic debt has also been increasing, with the government

gradually increasing the amount of domestic borrowing since 2000 to levels of over 50 per cent of total debt by August 2011. At the same time, remittances have been growing at an annual average of about 2 per cent since January 2009.

5.2 Monetary Policy Management in Kenya

Monetary policy in Kenya is based on monetary quantity framework, where CBK targets the growth in broad money, which is directly linked to the real sector of the economy. The policy instrument used is the short-term interest rate which aims at achieving stability, growth and inflation targets. The monetary policy indicator is given by the bank rate. CBR has been used for this purpose since June 2006. Before this, the Treasury bill rate plus 3 per cent was used as a monetary policy indicator.

The central bank controls broad money (M3), comprising activities of the central bank (including reserve money) and those of other depository corporations such as commercial banks. However, since broad money cannot be controlled directly, reserve money is used as a nominal anchor, which together with the money multiplier gives the broad money. Reserve money forms the balance sheet of the central bank; hence attaining the balance in its balance sheet will ensure that broad money is controlled. The central bank therefore monitors, on a daily basis, movement in reserve money and makes the necessary adjustments so as to maintain stability.

The monetary policy targets to be attained by the monetary authorities are determined in the Macroeconomic Working Group (MWG), composed of CBK, Kenya Institute for Public Policy Research and Analysis (KIPPRA), and the Treasury. The MWG takes into consideration the prevailing economic environment and makes forecasts which then form the targets of growth and

inflation to be maintained by the monetary authorities. These targets are communicated to the monetary authorities either in the budget outlook paper, budget speech or through a letter from the Minister of Finance to the central bank at the beginning of each fiscal year, stating the policy targets. For the central bank to achieve these targets, it targets a monetary variable which forms the nominal anchor. Hence, policy targets are attained making assumptions on the growth in money velocity. The premise is that once appropriate assumptions are made on the velocity of money, then the growth in broad money is achieved such that it meets the targeted policy variables.

However, instability of demand for money has made controlling broad money a challenge. The demand for money links nominal money supply to the behaviour of domestic prices, the balance of payments and real income (Mwega, 1990); hence if it is unstable, the conduct of monetary policy becomes difficult[42]. Such instability has led to preference of interest rate as monetary policy instrument rather than monetary aggregates (Orphanides, 2010). In an effort to address this, the central bank has also been using net domestic assets (NDA) and net international reserves (NIR) as nominal anchors, especially when there is an IMF programme. The NDA and NIR forms the asset side of the central bank balance sheet and thus is an indirect way to control broad money, since these are components of reserve money. However, effectiveness of using NDA and NIR cannot be assessed since it has been in place for a short period of time.

Short term capital inflows lead to increase in net foreign assets (NFA) and results into appreciation of the exchange rate and increase in money supply, which ultimately results into

[42] The argument is that demand for money cannot be predicted by the monetary authorities. Studies by Mwega (1990) find demand for money to be stable, but the money multiplier unstable. Recent studies have found the demand for money in Kenya to be unstable (for example, Sichei and Kamau, 2012). The difference in the findings is attributed to reforms within the financial sector, change to floating exchange rate and financial innovations that have taken place over time.

decrease in interest rates. If the short term inflows are substantial, then these can overheat the economy and affect the capital account. The volatility of short term capital flows will lead to exchange rate instability, which is of concern to monetary authorities since monetary policy becomes ineffective in the face of macroeconomic instabilities. For it to be effective, stability has to be maintained by the central bank using the necessary monetary policy actions.

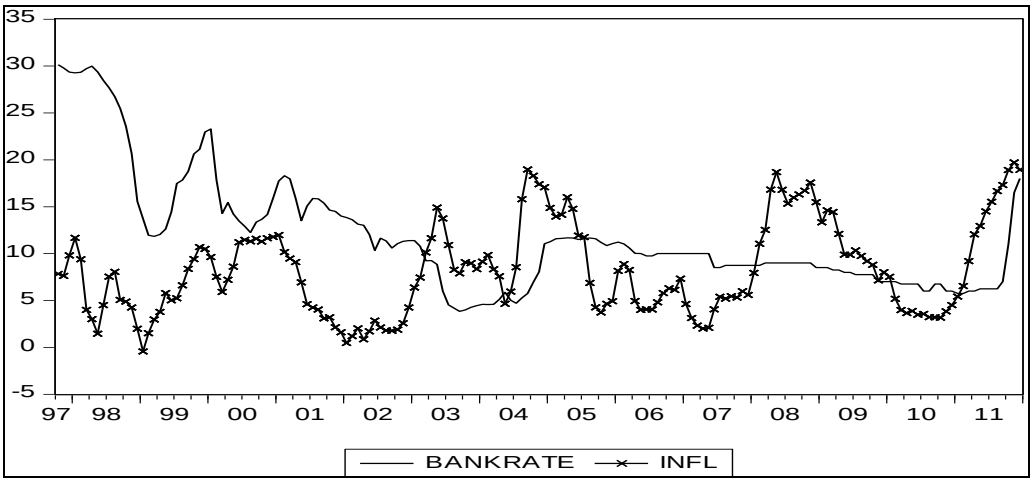
To conduct monetary policy, the central bank continuously monitors all sectors of the economy and forecasts major indicators such as inflation for up to 3 months horizon. The forecasts inform decisions on the stance of monetary policy. When broad money is off target for instance, the targets for output and prices cannot be achieved. Hence, the monetary authority will determine the amount of reserve money necessary to restore broad money to the target and this is achieved by using a policy instrument; the short term interest rate. This implies that the central bank uses a monetary policy rule to guide its decisions with interest rate as the policy instrument.

When the interest rate is set, it feeds into the inter-bank rate then to Treasury bill rate and this effect feeds into the lending rate, then to the credit market. However, given the inefficiency of the market, the interest rate channel is likely not to be that effective in the transmission process. Hence, there have been advocates for credit channel which is more effective than the interest rate channel (Khan, 2011; O'Connell, 2011).

A graph of the relationship between the bank rate, given by CBR and Treasury bill rate plus 3 per cent prior to CBR coming into effect, and inflation is presented in Figure 5.5. It is evident that from 1997 to 2003, the bank rate was exceptionally higher than inflation rate, depicting a tight monetary policy. The bank rate was however declining following liberalisation of the financial market in 1996. This was reinforced further with the coming into force of Economic

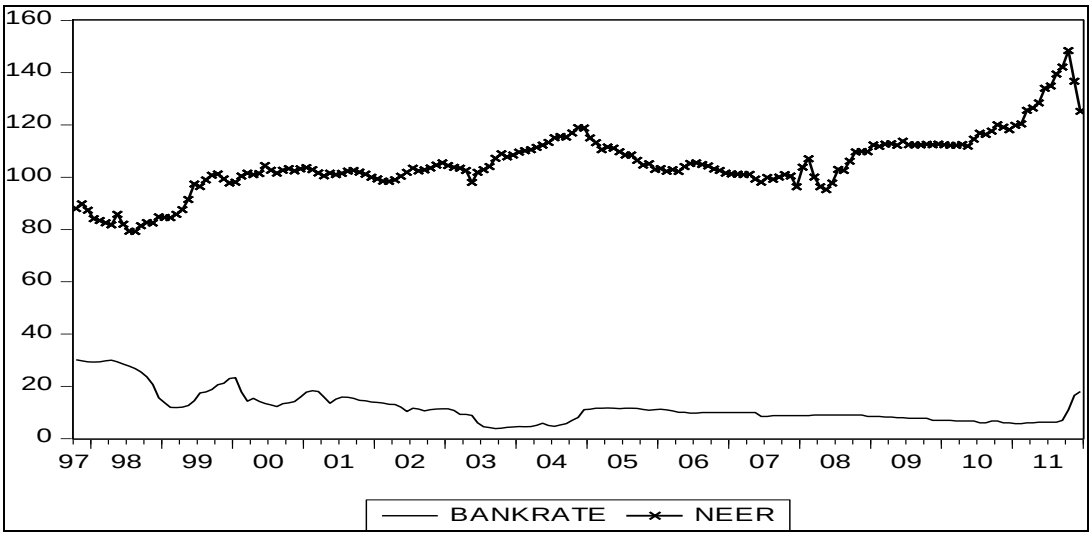
Recovery Strategy (ERS) in 2003, which was meant to stimulate growth, resulting to bank rates declining to below inflation levels between 2003 and 2005. The bank rate has had a general declining trend up to 2011, though almost constant between 2007 and 2009. In 2011, the trend of the bank rate was reversed by tightening monetary policy to address depreciation of the currency and growing inflation levels.

Figure 5.5: Bank Rate and Inflation Trends, October 1997 to December 2011



The bank rate has been declining over time, but the exchange rate has been depreciating (Figure 5.6). Continued depreciation of the currency calls for tightening of monetary policy by raising the bank rate, but such a policy was only implemented in 1999, 2001, 2004 and 2011. This may have been because tight monetary policy has an effect on other macroeconomic factors such as raising the cost of credit, and thus affecting macroeconomic performance.

Figure 5.6: Bank Rate and Nominal Effective Exchange Rate, October 1997 to December 2011



5.3 Literature Review

The central bank needs a monetary framework in place, a basis through which to respond to any changes in the monetary environment that can lead to instability, to be able to carry out its operations. Monetary policy frameworks[43] vary from country to country, and define the kind of monetary policy pursued by a particular country. The framework therefore gives an indication of how the monetary authorities are likely to respond to instabilities based on monetary policy rules.

