Short Term Private Capital Flows and Real Exchange Rate in Kenya

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Abstract

Kenya's capital and financial account balance displays a sharp shift in external financing from official assistance to private capital transfers in the 1990s. Whereas the capital account of the balance of payment reflects a surplus, the current account balance shows a huge deficit, which is increasing over time. Foreign exchange reserve, on the other hand, is building up. This paper examines the relationship between short-term private capital flow and real exchange rate in Kenya. Using Vector Error Correction Model (VECM), the analysis reveals that a long-run relationship exists between real exchange rate and its fundamentals. Furthermore, short-term private capital flows are associated with exchange rate appreciation, such that a 10 per cent increase in short-term private capital flows will appreciate the real exchange rate by 0.5 per cent. Other macroeconomic variables are also identified as having negative effects on the real exchange rate. The study reveals that real exchange rate appreciation leads to a loss of external competitiveness, which hurts exports, and that sterilization through sale of government securities to mop-up excess liquidity seems a sub-optimal option since interest rates are affected in the process. An important policy intervention is that of reducing domestic interest rate to close the gap in real interest differential. This may lead to a reduction in short-term private capital flows and eventual weakening of the shilling.

Abbreviations and Acronyms

ADF	Augmented Dickey Fuller
AERC	African Economics Research Consortium
CBK	Central Bank of Kenya
ECM	Error Correction Model
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IFS	International Financial Statistics
IMF	International Monetary Fund
IRP	Interest Rate Parity
NSE	Nairobi Stock Exchange
PP	Phillips-Perron
PPP	Purchasing Power Parity
RER	Real Exchange Rate
UIP	Uncovered Interest Parity
UNCTAD	United Nations Conference on Trade and Development
VAR	Vector Autoregressive model
VECM	Vector Error Correction Model

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1. Introduction

In the 1970s and 1980s, capital flows were mainly directed to the government and/or the private sector through the banking system, and this was mainly in the form of official flows. Thereafter, in the 1990s, capital flows took the form of equity and debt-based flows[1] (Morrissey and Osei, 2004). This was brought about by the wave of integration of poor developing countries into the global economy in the late twentieth century and the market-oriented reforms instituted in many countries, which liberalized access to financial markets. These events are associated with a surge in the volume of short term private capital flows.

Capital flows are fundamental elements in economic performance since they provide resources to finance investment and stimulate economic growth, hence smoothing out consumption, which raises welfare of the people in developing countries. Furthermore, they help countries to achieve better diversification of their portfolios as they search for higher returns. However, the potential volatility of international short-term private capital flows could carry risks to developing economies with less resilient financial markets and could undermine macroeconomic stability.

The concern about increased short-term private capital flows and its destabilizing effects goes beyond immediate fear as it affects not only the financial system but also other markets in the economy. FitzGerald (1998) identified the various channels as follows:

(a) Relative prices are shifted by the inflows and subsequent outflows of capital, since non-residents acquire and subsequently sale the domestic financial assets and this distorts resource allocation decisions particularly through fluctuations in the exchange rate and the domestic interest rates

(b) Aggregate demand fluctuates abruptly due to changes in money supply brought about by shifts in foreign exchange reserves held by public and private financial institutions as capital flows in or out, and the monetary interventions by the authorities in the attempt to manage balance of payments

[1] Flows of private finance take the form of: (a) Equity-based, which includes foreign direct investment (FDI) and portfolio investment; (b) Debt-based, which include asset-based loans and trade financing.

(c) Fluctuations themselves raise the level of country risk, which then depresses foreign investment and makes government borrowing abroad more difficult, with long-term effects for growth and employment. These undesirable macroeconomic effects render the economy more vulnerable to external shocks.