5.3.1 Monetary policy frameworks

There are four main types of monetary policy frameworks identified in the literature: exchange rate targeting, inflation targeting, monetary quantity targeting and dollarization[44]. Developing

[43] A monetary policy framework is an institutional arrangement that determines and implements monetary policy and provides the policy anchor, identifies policy objectives and describes implementation of monetary policy (Kasekende and Brownbridge, 2011).

[44] See Frankel (2011) and Agenor and Montiel (2008) for a discussion on the different monetary policy frameworks.

countries can chose from inflation, exchange rate and money supply as nominal targets (Frankel, 2011).

Inflation targeting is an approach to control inflation where the central bank sets a target for inflation to be achieved and continuously predicts the future behaviour of prices so as to ensure inflation does not deviate much from the target (Agenor and Montiel, 2008). Most countries are trying to adopt inflation targeting mainly because it leads to greater achievement of monetary policy objectives compared to other monetary policy frameworks. For instance, Lin and Ye (2009) have established that inflation targeting has large and significant effects on lowering both inflation and inflation variability in developing countries, but its effectiveness depends on country characteristics such as government's fiscal position, central bank's desire to limit the movements of exchange rate, its willingness to meet the preconditions of policy adoption, and the time length since the policy adoption. They found the credibility gain from an explicit announcement of an inflation target to be more substantial in the developing world. While the belief about inflation targeting has grown over time, the global financial crisis of 2007-2009 challenged its use shifting the focus of central banks to other nominal variables such as exchange rate, prices of agricultural and mineral products, and asset prices such as equities and real estate (Frankel, 2011).

Monetary quantity targeting directs monetary policy to a particular rate of growth in the monetary aggregate that is compatible with low inflation. The monetary policy objective is to ensure that inflation remains at low levels through management of aggregate money supply. Monetary quantity targeting is applicable where there is a stable relationship between one or

more aggregates and the general level of prices, and requires adequate knowledge of the parameters characterising the demand for money (Agenor and Montiel, 2008).

Exchange rate targeting relies on foreign country's monetary policy credibility by pegging the nominal exchange rate to a foreign currency that is stable and has low inflation so as to achieve price stability (Agenor and Montiel, 2008). However, it is ineffective where there is a high capital mobility and unstable capital movements as fixing exchange rate in a financially integrated environment implies giving up monetary independence to supply shocks (Agenor and Montiel, 2008; Frankel, 2011). Dollarization is where a country replaces the use of her currency with that of a foreign currency, which is deemed more stable following loss in value of the domestic currency.

5.3.1.1 Monetary policy frameworks in sub-Saharan Africa (SSA) countries

Monetary policy frameworks in SSA fall into two main categories: monetary targeting frameworks and fixed exchange rate regimes (including the CFA monetary unions) (Kasekende and Brownbridge, 2011). The evolution of monetary policy in SSA involved moving from direct to indirect instruments of monetary control, especially following the structural adjustment period. Monetary policy objective was changed from pegged but adjustable exchange rate to inflation control (Ajakaiye and O'Connell, 2011).

Most countries in SSA use quantitative money targets as domestic anchor for monetary policy (Kasekende and Brownbridge, 2011; Ajakaiye and O'Connell, 2011). There have been calls for adoption of a broader set of policy objectives in addition to inflation, by introducing more sophisticated set of indicators as intermediate targets due to challenges arising from exogenous shocks faced by most SSA countries (Kasekende and Brownbridge, 2011).

Studies on evaluation of monetary policy have gone to estimating dynamic stochastic general equilibrium (DSGE) models in what is referred to as the new Keynesian framework. While DSGE models have not been popular in studies within African countries, their use has lately been advocated for given the inherent challenges such as a large and volatile food sector, imperfect capital mobility and a credit channel for monetary policy in African countries that current models do not reflect (O'Connell, 2011). The DSGE models have become relevant as African countries move to greater exchange rate flexibility with emphasis on inflation as the intermediate target of policy (O'Connell, 2011).

Among the various components of a DSGE model is the monetary reaction function. While the use of DSGE models is important, the focus of the study is only on the monetary reaction function, rather than the entire DSGE model. The DSGE models can be implemented as an interest-rate rule, with the money stock determined endogenously or as a money-growth rule with the interest rate determined endogenously. This makes DSGE models applicable for African countries as most of them use reserve-money rather than interest rate as policy instrument or operating target (O`Connell, 2011). Use of monetary rather than inflation targeting is advocated for since it allows greater control over monetary aggregates and the targets are easier to meet than inflation targets, though they have lower information content (Khan, 2011).

Kenya follows a hybrid regime of inflation targeting and monetary targets, maintaining inflation at single digit levels, while setting targets for monetary aggregates annually depending on the prevailing macroeconomic conditions (Kasekende and Brownbridge, 2011). Monetary targeting regimes have enabled SSA countries to control inflation, despite being less effective at low levels of inflation due to instability of money demand (Kasekende and Brownbridge, 2011). To

effectively establish price stability, the central bank has to forecast the macroeconomic environment in the future. That is, using private sector expectations and macroeconomic performance, the projections assist in making decisions on the nature of monetary policy to pursue in the medium term. Questions have been raised about the accuracy of these estimates, especially in African setting where a number of risk factors have to be controlled. However, a study by Rulke (2012) found that central bank projections are rational and unbiased, though inflation projections are more biased than growth projections[45].

5.3.2 Monetary policy rules

Short-term capital flows to countries affect macroeconomic performance of these economies through the macroeconomic prices. In such a case, the monetary authorities have to adopt a policy that maintains price stability and one geared towards achieving a certain level of growth in the face of capital flows. The role of monetary authorities is to ensure that monetary policy achieves price stability, attains sustainable economic growth and establishes a stable financial system (Ouma et al., 2006). The monetary authorities respond to macroeconomic imbalances that are likely to cause price instability and act as impediments to the quest for economic growth by targeting nominal variables like money stock, GDP or inflation rate.

In a floating exchange rate system, monetary policy is based on the trinity of a flexible exchange rate, an inflation target and a monetary policy rule (Taylor, 2001)[46]. The rules followed by

[45] Rulke (2012) analysis covers 15 major central banks, including only one in Africa (South Africa). The countries included in the sample have developed and sophisticated financial systems compared to SSA countries, and thus expectations of the private sector may be more accurately estimated. However, given that no known study of the same nature has been done, specifically for developing or SSA countries, we assume that the same results hold for central banks in SSA and Kenya in particular, though the level of accuracy in projections may vary.

[46] Taylor (2001) defines a monetary-policy rule as "a contingency plan that specifies how the central bank should adjust the instruments of monetary policy in order to meet its inflation and other targets" (footnote 1).

monetary authorities are either on interest rate or monetary (Khan, 2011). A monetary policy reaction function defines the goals that have been determining a country's monetary authority's actions and how monetary instruments have been adjusted to meet economic objectives (Ouma et al., 2006; Orphanides, 2010). It formalises how policy makers systematically respond to variations in the economy, which are not reflected in the reaction function captured by monetary policy shock (Christiano et al., 1999). The effects of adjusting short term interest rate are uncertain and varied, but the impact is felt on real GDP and inflation, underscoring the importance of finding a reaction function that captures the magnitude of such changes (Taylor, 1995). The argument for monetary policy rules is that it reduces inefficiencies and uncertainty about the future, in addition to guiding in making expectations in the financial markets, thus it should be simple and transparent (Taylor, 2000; Orphanides, 2010). Use of monetary policy rules is beneficial in emerging markets as well (Taylor, 2000).

Other than the monetary policy targets, that is interest rates and inflation, other macroeconomic variables such as exchange rates are also important in estimating monetary policy reaction. Exchange rate enters a monetary-policy rule as part of an arbitrage equation relating interest rates in different countries in the interest rate parity relationship (Taylor, 1995; 2001). Despite the importance of exchange rate in monetary policy evaluation in emerging market economies, Taylor (2000) found that policy rules that focus on smoothed inflation measure and real output without reacting to the exchange rate might actually work well in these markets. This finding is in support of the trilemma in monetary policy as established by Obstfeld et al. (2005).

Monetary policy rules allow for consistency in monetary policy management as the surprises may have an impact on the economy, for example, on stock market performance. For instance,

Bredin et al. (2009), using an event study, found that UK monetary policy surprises had a significant negative influence on both aggregate and industry level returns in UK and Germany, while the influence of German/Euro area monetary policy shocks were insignificant in both Germany and UK. Bredin et al. (2009) noted that in efficient markets, a change in monetary policy can influence stock returns via arbitrage through opportunity cost of holding an asset or by influencing expected future cash flows by changing economic activity.

Ouma et al. (2006) estimated a monetary policy reaction function for Kenya since inception of the CBK using a VAR framework. Dividing the period into two, they found that when CBK was using domestic credit as the instrument of policy, the reaction of monetary policy had an inverse relationship with inflation but an insignificant reaction to changes in the output gap, and that the reaction of monetary policy to exchange rate change has been random over time. This shows inconsistency in their results as it suggests that monetary authorities did not have in place a specific monetary policy which was not the case. They also found changes in monetary policy to be dominated by changes in net foreign assets (NFA), which they interpret to mean that CBK considers changes in NFA more important than changes in the other macroeconomic variables. Given their finding that changes in monetary policy are dominated by changes in NFA, they call for a study to establish the strength of current monetary policy against external influence, especially the adjustment of interest rate differentials, which might influence capital inflows. Since the external influence can be manifested in short-term capital flows given the interest rate parity, this issue is addressed in the study.

Since central bank uses the interest rate as the monetary instrument, an interest rate rule becomes more applicable in estimating a monetary reaction function. One such rule is the Taylor rule

(Taylor, 1993) which considered the interest rate setting behaviour of US monetary authorities. This rule has been extended to capture the behaviour of central banks in the conduct of monetary policy (for example, Clarida et al., 1998; 2000; Mehra, 1999)[47]. Taylor rule is important for making monetary policy decisions and it provides a benchmark for predicting future monetary policy directions (Nandwa, 2006). However, the central bank may not necessarily have a formalised reaction function which it follows, but acts on changes in the macroeconomic environment by following a framework that ensures stability is attained.

From the review, it is evident that the kind of monetary policy in use by developing countries determines the effectiveness in meeting monetary stability given the challenges these countries face that expose them to external factors. However, there must be a defined monetary policy rule in place as this reduces inefficiency, provides policy consistency and reduces policy uncertainty. Given that monetary shocks and decisions affect the entire economy, the way the monetary authorities react to the shocks in the economy is important. A question that arises is how the Central Bank of Kenya has reacted in ensuring monetary stability given the volatility in short term capital flows.

5.4 Methodology

5.4.1 Theoretical framework

Since the central bank focuses on the monetary quantity aggregate, this study starts from the quantity theory of money, expressed as broad money (M) times velocity of money (V) equals the

[47] Policy rules are called for when authorities do not have information on when or how much to act on the economy, and also because they help minimise incentives for operating in a time-inconsistent manner (Adam et al., 2010).

price level (*P*) times output (*Y*), that is, $MV = PY$. Expressing this in logarithm, then the quantity equation becomes:

$$m = p + y - v \tag{5.1}$$

The growth in broad money, *m*, is linked to growth in prices, *p*, and output, *y*. The central bank therefore makes assumptions on *v*, hence if *v* = 0 then *m* is achieved by having specified levels of growth in prices and output. But since broad money (M3) cannot be controlled directly, the reserve money is used as the nominal anchor, hence broad money is given as $M = \mu R$, where μ is the money multiplier and *R* is reserve (or base) money. Hence, in logarithm form, this becomes $m = \mu + r$ and Equation 5.1 can therefore be expressed as:

$$r = p + y - v - \mu \tag{5.2}$$

The broad money aggregate is related to the monetary base, which the central bank may control by setting reserve requirements. The central bank intervenes in the market to determine the money supply using short term interest rates as the operating target. The growth rate in prices gives the inflation rate, π. Target levels of broad money and inflation are achieved by forecasting output growth, growth in velocity and money multiplier. With the superscripts (*) denoting a target and (*f*) a forecast, Equation 5.2 can be expressed as:

$$r^* = \pi^* + (y^f - v^f - \mu^f) \tag{5.3}$$

The equation links reserve money growth to target inflation rate, while taking into consideration the real demand for base money and the money multiplier. Through the reserve money, the supply of money can be changed either by using open market operations, the discount rate where banks borrow at the discount window, or through change in reserve ratio. However, it is the open

market operation that is used for day-to-day control of money supply. In this case, the central bank buys bonds from the market to increase money supply and vice versa.

However, the velocity of money is not observable but can be inferred from the money demand function. The money demand function captures the response of the private sector to changes in economic activity, for instance money demand will change following a change in prices. Following Carstensen (2006), the money demand equation is expressed as:

$$m - p = \omega_0 + \omega_1 y - \omega_2 i$$

where i is the interest rate representing the opportunity cost of holding money. The long-run equilibrium money demand is therefore expressed as;

$$m - p^* = \omega_0 + \omega_1 y^* - \omega_2 i^*$$

where i^* is constant and is given by the sample average of i. The long run equilibrium velocity can therefore be expressed as (from Equation 5.1):

$$v^* = -\omega_0 + (1 - \omega_1) y^* + \omega_2 i^* \tag{5.4}$$

Hence, from the money demand equation, change in prices can be presented as:

$$p^* = m - \omega_0 - \omega_1 y^* + \omega_2 i^*$$

$$i^* = \frac{1}{\omega_2}(\omega_0 + \omega_1 y^* - (m - p^*)) \tag{5.5}$$

In Equation 5.5, target interest rate is given as a function of target output and real money balance.

Taylor rule is therefore used as the framework for estimation, by extending the rule to capture the reaction function. Taylor rule is a framework for understanding the choices made by monetary authorities operating with discretion. This varies from the approach adopted by Ouma et al. (2006), where a VAR framework is used to estimate the monetary policy reaction function for Kenya. The downside of using a VAR to estimate a monetary reaction function is that it is not possible to determine the magnitude of monetary policy reaction coefficients.

5.4.2 Model specification

From the basic Taylor rule, the monetary policy reaction function (MPRF) assumes the central bank set interest rates according to the rule;

$$i = i_0 + i_\pi \left(\pi - \pi^t \right) \tag{5.6}$$

This is the Taylor rule for interest rates (with the central bank reacting only to the inflation rate), where *i* is the interest rate, π is the rate of inflation and π^t is the target inflation rate.

Since in practice the central bank targets other objectives together with output and inflation levels, it is necessary to modify the rule by including these variables to have a clear reflection of monetary policy actions by the central bank. Most studies have shown that forward looking specification outperforms backward looking specifications on how central banks react (for example, Clarida et al., 1998; 2000; Mehra, 1999). This may be because central banks base monetary policy on forecasts of major economic variables and not past variables. In this case, the study focuses on estimating a forward looking reaction function.

In order to get an estimable forward-looking policy reaction function, Clarida et al.(1998; 2000) propose that the target interest rate (i_t^*) depends on the long-run equilibrium nominal rate ($\bar{i}$), the expected deviation of inflation from target $\left(E\left[\pi_{t+n}|\Omega_t\right]-\pi^*\right)$ and the expected output gap $\left(E\left[y_t|\Omega_t\right]-y_t^*\right)$, that is:

$$i_t^* = \bar{i} + \beta\left(E\left[\pi_{t+n}|\Omega_t\right]-\pi^*\right)+\gamma\left(E\left[y_t|\Omega_t\right]-y_t^*\right) \tag{5.7}$$

where Ω_t is the set of information available to the central bank at the time it sets the monetary target and it includes the lagged values of exchange rate, lagged short-term interest rates like Treasury bill rate and inflation. The central bank makes decision based on observed values as the future inflation rate and current output gap cannot be observed, hence expected rather than realized values enter the policy rule (Carstensen, 2006).

To reflect actual changes in interest rates, a partial adjustment model of the market interest rate , r_t, to the target, r_t^*, is specified (Clarida et al., 1998; 2000; and Carstensen, 2006):

$$r_t = (1-\rho)r_t^* + \rho r_{t-1} + \upsilon_t \tag{5.8}$$

where $\rho \in [0,1]$ is an indicator of the degree of smoothing interest rate changes, and υ_t is an exogenous random shock to the interest rate.

Rewriting the policy rule in terms of realised variables and assuming actual values rather than expectations gives:

$$i_t = (1-\rho)\left(r_t^* + \pi_t^*\right)+\rho r_{t-1}+\gamma_1\left(\pi_t-\pi_t^*\right)+\gamma_2\left(y_t-y_t^*\right)+\varepsilon_t \tag{5.9}$$

where the error term is a linear combination of the forecast errors of inflation, output and the exogenous variables. This can be expressed as:

$$i_t = (1-\rho)r_t + \rho r_{t-1} + \gamma_1(\pi_t - \pi_t^*) + \gamma_2(y_t - y_t^*) + \varepsilon_t \quad (5.10)$$

where $r_t = r_t^* + \pi_t^*$, that is, nominal interest rate is defined as the sum of real interest rate and inflation, $(\pi_t - \pi_t^*)$ is inflation gap and $(y_t - y_t^*)$ is output gap. This forms the baseline model. The model is extended further to capture the effect of short term capital flows on monetary policy by including the change in exchange rate as:

$$i_t = (1-\rho)r_t + \rho r_{t-1} + \gamma_1(\pi_t - \pi_t^*) + \gamma_2(y_t - y_t^*) + \varphi_1 \Delta exch + \varepsilon_t, \quad (5.11)$$

This can further be extended by including the change in output gap in the model to give:

$$i_t = (1-\rho)r_t + \rho r_{t-1} + \gamma_1(\pi_t - \pi_t^*) + \gamma_2(y_t - y_t^*) + \gamma_3(\Delta y_t - \Delta y_t^*) + \varphi_1 \Delta exch + \varepsilon_t$$

5.4.3 Estimation framework

The monetary authorities target the monetary aggregate but using the interest rate as the policy instrument. They therefore focus on the short-term interest rate to restore and maintain stability in the economy. Currently, the CBR is used to signal the stance on monetary policy and guides the market in setting the other short term interest rates used in open market operations. CBK, therefore, runs a monetary programme which is achieved through open market operations and other instruments of monetary policy, that is, by using repurchase agreements and cash reserve ratio. However, the trilemma holds such that given an open capital account, the authorities cannot manage both interest rates and the exchange rate (Obstfeld et al., 2005). In this case, the

monetary authorities have focused on managing interest rate with an open capital account. The reaction function of the monetary authorities can be represented as:

$$i_t = r_t^* + \pi_{t+1} + \gamma_1\left(\pi_{t+1} - \pi_t^*\right) + \gamma_2\left(y_t - y_t^*\right) + \varepsilon_t \qquad (5.12)$$

where *i* is the nominal bank rate, r_t^* is the real rate of interest, π_{t+1} is inflation rate at time *t*+1, and π_t^* is the target inflation.