1.1 Overview

1.1.1 Real exchange rate

Kenya operated a fixed exchange rate regime in the 1960s and 1970s. This period was predominantly characterized by controls in key sectors of the economy (Were *et al.,* 2001). In 1982, the regime shifted from fixed exchange rate to crawling peg, which lasted until 1990 when the country adopted an official dual exchange rate. During this time, there were active measures to implement several financial reform programmes aimed at transforming the controlled economy into a market-driven one, an event which led to the liberalization of the financial market in the early 1990s and capital account balance in 1995 through repeal of the Foreign Exchange Act.[2]

A floating exchange rate system was adopted in 1993. This, according to Ndung'u (1999), was expected to have some advantages for Kenya. For example:

- It would allow a more continuous adjustment of the exchange rate to shifts in the demand for and supply of foreign exchange
- It would equilibrate the demand for and supply of exchange rate by changing the nominal exchange rate rather than the level of reserves
- It would allow Kenya the freedom to pursue its own monetary policy without having to be concerned about balance of payments effects
- The system would allow external imbalances to be reflected in the exchange rate movements instead of reserve movements.

However, the benefits of a floating exchange rate regime have not yielded any fruits since the country has experienced increased flexibility

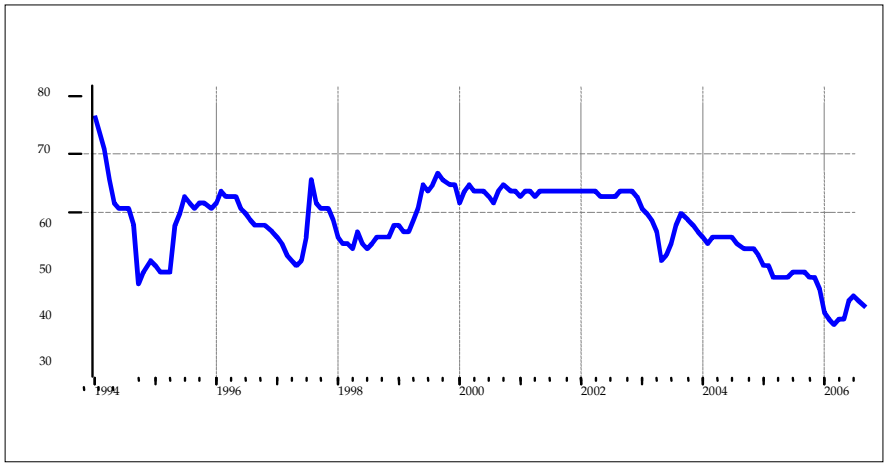
[2] See Ndung'u (2001) for a detailed analysis of the financial liberalization process in Kenya.

in the exchange rate, which has been greatly associated with a general shift towards increased openness, a surge in the international capital flows that are short-term in nature and the globalization of the financial market (Mwega, 2007; Ndung'u, 2001; Were *et al.*, 2001).

Pollin and Heintz (2007) and Mwega (2007) suggested that Kenya's exchange rate is overvalued and that maintaining an overvalued exchange rate has negative implications for long-run economic growth; when the exchange rate appreciates, the country's international competitiveness is reduced because exports become more expensive while imports get cheaper. Figure 1 below presents an index of the real exchange rate. The graph shows that there was a sharp appreciation of the exchange rate after the financial liberalization period. This was the period when the exchange rate responded to sharp inflows of capital that were speculative in nature (Ndung'u, 1997; Ndung'u, 2001). The appreciation period extended until 1995, when there was a slight depreciation due to capital outflows since the authorities had intervened by reducing the Treasury bill rates. Pollin and Heintz (2007) estimated the degree of overvaluation of the Kenyan shilling and found that there were many fluctuations between the periods 1995-2003 with a slight undervaluation in 2000. By the end of 2003, the Kenyan shilling was overvalued by 8 per cent.

By the year 2006, the appreciation of the shilling as shown in the graph, was still being felt. This was linked to various factors, among them: liberalization of cross boarder financial flows, supply side

Figure 1: Real exchange rate, Kenya, 1994-2006



inflation shocks, remittances from abroad and global commodity price boom (Pollin and Heintz, 2007).

1.1.2 Short-term private capital flows

After the liberalization of the capital account balance in 1995, short-term private capital started flowing in; there was a gradual rise in 1994 and 1995 of Ksh 13,774 million and Ksh 16,394 million, respectively. In 1996, the net flows more than doubled to a record Ksh 37,317 million. This was attributed to the stepping up of the weekly Treasury bill rates and the subsequent rise in the domestic interest rates (Ndung'u, 2001). As a result, the difference between domestic and foreign interest rates widened and this triggered the speculative short-term capital inflows.