The main role of the CBK is to maintain price stability and support growth. Hence, the implicit targets considered in the reaction function, just as in the literature, are output gap and inflation gap (Clarida et al., 1999). While other studies (for example, Sanchez-Fung, 2005) have included deviation of market exchange rate from the official exchange rate as implicit targets, the Kenyan case is different since there is no explicit exchange rate target, but a need to maintain exchange rate stability. The hypothetical monetary policy rule can therefore be presented as:

$$i_t = r_t^* + \pi_{t+1} + \beta_1 \pi gap + \beta_2 ygap + \varepsilon_t \qquad (5.13)$$

where i_t is the nominal bank rate, r_t^* is the real rate of interest, π_{t+1} is inflation rate at time *t*+1, πgap is the inflation gap given by actual inflation, π_t minus target inflation π_t^*, that is, $\left(\pi_t - \pi_t^*\right)$, and $ygap$ is the output gap given as deviation of actual GDP, y_t from potential GDP y_t^*, that is, $\left(y_t - y_t^*\right)$, while ε_t is the disturbance term.

Inflation gap $\left(\pi_t - \pi_t^*\right)$ and output gap $\left(y_t - y_t^*\right)$ are expressed as deviations of inflation and log GDP from their potential values π_t^* and y_t^*, respectively. The potential inflation is based on the government medium term inflation target which is 5 per cent. On the other hand, potential GDP

is estimated by taking the highest deviation of GDP from the fitted values and adding it to fitted values. This is to ensure that potential GDP always lies above the actual GDP. Some studies use Hodrick–Prescott filter (HPF) (Hodrick and Prescott, 1997) to estimate the potential GDP, however HPF leads to cases where potential GDP falls below actual GDP. The bank rate is derived as Treasury bill rate + 3 per cent before the CBR came into effect and thereafter using the CBR. The representative interest rate used is the interbank rate which is market driven given that it is determined by demand and supply in the interbank market. Output is measured using real GDP and inflation by 12-month change in consumer price index (CPI).

The study follows Clarida et al. (1998; 2000) in choosing the instruments for estimation. Therefore, the constant, the first three lags, the six and the ninth lag of output gap, inflation gap, and interbank rate are taken as instruments. The choice of lags is based on the assumption that the monetary authorities consider all the observations within the previous quarter, end of second previous quarter and end of third previous quarter. A generalised method of moments (GMM) model is estimated while correcting for heteroscedasticity and autocorrelation of unknown form with a lag truncation parameter of 3. Some of the independent variables used in estimating a monetary policy rule may be correlated with the error term, making the least squares estimator biased and inconsistent. GMM allows for such possibilities and result in unbiased and consistent estimator. The choice of lag truncation value is informed by the fact that the central bank focuses on quarterly forecasts to make decisions rather than long forecasts of more than one quarter. Bartlett weights are also used to ensure positive definiteness of the estimated variance-covariance matrix.

The instruments used in the model are tested for validity using the *J* statistic, a test of over-identifying restrictions which has a chi-square distribution with degrees of freedom equal to the number of instruments minus the parameters estimated. The *J* statistics tests the null hypothesis that the moments of estimation are correctly specified, that is, the instruments are valid against the alternative that they are misspecified.

5.4.4 Data and sources

Monthly data from October 1997 to December 2011 collected from Central Bank of Kenya and Kenya National Bureau of Statistics was used for estimation. The period was chosen to capture the period after removal of restriction in the financial sector to allow for movement of capital and based on availability of monthly data. The use of monthly data enables the study to capture immediate response by the monetary authorities within a short period which gives more realistic view of what actually happens. This is because even in setting forecasts, monetary authorities are more likely to base the time period of these forecasts on a monthly basis, which is achievable than on an annual basis. However, getting monthly data on some of the variables was a challenge since monthly data has not been kept for a long period with initial focus largely being on maintaining annual data and, to a certain extent, quarterly data. This restricted the period of study to start in October 1997, when monthly data was available.

5.5 Empirical Results

The model estimated is given by Equation 5.10 which forms the baseline model. The estimation results are presented in Table 5.1 (detailed results are in Appendix Table A5 to Table A7). First,

a baseline model which does not capture the effect of short term capital flows is estimated; then models including growth in output gap and change in exchange rate are estimated.

Model I gives results of the baseline model, presenting monetary policy rate as a function of market interest rates, inflation gap and output gap. Coefficients for the adjustment parameter, inflation gap and output gap are significant in the model [48]. The bank rate adjusts to changes in interbank rate, but marginally with an adjustment parameter of 0.141, implying that a percentage increase in the market determined interest rate (interbank rate) results into adjustment of the bank rate by about 0.859 per cent (that is, $1-\rho$). A 1 per cent increase in output gap results to reduction of the bank rate by 0.128 per cent.

Table 5.1: Reaction Function of Central Bank of Kenya

	Model	ρ	γ_1	γ_2	γ_3	φ_1	Adj. R^2	J-statistic
Baseline	I	0.141	-0.145	-0.128			0.742	28.904
		(2.254)	(-5.362)	(-10.417)				(0.007)
Exchange rate	II	0.533	-0.038	-0.120		0.675	0.722	20.758
		(4.717)	(-0.788)	(-10.322)		(3.731)		(0.188)
	III	0.529	-0.053	-0.124	0.002	0.498	0.755	15.892
		(7.062)	(-1.805)	(-11.513)	(1.356)	(5.858)		(0.664)

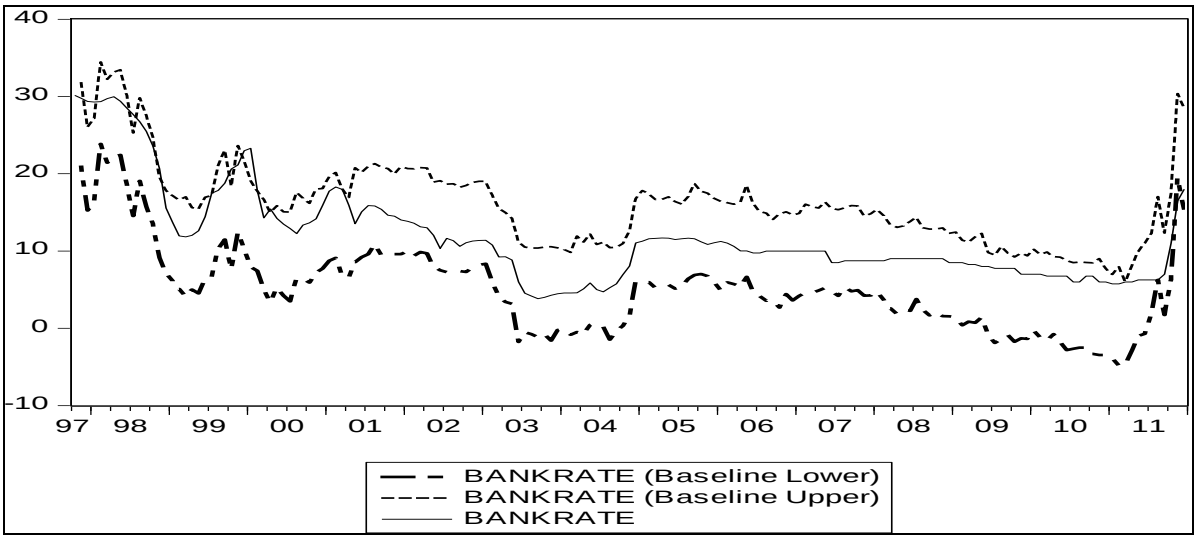
Note: The *t*-values are in brackets. For the *J* statistics, probability is provided in brackets.
Parameters: ρ is adjustment parameter; γ_1 inflation gap; γ_2 output gap; γ_3 change in output gap; φ_1 change in exchange rate.

The coefficient of inflation gap is significant but with unexpected sign, implying that bank rate is adjusted downwards by 0.145 when inflation gap increases by 1 per cent. However, the instruments used in this model are not valid as shown by the *J* statistic. The *J* statistics is reported as 28.90 with a probability of 0.007, implying that moments of estimation are misspecified.

[48] See appendix section for details.

Figure 5.7 presents the trend of the bank rate and dynamic simulations of the upper and lower bounds of the bank rate using the baseline model at 95 per cent confidence interval. It is evident that the bank rate was at the upper bound from 1997 to 1999 and in 2011, lower bound from 2000 to 2007, and within the middle of both bounds from 2008 to 2010. While within the upper and lower bounds, the bank rate needs to be somewhere in the middle as this is a reflection of consistent and stable policy.

Figure 5.7: Trend of Bank Rate, 1997:10 to 2011:12



Source: Based on estimated monetary policy rule

The baseline model does not include other factors such as the exchange rate which are observed when monetary policy decisions are made. Chapter 4 of this thesis established that the effect of short term flows is experienced in an economy through its impact on the nominal exchange rate. Hence, to indirectly account for the effect of short term capital flows in the reaction function, the movement in nominal exchange rate has to be taken into account in managing monetary policy. Inclusion of exchange rate, captured by the change in nominal effective exchange rate to the baseline model improves the estimates of the policy reaction function. This model has been

extended further by including the difference between output growth and its potential. This is backed by the argument that policy may be responding to either the level of the output gap or the difference between output growth and its potential (Orphanides, 2010).