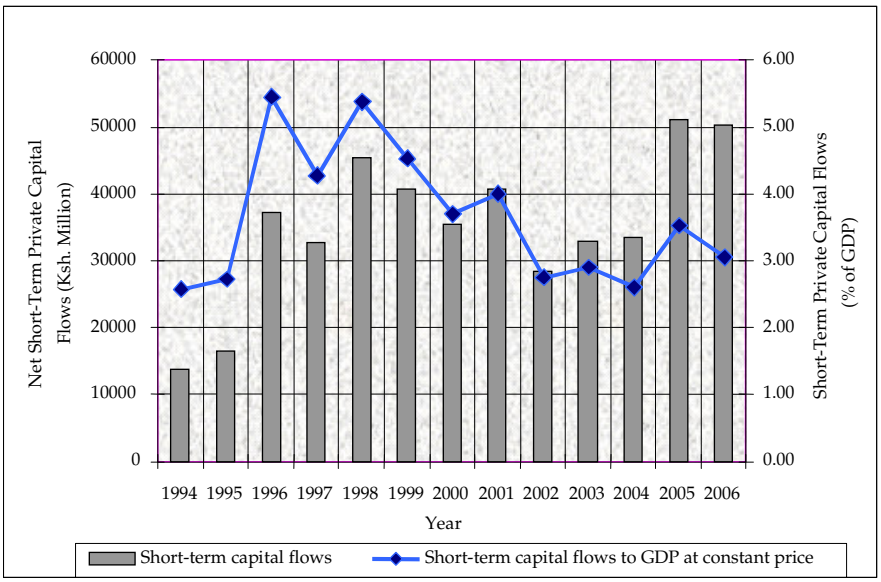
However, 1997 being an election year and given the sensitive nature of these flows, there was a decline of 12.2 per cent, which again rose in 1998. In 2000, it declined by 13.1 per cent to a record Ksh 35,439 million up from Ksh 40,782 million in 1999. The year 2002 recorded a sharp decline of 30.2 per cent to reach a low of Ksh 28,462 million. However, this was attributed to the government policy (to reduce the volume of short-term maturity domestic debt in preference for the relatively longer maturity treasury bonds hence the decline in the short-term interest rate) and the uncertainty regarding the outcome of the 2002 elections (Economic Survey, 2003).

Net short-term private capital flow has, since the year 2002, been on the rise as it peaked in 2005 to settle at Ksh 50,931 million, up from Ksh 33,331 million the previous year. The Economic Survey (2004 and 2006) linked the current surge in the short-term private capital flows to the political regime shift of 2002. Factors cited that have led to increased flows include:

- Improved investor optimism fuelled by speculative demand;
- Anticipated good profitability results for most listed companies;
- A vibrant stock market; and
- Preferred capital gain return relative to the falling risk free Treasury bill rates.

Figure 2 provides the 'real' value of net short-term private capital flows to Kenya.[3] In 1996, Kenya received net short-term private capital flows to GDP ratio of 5.46 per cent. This was the highest ever recorded in the study period because it was the year just after the capital account liberalization. The ratio declined to 4.28 per cent in 1997, which was an election year. The year 1998 saw a significant increase of 5.37 per cent, which gradually declined to 3.69 per cent in 2000. During the period 2001-2005, the annual average rate of short-term private capital flows to GDP ratio was 3.16 per cent and in 2006, it settled at 3.05 per cent, slightly lower than in 2005.[4] From the fore-going discussion, it is clear that there has been increasing net short-term private capital flows to Kenya, which led to increased exposure to volatility of these short-term flows which has undermined the policies aimed at maintaining a stable macroeconomic environment.

Figure 2: Net short-term private capital flows to Kenya (% of GDP), 1994-2006



Source: Economic Survey (various)

[3] GDP deflator was used to calculate the real value of short-term private capital flows. GDP figures are at constant 2001 prices and are sourced from Kenya National Bureau of Statistics database.

[4] This implies that in principle, Kenya owed its creditors 3.05% of GDP in 2006. An external transfer of this magnitude is likely to be quite costly, not only to levels of domestic absorption (consumption and investment), but also to real activities (liquidity squeeze, currency depreciation, etc).

1.2 Problem Statement

The current episode of strong short-term private capital flows and the growing uncertainty about the sustainability of the current pattern to Kenya constitutes a major vulnerability in the macroeconomic management. While many would consider these upsurges as desirable, they are in most cases associated with problems. It is not just the volume of short-term private capital flows, but the speed at which such flows pour in and can be withdrawn, that poses great danger to the macroeconomic fundamentals of the economy.

Variations in prices, such as interest rates and exchange rate, and quantities such as levels of bank credit and money supply are normally affected by short-term capital inflows. Even though these are to be reversed by subsequent outflow, the cumulative effect of inflow distorts the resource allocation decisions and brings about fluctuations of aggregate demand. Furthermore, FirtzGerald (1998) asserted that these variations might have negative effect on business expectations, depress private investment levels and even reduce efficiency of public expenditure. This poses challenges to policy makers in terms of managing short-term private capital flows and ensuring macroeconomic stability.

1.3 Objective of the Study

This study examines how movements in short-term private capital flows affect real exchange rate. The paper also accounts for the effects of other macroeconomic variables on the real exchange rate and draws policy implications.

1.4 Justification of the Study

It is worth noting that the impact of short-term private capital flows varies vastly across countries, time and the stage of financial and economic development as well as economic policies. This calls for the need for individual country study to enable comparison and stylized representation. The implications of short-term private capital flows on exchange rate as documented in various studies raise concerns that are significant for Kenya, which has also witnessed a swing from official

aid flows towards private capital flows in the early 1990s (Fernandez-Arias and Montiel, 1995; FitzGerald, 1998; Ndung'u, 2001; Ryou, 2001).

The Economic Survey (2007) recorded a net short-term private capital flows of Ksh 50 billion in 2006 while the capital and financial account of the balance of payment recorded a net of Ksh 64 billion, implying that the other types of capital flow (foreign direct investment Ksh 1.9 billion, portfolio Ksh 1,487 million and long-term flows Ksh 1,037 million) accounted for a very small per cent of the total capital flows. This paper, therefore, contributes to the current discussion on the implication of short-term private capital flows on real exchange rate.

2. Literature Review

2.1 Theoretical Literature

There has been a vast body of theoretical literature on the consequences of short-term capital on macroeconomic variables. In most of these studies, the factors that led to massive capital inflows and the ways through which short-term capital flows affect the macroeconomic variables have been identified.

A report by the Commonwealth Secretariat (1988), Fernandez-Arias and Montiel (1995) and Montiel (2003) identified the episodic pattern of capital flows from the official aid to a surge of private capital to developing countries. The Commonwealth Secretariat (1988) report revealed that lack of capital-savings relative to the opportunities for productive investment in most of the developing countries provided a complimentary interest to that of savers in developed countries, who were looking for profitable investment opportunities, since the rates of return were conceived to be higher where capital was scarce. Fernandez-Arias and Montiel (1995) and Montiel (2003) argued that the exclusion from world capital market during the debt crisis of the early 1980s led to a substantial number of developing countries experiencing large private capital inflows in the 1990s.

Fernandez-Arias and Montiel (1995) classified long-term and short-term private capital net flows into three different episodes for all the developing countries:

- Surge preceding debt crisis (1978-1981)
- Debt crisis period (1982-1989)
- Current surge (1990-1993).

The study findings indicated that net short-term private capital flows increased in the 1990-1993 period and that in most of the Latin American countries a large proportion of the inflows were used for reserve accumulation as opposed to domestic absorption. For the East Asian countries, the increased domestic absorption was dominated by increased investments as opposed to consumption. This study identified foreign interest rates as a push factor and credit-worthiness as a pull factor. The study further revealed that money multipliers increased and a modest inflation was noted in East Asian countries while in Latin America, the real exchange rate appreciated, which translated to

increased imports and reduced exports. The policy implications include the role of exchange rate either as a nominal anchor or for competitiveness consideration in relation to raising the domestic interest rate and stimulating domestic aggregate demand.