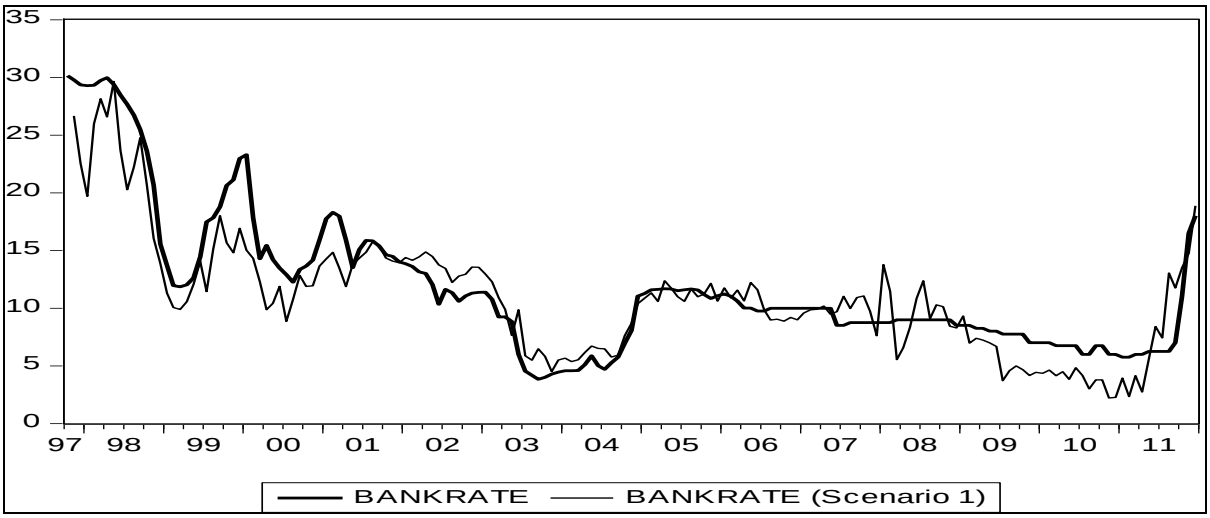
Without considering growth in output gap (model II), the smoothing parameter of the interbank rate improved to 0.533, implying that a percentage change in the interbank rate now results to adjustment of bank rate by about 0.47 per cent instead of over 0.80 per cent as before. Coefficient of inflation gap is now insignificant when setting the bank rate, while a percentage change in nominal effective exchange rate leads to the bank rate being adjusted upwards by 0.675 per cent. Inclusion of deviation of output growth from its potential results to marginal reduction in coefficients of output gap, change in exchange rate and the adjustment parameter, but its coefficient is not significant in the equation (model III). Hence, though it reduces R^2, it helps in ensuring that the coefficient of inflation has the correct sign and is significant at 10 per cent. The *J* statistics with a null that the instruments used are valid is not rejected in both models II and III with inclusion of deviation of output growth from its potential.

The implication is that with inclusion of change in exchange rate to capture the effect of monetary policy, the rate of adjusting market interest rates increases. From the analysis of the effect of innovation in short term capital flows on exchange rate (Chapter 4), short term capital flows have a strong impact on exchange rate. Increase in short term capital flows results to appreciation of the exchange rate, and this effect can be countered by tightening monetary policy by increasing the bank rate. Consideration of exchange rate in the monetary policy rule also leads to a change of focus from the inflation gap. One reason for this may be that inflation in Kenya is driven more by structural and not monetary factors (Duravell and Ndung'u, 2001). Another

reason may be the method used to calculate CPI, which was changed to geometric from arithmetic. The geometric method tends to give lower values of CPI, hence inflation. This may have affected the impact of inflation in the reaction function, since the study used the geometric derived inflation numbers. However, with change in output gap being considered, inflation gap is given some consideration in the monetary policy rule since, high deviations from targeted inflation will result into deviations of the output gap as well or given that inflation has a negative impact on the economy.

Figure 5.8 compares the actual bank rate and a dynamic simulation of what the bank rate would be if the exchange rate is considered in the monetary policy rule. A big deviation of the two rates is evident from 1997 to 2000, in 2002, 2007 to 2008, and 2009 to 2011 (Figure 5.9). The deviation is calculated as actual bank rate less the simulated bank rate.

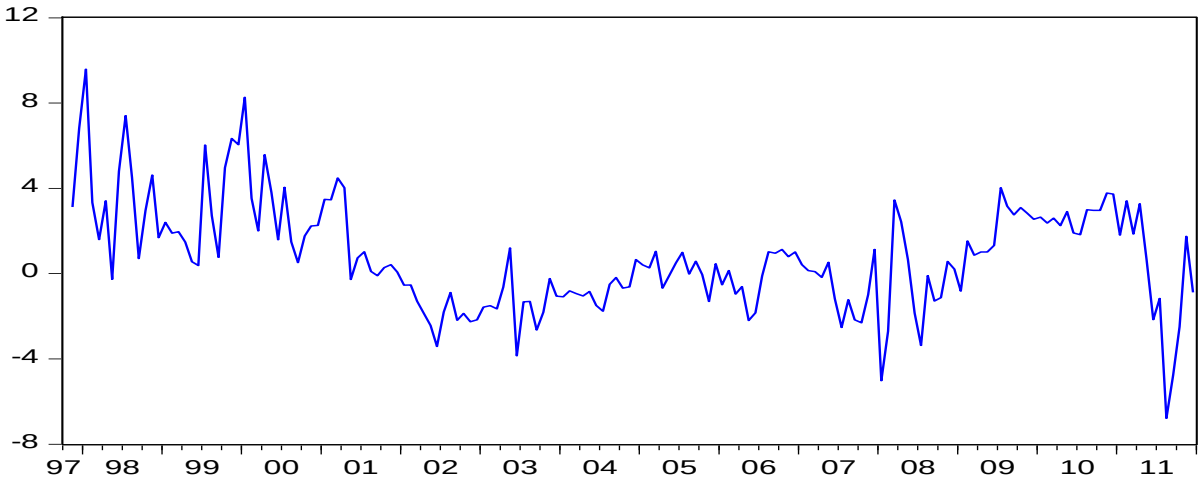
Figure 5.8: Trend of Actual Bank Rate and the Bank Rate with Exchange Rate in the Monetary Rule, 1997:10 to 2011:12



Source: Based on estimated monetary policy rule

These periods faced a number of challenges such as unfavourable weather leading to El-Nino in 1997-8 and drought in 2000; uncertainties due to elections in 1997, 2002 and 2007; global financial crisis in 2008; and high international oil and Euro crisis in 2011. These brought a challenge in implementing monetary policy as inflation increased and exchange rate depreciated, while, at the same time, there is need to support growth. In 2011, for instance, the nominal exchange rate was depreciating and the appropriate monetary policy would have been to raise interest rates. However, the central bank rate was maintained at fairly stable level resulting to a variance of about 7 per cent.

Figure 5.9: Deviation of Actual Bank Rate from Simulated Bank Rate Considering Exchange Rate



Source: Based on estimated monetary policy rule

The model was tested for stability by including a dummy for the introduction of central bank rate (CBR) as a bank rate in June 2006 and the results compared to those of the base rate (Table 5.2). This was meant to test if there are any significant differences in monetary policy before and after implementation of CBR.

Table 5.2: Reaction Function of Central Bank of Kenya including Dummy for 2006:06

	ρ	γ_1	γ_2	φ_1	*D6*	Adj. R^2	J-statistic
Baseline	0.141	-0.145	-0.128			0.742	28.904
	(2.254)	(-5.362)	(-10.417)				(0.007)
Including dummy for 2006:06	0.489	-0.084	-0.115	0.558	1.017	0.743	19.734
	(4.107)	(-1.552)	(-9.712)	(3.150)	(1.636)		(0.182)

Note: The *t*-values are in brackets. For the *J* statistics, probability is provided in brackets.
Parameters: ρ is adjustment parameter; γ_1 inflation gap; γ_2 output gap; φ_1 change in exchange rate; *D6* is dummy for June 2006.

The coefficient of the dummy variable is not significant though the results are still consistent with those of the base line model. This implies that change from TBR+3 to use of CBR did not change the monetary policy stance a lot. The adjustment of interbank rate however improved from a coefficient of 0.14 to 0.49 and the coefficient of exchange rate is still highly significant as was the case without the inclusion of a dummy variable. The instruments are also valid as shown by the *J* statistics.

5.6 Summary and Conclusion

This chapter analyses the implication of short term capital flows on monetary management by establishing how the decisions on monetary policy are affected by short term capital flows. The chapter models the reaction function of monetary policy, given the impact of short term flows which is experienced through the exchange rate. A baseline model which does not take into consideration the effect of short term capital flows is tested. The model is then expanded by considering the presence of short term capital flows when making monetary policy decisions. This is done by including changes in exchange rate in the monetary policy rule. The essay also tests whether a change to the use of CBR had any effect on the monetary policy stance. The results obtained from the analysis are:

First, monetary policy reaction function shows adjustment of monetary policy instrument to restore stability in the economy. The results reveal that the central bank adjusts the bank rate to restore stability in the economy, focusing mainly on adjustment of the output gap. This means that, holding other factors constant, the central bank does not consider inflation gap in its monetary policy decisions.

Second, the market responds to changes in the bank rate by smoothing the interbank interest rates. This ensures that changes in the interest rates do not affect the private sector activities as they are adjusted to reflect the stance of monetary policy.

Third, consideration of exchange rate in the monetary policy rule improves the response of the bank rate to inflation increases. However, inflation gap is only considered when change in output gap is observed in the monetary policy rule.