FitzGerald (1998) analyzed the consequences of the short-term capital flows on the real economy and income distribution in developing countries. The analysis showed that short-term capital flow instability arises from the desire of investors to hold liquid assets in the face of uncertainty. This affects the real economy through variations in prices such as interest rates and exchange rate and quantities such as levels of bank credit and sale of government bonds. The study revealed that unsterilized short-term capital inflows often lead to an unstable appreciation of the exchange rate, which prevents export promotion and generates import boom. Moreover, the broader effects of capital flows on the real exchange rate affects the level of aggregate employment in the economy and the level of real wages through the relative prices. Policies proposed by Fitzgerald (1998) included the design of appropriate macroeconomic policy to be preceded by an identification of the causes of original fluctuation of short-term capital flows.

↑

Montiel (2003) identified pull factors that originate from the recipient countries and the push factors that originate from the lending countries and the changes in the degree of financial integration. Concerning the effect on the macroeconomic fundamentals, the study identified the transmission mechanism as:

Capital inflows ↑ → Capital account → Reserves → Monetary base → Money supply → Aggregate demand → Domestic price level → Real exchange rate → Trade deficit

↘ ↗

Real output ↑

Montiel (2003) demonstrated the macroeconomic overheating using a short-run model that links inter-temporal and intra-temporal relative prices with domestic macroeconomic policies as well as various exogenous shocks. This is simultaneously determined in a general equilibrium involving the labour market, goods market and the financial market. He argued that capital inflows resulting from portfolio reallocations on the part of investors causes the domestic money supply

to expand, leading to an expansion of aggregate demand, and causing an appreciation of the real exchange rate and a deterioration of the trade balance.

Agosin (2005) reviewed the Mundell-Fleming model and developed an alternative paradigm called the "neostructuralist" view to analyze the effects of unfettered capital flows in the emerging market. In the model, the goods market (IS curve), money market (LM curve) and the balance of payment (BP curve) are assumed to be at equilibrium. Some modifications made on the key assumptions include: output settles short of its high employment level, heterogeneous capital flows among others. The amplifying mechanism is set off by either push or pull factors, e.g. introduction of market-oriented reforms, which trigger capital inflows. The economy experiences a boom, liquidity constraints are relaxed and asset prices rise. There is a big boost in demand for non-tradables segment of the economy (real estate, commerce, finance), while production of tradables is discouraged by exchange rate appreciation and a rise in real income. Appreciation of the exchange rate makes importable consumer goods cheaper, and giving a further boost to real incomes. Agosin (2005) proposed that there should be proper management of capital flows and exchange rate policy with bands wide enough to allow some flexibility.

2.2 Empirical Literature

The existing empirical literature has basically focused on the effect of short-term private capital flows on the exchange rate. Majority of these studies centered on the emerging economies following the financial crisis experienced in the 1990s due to massive inflows of short-term private capital (Elbadawi and Soto, 1994; Cevis and Kadilar, 2001; Ryou, 2001, among others). Few studies have empirically analyzed the effects of short-term private capital flows on the exchange rate in sub-Saharan Africa and Kenya in particular.

Elbadawi and Soto (1994) used annual data for the period 1960-1992 to study capital flows and long-term equilibrium real exchange rates in Chile. The model used extended the standard models of Rodriguez (1989) and Edwards (1987) and considered a small economy with three sectors (importables, exportables and non-tradables). Co-integration technique was used to disentangle the effects of capital flows on the equilibrium real exchange rate. Short-term flows and portfolio

investment were found to have no influence on the equilibrium exchange rate but the sustainable long-term inflows and FDI had appreciating effect. Elbadawi and Soto (1994) concluded that short-term capital flow influence exchange rate only in the short-run.

Cevis and Kadilar (2001), Mutua (2000), Ndung'u (2001) and Ryou (2002) used a Vector Autoregressive (VAR) technique to analyze the relationship between short-term private capital flows and the real exchange rate. Cevis and Kadilar (2001) used monthly data for the period 1989-1997 for Turkey. The results showed that bank reserves respond negatively for the first period whereas exchange deposit accounts for residents had positive response to a one standard deviation in short-term capital inflows. The impulse response of real exchange rate was such that it appreciated up to the forth month while interest rate differential responded negatively up to the forth period. The study revealed that a surge in short-term capital flows led to a decline in interest rate differential and that there was a strong relationship between interest rates and exchange rate, which significantly impacted on the current account balance. Cevis and Kadilar (2001) suggested the use of non-sterilized interventions and tight fiscal policy to help reduce short-term capital flows and attain financial stability.

Ndung'u (2001) analyzed the relationship between exchange rate movements and real interest rate differential, and the impact of short-term private capital flows, money supply growth rate, inflation and fiscal deficit on real exchange rate for the period 1990-1997 in Kenya. This was done in two stages. In the first stage, the study used the Dornbusch model by using the Uncovered Interest Parity (UIP) specification. The results showed that interest rate differential widened with exchange rate appreciation and this triggered capital inflows. In the second stage, a VAR model was estimated with short-term private capital flows entering in their levels and volatility form. The results indicated that both domestic and external shocks influenced the movement of real exchange rate and real interest rate differential and thereby triggered short-term capital flows. In addition, lowering the domestic interest rates was consistent with real exchange rate depreciation. The study proposed that the optimal approach was to limit interventions in the foreign exchange market to allow short-term capital flows to be stabilized by the exchange rate movement in the medium and long-term. That would have removed the effects of interventions on the interest rate structure.

Mutua (2000) studied the relationship between domestic debt, exchange rate and short-term private capital flows in Kenya for the period 1990-1999. This was done in three steps. In the first step, the study used the Johansen procedure and formulated an error correction model to capture the long-run relationship between non-stationary variables. In the second step, a granger non-causality test was performed and the result showed that domestic debt drives interest rates differential, which in turn drives short-term capital flows with reverse effects. In the third step, a VAR model was used by applying the variance decomposition. The results showed that short-term capital flows and nominal exchange rate drive themselves, aided by the interest rates differential. Mutua (2000) concluded that policy aimed at influencing domestic debt should be carefully undertaken since it was largely responsible for the interest rate structure.

A study by Ryou (2001) analyzed the role of capital inflows through the stock market and the macroeconomic policy of the emerging market economies. The study applied the Mundell-Fleming model and divided the study period into pre-crisis period set from 1992-1997 and post-crisis period set from 1998-2000. The Vector Error Correction Model (VECM) was used to study the impulse responses of the variables to shocks brought by capital inflows. The results obtained showed that capital flows through the stock market, whereas monetary expansion led to current account surplus and the appreciation of domestic currency. The study also revealed that relative effectiveness of monetary policy over fiscal policy based on Mundell-Fleming model does not hold for all emerging market economies. It also revealed that the role of exchange rate as a shock absorber against world interest rates or deterioration in terms of trade is important in managing macroeconomic stability. It concluded that flexible exchange rate is a better option.

Wang (2004) analyzed sources of real exchange rate fluctuations in China. The study used the Mundell-Fleming model and estimated a VAR using annual data from 1980 to 2002. The co-integration test showed that the variables are not co-integrated. The study findings on the effect of macroeconomic shocks on real exchange rate revealed that both positive supply shock and positive real demand shock led to short-term appreciation while nominal shock had temporary depreciating effect on the real exchange rate. The structural decomposition revealed

that relative demand shocks and supply shocks accounted for most variations in the real exchange rate changes during the study period.

Generally, the literature reviewed illustrates the relationship between short-term capital flows and the exchange rate. Using the theoretical literature, the effect of short-term capital flow on the exchange rate is illustrated via the transmission mechanism. The empirical literature reviewed used mainly the Dornbusch and Mundell-Fleming models to capture the effects of short-term capital flows on exchange rate, even though Goldstein *et al* as quoted in Ndung'u (2001) explains that it is difficult to come up with a structural model to explain short-term capital flows because short-term movements reflect stock adjustment in the arbitrage process.

Studies by Ndung'u (2001) and Mutua (2000) revealed that interest rate differential played a crucial role as a push factor for short-term private capital flows. However, it is important to note that financial and economic development (stock market and the overall good performance of the economy) could also have triggered the huge short-term private capital flows. With this comes increased exposure to volatility of these short-term capital flows, which undermines the policies aimed at maintaining a stable macroeconomic environment.