The analysis shows consistency in monetary policy even with the move from using Treasury bill rate to CBR as the bank rate. Inclusion of exchange rate, captured by the change in nominal effective exchange rate, to the monetary policy rule improves the estimates of the policy reaction function. Since the effect of short term capital flows is experienced through the exchange rate, this captures those effects in the monetary policy rule. The results suggest that in managing monetary policy, due consideration should be given to exchange rate since this is the avenue through which short term capital flows are transmitted to the economy. However, taking into account exchange rate in a monetary policy rule, focus changes from inflation to exchange rate. While the factors that affect inflation in Kenya are structural in nature, the domestic prices are affected more by external shocks, which are well addressed by ensuring stability of the exchange rate.

Based on the findings, monetary authorities should focus on monetary management to ensure exchange rate stability, so as to meet other monetary policy objectives. Hence, change in exchange rate should be given consideration when adjusting the bank rate as a way to also address the impact of short term capital flows in the economy. There is also need for the monetary authorities to be cognisant of both the output gap, and change in output gap as this will assist in establishing the level of adjustment necessary in meeting the growth objectives.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Summary

The study empirically examines the impact of short term capital flows on macroeconomic prices in Kenya. The main argument advanced is that short term flows are volatile, thus leading to macroeconomic instability, hence affecting macroeconomic management, especially monetary policy management. While the effect of capital flows has been widely studied in more developed and in some emerging markets, more evidence is still needed in countries like Kenya where the volumes of short term capital have been growing. The question is what the likely impact of short term capital flows are in Kenya. This is addressed by focusing mainly on how short term capital flows affect macroeconomic prices, that is, stock market index, interest rates and exchange rate. The implication of short term capital flows in monetary management is considered by establishing how the decisions on monetary policy are affected by short term capital flows, using a monetary policy rule.

The first empirical chapter uses a multifactor asset pricing model to establish the link between portfolio flows and stock market performance. An arbitrage pricing theory model which considers the factors that affect stock market return is developed, and portfolio flows is included as one of the determinants. The effect of portfolio flows is tested by separating the expected from the unexpected component, and then testing whether the various hypothesis on foreign investments in the stock market hold.

This is built further in the second part where a VAR model is developed to link short term flows to interest rate and exchange rate. The analysis in the second part starts with empirically testing whether covered interest parity between the Kenya Shilling and the US dollar holds using a cointegration framework. Covered interest parity is tested both for the case with no short term capital flows and then by considering short term capital flows and international reserves. A structural VAR model is then used to establish first how capital flows affect various macroeconomic variables, especially interest rate and exchange rate, and then establishing whether short term capital flows cause exchange market pressure.

The third empirical chapter models the reaction function of monetary policy given the impact of short term flows which is experienced through the exchange rate. First, a baseline model which does not take into consideration the effect of short term capital flows is tested. This model is then expanded by considering the presence of short term capital flows when making monetary policy decisions by including the changes in the exchange rate in the monetary policy rule.

Based on the analysis from the various models, a number of findings are drawn. First, participation of foreign investors has an effect on domestic stock market returns. The empirical results show that the stock market return is affected by lagged unexpected flows and not by its contemporaneous value. The price pressure hypothesis is also supported, only weakly, with security prices revised downwards with a lag in unexpected flows. The base-broadening hypothesis also holds (as the coefficients of expected flows are positive), hence the amount of foreign investment in the market drives up returns, hence the market performance. The implication is that foreign portfolio inflows push stock prices up, which may be due to increased demand. Prices also respond more to previous period's unexpected flows.

Second, internal investors' purchases push prices up and increase market returns. This means that liquidity in the market can be improved by encouraging active participation of local investors. It also reflects confidence in the market in situations where information asymmetry exists between local and foreign investors. Macroeconomic factors, especially the change in exchange rate and Treasury bill rate, are also found to be important in determining returns. Changes in exchange rate reduce returns with a response coefficient of -0.151.

Third, macroeconomic factors, that is, exchange rate and interest rate, are important in determining stock market performance as their coefficients are significant. The exchange rate may create uncertainty in the market as the value of assets is eroded due to depreciations. On the other hand, Treasury bill rate may reflect improvement in asset return levels as it captures risk free rate, thus pushing prices up. Stability of exchange rate is therefore important in ensuring stability in the stock market.

Fourth, there was no feedback effect between returns and foreign portfolio flows, with the effect only running from portfolio flows to returns. This may point to the fact that foreign investors are mainly attracted in the market for risk diversification purposes, rather than returns. The expected portfolio flows show a positive and significant relationship to stock market returns, implying that increase in expected portfolio flows will stimulate market performance as it creates confidence among investors in the market.

Fifth, covered interest parity holds between the Kenyan shilling and US dollar only when reserves and short term capital flows are not considered. However, with the inclusion of reserves and short term capital flows, covered interest parity fails. This means that foreign capital will be

attracted to the domestic market to take advantage of interest rate differentials as arbitrage opportunities exist.

Sixth, increased short term capital flows affect monetary stability by reducing the interest rates over time, however, the effect is weak.

Seventh, increased short term capital inflows lead to currency appreciation and the effect is persistent for up to 8 periods. Hence, the impact of short term flows on macroeconomic prices is felt for a longer period in the exchange rate market. This is because inflow of short term capital leads to improvements in the stock of reserves, thus providing room for monetary policy intervention in the foreign exchange market. Despite the appreciation, short term capital flows have no significant effect on the exchange market pressure. This may be because the amount of short term capital inflows is not substantial enough and they can thus destabilise the exchange rate.

Eighth, innovations in short term flows significantly affect growth at the first period with 10 per cent increase in short term flows leading to increase in GDP by 0.01 per cent. This shows the impacts of short term flows on economic growth as they finance economic growth by making capital available for investment.

Ninth, short term capital flows have no direct effect on exchange market pressure. Hence, exchange market pressure is mainly caused by changes in exchange rate that result to reduction in international reserves and not by short term capital flows. The implication is that the stock of official foreign exchange reserves held by the monetary authorities should be adequate to address

any instability in the foreign exchange market, as reserves act as buffers during periods of exchange rate fluctuations.

Tenth, the central bank adjusts the bank rate to restore stability in the economy, focusing on adjustment of the output gap and not inflation gap. This is against what is expected as the assumption has been that the central bank takes into consideration movement in prices when setting the bank rate. The explanation for this is that inflation is determined by structural factors and the fact that geometric derived inflation figures, which tend to give lower values of CPI, hence inflation, were used in analysis.

Eleventh, consideration of the exchange rate in the monetary policy rule improves the estimates of the policy reaction function. Since the effect of short term capital flows is experienced through the exchange rate, this captures effects in the monetary policy rule.

6.2 Conclusions

This study has shown that consideration of short term capital flows is important for macroeconomic management. Short term capital flows have been growing in developing countries, though the current levels are still low. This is the same situation in Kenya, and this provides room for increased inflows of short term capital. Hence, it is important to start thinking of the likely effect of such capital flows to the economy. On the impact of portfolio flows on stock market performance, the study concludes that portfolio flows are important in determining market returns as they lead to share price changes. Given that the stock market is liberalised, it is necessary to be cognisant of the implications of this on the stock market performance. Foreign capital is necessary for provision of capital and financing growth of countries such as Kenya,

since they reduce the cost of capital and make it available to most firms. However, the stock market can only develop further if these foreign flows are encouraged through proper policies, however the regulations should also ensure that the market is not affected much when there are capital outflows.

On the impact of short term capital flows on interest rate and exchange rate, short term flows cause macroeconomic instability as they lead to appreciation of the currency and increase in interest rate when they come in. This also has an impact on international trade, especially if the short term inflows are high. Since there is no direct control over short term flows, this raises concerns to monetary policy management, especially if these flows are volatile. Also, most of the short term capital that flows into the country are mainly for return and diversification purposes as the covered interest rate parity does not hold in the Kenyan case, especially when short term capital flows are taken into consideration.

Despite the challenge of short term capital flows, it has been established that they do not lead to exchange market pressure. This may be because of the currently low levels of short term capital flows in comparison to other emerging markets. The effect however may be felt with increased flows of short term capital. The finding that short term capital flow effects are experienced through the effect on exchange rate implies that ensuring a stable currency may not be easy, especially if the short term rates are volatile. The implication is that monetary policy management has to take into consideration short term capital flows when making monetary policy decisions. This can be ensured by considering the changes in the currency when setting the central bank rate (CBR).

6.3 Policy recommendations

Based on the findings of the study, the following recommendations are made:

a) The capital market regulator should increase investor education and awareness campaigns for local investors so that their participation at the stock market can increase. Active participation of local investors is necessary to drive liquidity and bring confidence to the market. This will make the stock market to withstand the shock of unexpected foreign portfolio flows.

b) Monetary authorities should ensure macroeconomic stability prevails, especially in the exchange rate and interest rates as this will reduce uncertainty and improve confidence in the stock market.

c) Measures should be put in place to ensure that inflows of short term capital are not disruptive as they lead to appreciation of the currency, making the country uncompetitive, and increase in interest rates leading to high costs of credit and affects investment. Hence, with the growing volume of short term capital flows into the country, focus should be on how well the inflows can be harnessed to support growth, while at the same time ensuring macroeconomic stability.

d) Monetary authorities should focus monetary management to ensuring exchange rate stability as this will ensure that other monetary policy objectives are met. Hence, change in exchange rate should be given consideration when adjusting the bank rate as a way to also address the impact of short term capital flows in the economy.

e) Monetary authorities need to be cognisant of both the output gap and change in output gap when making monetary policy decisions, as this will assist in establishing the level of adjustment necessary in meeting the growth objectives.

6.4 Areas for Further Research

The study provided findings that were within the objectives set out. However, the findings reveal potential areas that should be considered for further research. The first empirical chapter established that portfolio flows have an impact on firm performance as proxied by return on stock market index. Despite this important finding, it is necessary to establish how portfolio inflows from foreign investors affect performance of specific industries or firms at the micro level. This is because foreign investment may be attracted to different firms depending either on returns, growth opportunities available or stability in prices such that those investments are used to hedge against risk.

Foreign investment also affects liquidity of shares of specific firms and, to a large extent, the preference for debt or equity financing. Another area that can be considered is how foreign finances affect investment at the firm level. This is because the choice of investment to take may depend on the nature of financing available to the firm. This can also be linked to the agency theory of the firm or governance of firms with high foreign interests. These areas are beyond the scope of this study. Research in these areas will be able to highlight more firm and industry specific effects.

In the monetary policy rule, the effect of inflation was not significant. One reason advanced is that inflation is affected more by structural factors and not monetary policy. This implies that

analysis of a monetary policy rule needs to include other sectors of the economy within one framework. Hence, it may be necessary to explore the use of dynamic stochastic general equilibrium models (DSGE) to evaluate the effect of monetary policy in the economy. DSGE models have been in use for monetary policy evaluations in developed countries. The advantage of these models is that it takes a microeconomic approach to monetary policy evaluation by capturing various sectors of the economy and incorporates within it the monetary policy rule. Their use will allow for adequate representation of the structure of the economy as they capture the nature of the financial market and provide the welfare implications of monetary policy. In developing the DSGE models, one factor that should be taken into account is that the market is imperfect, thus an adjustment to the models currently in use is necessary.

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APPENDIX TABLES

Table A1: Foreign Investors' Activity at the NSE, 1996 - 2011, KShs. million*

Year	Purchase	Sales	Net Inflows	Total Turnover	Average foreign turnover to total turnover (%)
1996	633.2	62.2	571.1	695.4	8.18
1997	1,664.2	101.4	1,562.8	1,765.6	13.51
1998	411.9	334.4	77.5	746.3	7.94
1999	210.3	769.6	-559.3	979.9	9.02
2000	89.2	606.3	-517.2	695.5	9.06
2001	231.2	227.7	3.5	459.0	6.81
2002	140.3	239.0	-98.7	379.3	6.76
2003	358.1	161.2	196.9	519.3	2.05
2004	4.0	24.2	-20.1	28.2	0.06
2005	1,515.2	2,192.7	-677.6	3,707.9	4.84
2006	53.2	53.6	-0.5	106.8	0.06
2007	317.3	67.5	249.8	384.7	0.21
2008	15,479.9	23,669.1	-8,189.2	39,149.0	21.20
2009	15,723.2	7,397.2	8,326.0	23,120.4	28.52
2010	30,706.4	15,579.5	15,126.8	46,285.9	22.98
2011	39,492.6	39,272.3	220.3	78,764.9	51.89

*The information for 1996 is aggregated from April to December. Average foreign turnover to total turnover is the annual average of monthly percentages of foreign turnover to total turnover.
Source: Computations using data from Nairobi Securities Exchange.

Table A2: Initial Public Offers (IPOs), Public Offers (POs), Introductions and Offers for Sales (OFS), 2000 - 2011

Company	Ordinary Shares	Type of Issue Value	Year of Issue	Issue Price	Sum Raised	Rate of Subscription (%)
Pan African Insurance Holdings	24,000,000	OFS	2000	21.50	516,000,000	100.00
African Lakes (Delisted in 2003)	4,000,000	IPO	2000 Mar	94.50	378,000,000	150.00
ICDC	8,948,725	OFS	2001	37.00	211,905,808	64.00
Mumias Sugar	300,000,000	IPO	2001 Nov	6.25	1,125,000,000	60.00
Express Kenya	27,385,264	IPO	2003 Dec	6.50	178,000,000	100.00
KCB	50,000,000	IPO	2004 Jun	49.00	2,450,000,000	112.25
Kengen	658,900,000	IPO	2006 Apr	11.90	7,840,910,000	340.00
Scangroup	69,000,000	IPO	2006 Jun	10.45	721050000	620.00
Equity Bank	90,500,000	Introduction	2006 July	90.00	N/A	N/A
Eveready	63,000,000	IPO	2006 Aug	9.50	598,500,000	830.00
Mumias Sugar Company	91,999,220	OFS	2006 Dec	49.50	4,320,000,000	95.00
Access Kenya	80,000,000	IPO	2007 Mar	10.00	800,000,000	363.00
Kenya Re	240,000,000	IPO	2007 July	9.50	2,280,000,000	334.00
Safaricom	10,000,000,000	IPO	2008 Jun	5.00	50,000,000,000	463.00
Co-op Bank	701,000,000	IPO	2008 Oct	9.50	5,400,000,000	81.00
Deacons Kenya	12,800,000	PO	2010	62.50	700,990,000	87.50
British American Insurance	660,000,000	IPO	2011 Sep	9.00	3,515,103,000	60.00
CFC Insurance Holdings	515,270,364	Introduction	2011	6.15	N/A	N/A
Transcentury Group	267,038,090	Introduction	2011 July	50.00	N/A	N/A
Total	**13,863,842,443**				**81,269,458,808**	

Source: Compiled from CMA Quarterly Statistical Bulletins.

Table A3: VAR Granger Causality/Block Exogeneity Wald Tests

Sample: January 1999 to December 2012
Number of observations: 145

Dependent variable: *LSTFLOW*

Excluded	Chi-sq	df	Prob.
LGDP	14.06	11	0.23
LCPI	15.80	11	0.15
LTBIL	5.96	11	0.88
LDC	18.19	11	0.08
LNEER	19.68	11	0.05
All	80.56	55	0.01

Dependent variable: *LGDP*

Excluded	Chi-sq	df	Prob.
LSTFLOW	9.09	11	0.61
LCPI	12.33	11	0.34
LTBIL	15.76	11	0.15
LDC	8.18	11	0.70
LNEER	10.02	11	0.53
All	57.92	55	0.37

Dependent variable: *LCPI*

Excluded	Chi-sq	df	Prob.
LSTFLOW	10.05	11	0.53
LGDP	20.47	11	0.04
LTBIL	9.94	11	0.54
LDC	19.64	11	0.05
LNEER	13.71	11	0.25
All	74.00	55	0.04

Dependent variable: *LTBIL*

Excluded	Chi-sq	df	Prob.
LSTFLOW	9.43	11	0.58
LGDP	10.77	11	0.46
LCPI	7.71	11	0.74
LDC	13.16	11	0.28
LNEER	20.74	11	0.04
All	65.76	55	0.15

Dependent variable: *LDC*

Excluded	Chi-sq	df	Prob.
LSTFLOW	7.81	11	0.73
LGDP	9.70	11	0.56
LCPI	9.53	11	0.57
LTBIL	11.17	11	0.43
LNEER	20.53	11	0.04
All	63.59	55	0.20

Dependent variable: *LNEER*

Excluded	Chi-sq	df	Prob.
LSTFLOW	12.64	11	0.32
LGDP	28.78	11	0.00
LCPI	5.86	11	0.88
LTBIL	22.13	11	0.02
LDC	16.35	11	0.13
All	85.54	55	0.01

Table A4: VAR Granger Causality/Block Exogeneity Wald Tests (using *EMP*)

Sample: January 1999 to December 2011
Number of observations: 152

Dependent variable: *LSTFLOW*

Excluded	Chi-sq	df	Prob.
LNER	6.29	4	0.18
LDC	27.61	4	0.00
EMP	6.85	4	0.14
LEXRET	11.16	4	0.02
All	48.20	16	0.00

Dependent variable: *LNER*

Excluded	Chi-sq	df	Prob.
LSTFLOW	4.35	4	0.36
LDC	2.19	4	0.70
EMP	11.88	4	0.02
LEXRET	4.31	4	0.37
All	25.16	16	0.07

Dependent variable: *LDC*

Excluded	Chi-sq	df	Prob.
LSTFLOW	6.93	4	0.14
LNER	23.13	4	0.00
EMP	3.28	4	0.51
LEXRET	7.98	4	0.09
All	35.92	16	0.00

Dependent variable: *EMP*

Excluded	Chi-sq	df	Prob.
LSTFLOW	4.90	4	0.30
LNER	8.32	4	0.08
LDC	2.50	4	0.64
LEXRET	0.52	4	0.97
All	17.99	16	0.32

Dependent variable: *LEXRET*

Excluded	Chi-sq	df	Prob.
LSTFLOW	2.90	4	0.57
LNER	19.45	4	0.00
LDC	8.27	4	0.08
EMP	4.34	4	0.36
All	35.40	16	0.00

Table A5: Estimates of Monetary Policy Reaction Function - Baseline (Model I)

	Coef.	Std. Error	t-Statistic	Prob.
Interbank(-1)	0.141	0.062	2.254	0.026
Inflation gap	-0.145	0.027	-5.362	0.000
Output gap	-0.128	0.012	-10.417	0.000
R-sq.	0.745	Mean dependent var		11.148
Adj.R-sq.	0.742	S.D. dependent var		5.271
S.E.	2.677	SSR		1161.217
DW stat	0.396	J-statistic		28.904
Instrument rank	16	Prob(J-statistic)		0.007

Dependent variable: Bankrate. *Instruments*: Output gap (-1 to -3, -6), Inflation gap (-1 to -3, -6), Interbank (-1 to -3, -6), Bankrate (-1, -3, -6), Constant. *Sample*: April 1998 – December 2011 (n = 165).

Table A6: Estimates of Monetary Policy Reaction Function - Exchange rate (Model II)

	Coef.	Std. Error	t-Statistic	Prob.
Interbank(-1)	0.533	0.113	4.717	0.000
Inflation gap	-0.038	0.048	-0.788	0.432
Output gap	-0.120	0.012	-10.322	0.000
Δ *Nominal exchange rate*	0.675	0.181	3.731	0.000
R-sq.	0.727	Mean dependent var		11.034
Adj.R-sq.	0.722	S.D. dependent var		5.076
S.E.	2.675	SSR		1144.633
DW stat	0.703	J-statistic		20.758
Instrument rank	20	Prob(J-statistic)		0.188

Dependent variable: Bankrate. *Instruments*: Output gap (-1 to -3, -6), Inflation gap (-1 to -3, -6), Interbank (-1 to -3, -6), Δ Nominal exchange rate (-1 to -3, -6), Bankrate (-1, -3, -6), Constant. *Sample*: May 1998 – December 2011 (*n* = 164).

Table A7: Estimates of Monetary Policy Reaction Function - Exchange rate (Model III)

	Coef.	Std. Error	t-Statistic	Prob.
Interbank(-1)	0.529	0.075	7.062	0.000
Inflation gap	-0.053	0.029	-1.806	0.073
Output gap	-0.124	0.011	-11.513	0.000
Δ *Output gap*	0.002	0.001	1.356	0.177
Δ *Nominal exchange rate*	0.498	0.085	5.858	0.000
R-sq.	0.761	Mean dependent var		11.034
Adj.R-sq.	0.755	S.D. dependent var		5.076
S.E.	2.510	SSR		1001.807
DW stat	0.539	J-statistic		15.892
Instrument rank	24	Prob(J-statistic)		0.664

Dependent variable: Bankrate. *Instruments*: Output gap (-1 to -3, -6), Inflation gap (-1 to -3, -6), Interbank (-1 to -3, -6), Δ Output gap (-1 to -3, -6), Δ Nominal exchange rate (-1 to -3, -6), Bankrate (-1, -3, -6), Constant. *Sample*: May 1998 – December 2011 (*n* = 164).

APPENDIX FIGURES

Figure A1: Inverse Roots of AR Characteristic Polynomial

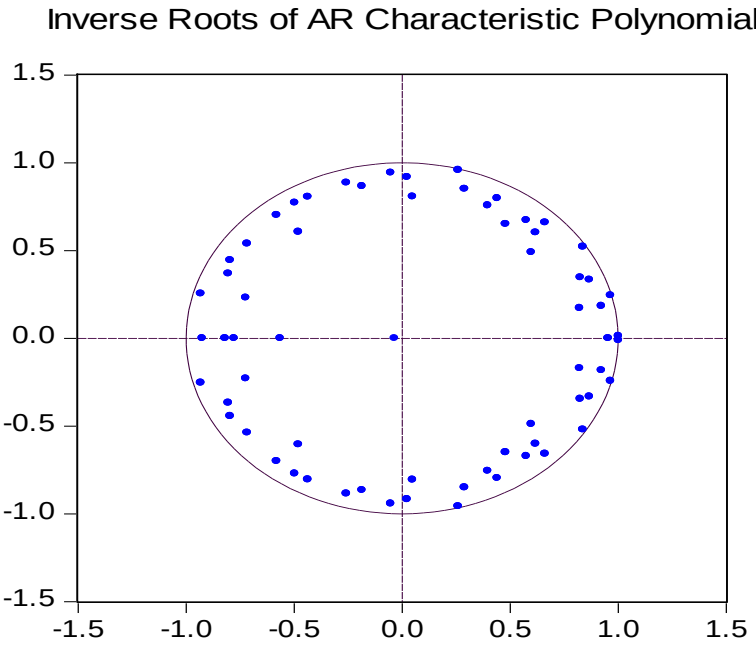

Figure A2: Impulse Response to Short Term Interest Rate (*LTBIL*) Transmission Mechanism

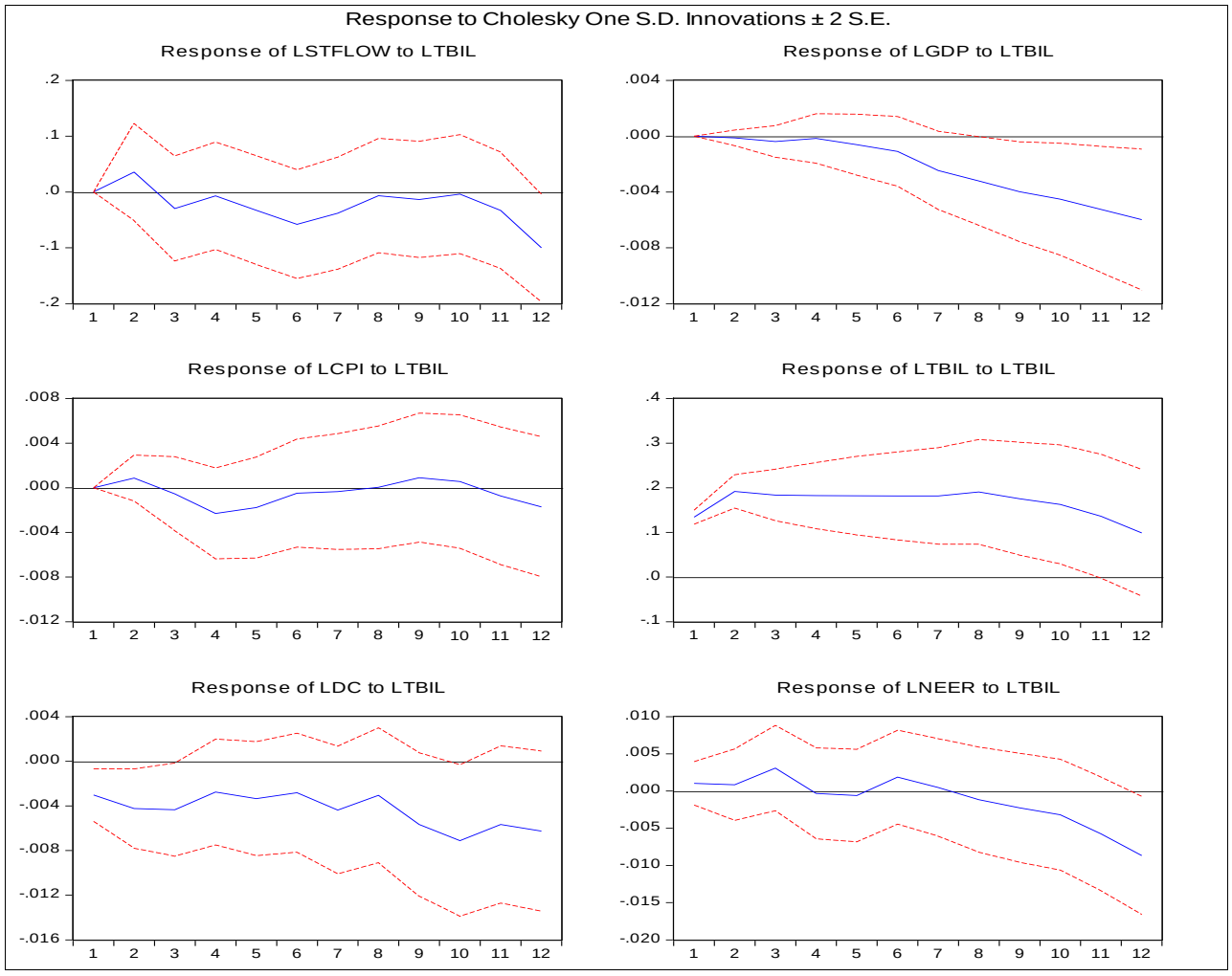

Figure A3: Inverse Roots of AR Characteristic Polynomial

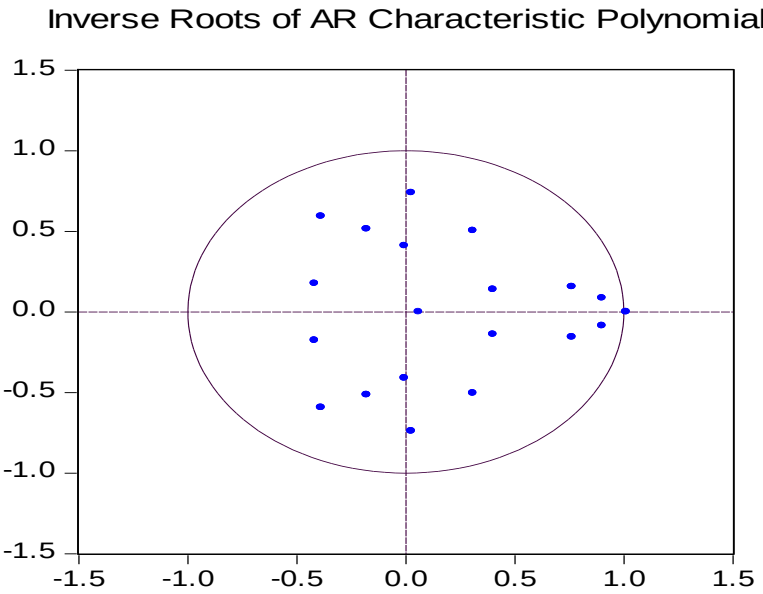

Figure A4: Impulse Response to Exchange Market Pressure (*EMP*) Transmission Mechanism