Results obtained from the study by Elbadawi and Soto (1994) conflict with results from other studies. This could have been affected by the study period since towards the end of the study period marked the beginning of massive surge of short-term capital flows especially in the Latin American and Asian countries. The other studies suffer from a number of pitfalls. Some studies fail to discuss and account for the time series properties of the variables under investigation, although regressions of non-stationary variables are known to be spurious. Studies that run the regression in variation by removing any unit root fail to test for co-integration within the VAR model, thus allowing omitted variable bias (Cevis and Kadilar, 2001; Mutua, 2000; Ndung'u, 2001).

The Kenyan studies were done at a time when the exchange rate was in transition and efforts were not made to separate the two periods. Furthermore, there is need to consider the time lap and stage of financial and economic development as well as economic policies. Therefore, it is in this respect that this study strives to overcome the weaknesses of the earlier studies by using modern time series techniques. In addition,

this study considers the huge short-term inflows that the country has received after the liberalization of both the exchange rate and the capital account of the balance of payment.

3. Research Methodology

3.1 Theoretical Model

The model developed in this study is a variant of the Mundell-Fleming model used by Ryou (2001) and Agosin (2005). The model was modified to include a stock market variable. The model is relevant for a developing economy such as Kenya, since the economy is fairly open and more market oriented, with high capital mobility and a flexible exchange rate. Furthermore, the model clearly depicts how the effects of monetary and fiscal policies are related to the integrated international capital market. Even though the model makes highly simplified assumptions about price rigidities in the short-run and expectations in the financial market, these shortcomings have been remedied by later researchers to include additional types of financial assets and richer dynamic adjustments of prices and current account.

The Mundell-Fleming model considers a small open economy with three equilibrium conditions for the goods market, the money market and the balance of payment. Equilibrium in the goods market is the IS schedule (Appendi 1), which represents any combination of interest rate and output that satisfy the equilibrium condition. The money market is in equilibrium when supply of money equals desired money holdings, which depends on output and interest rate (LM schedule). The balance of payment (BP schedule) represents external balance, and is in equilibrium when the sum of current account balance and capital account balance equals zero. The capital account balance, which shows the capital flows, is affected by domestic and foreign interest rates.

The starting point of the Mundell-Fleming model is the short-run implications of the policy changes under various economic circumstances. Short-term private capital flows respond to the underlying changes in fundamentals in the recipient countries and/or foreign countries.[5,6] Agosin (2005) argued that the only reason that

[5] The "pull" view perceives inflows as attracted to the recipient countries by an improved domestic policy environment, such as policies that increase the long-run expected rate of return, structural and macroeconomic policies that increase the expected rate of return on financial instruments, etc. "Push" view attributes the phenomenon to lower returns available in the creditor/foreign countries, e.g. decline in the world interest rate (Fernandez-Arias and Montiel, 1995).

[6] Agosin (2005) argued that capital flows occur because of a variety of factors, almost always the result of changes in the humours of foreign portfolio investors and international banks and almost never having much to do with domestic policy, even though poor policies can exacerbate both inflows and outflows.

short-term capital inflows might increase is a decline in the country risk premium or in international interest rates. Assuming that the cause of a decline in country risk premium is due to market oriented reforms, this will act as a pull factor to the inflow of short-term capital, which has effects on the real exchange rate. Equilibrium in the economy is when both internal and external balance is achieved. Such a condition is represented as a combination of the interest rates and output that satisfies the IS-LM-BP schedule simultaneously (Point E*, Appendix 1). This study assumes limited short-term capital flow and that the country is instituting market oriented reforms. The traditional model assumes that capital flows through the bonds market; in this case it is assumed that short-term private capital flows through equity investments.

The mechanism of the model is such that monetary expansion shifts both the LM and BP curves.[7] An increase in the supply of money will shift the LM curve to the right. This directly reduces domestic interest rates. A short-run equilibrium in the internal market is determined at point E_S at lower interest rates and higher income level. According to the traditional Mundell-Fleming model, lower domestic interest rate relative to global interest rate leads to short-term capital outflow and consequently, real exchange rate depreciation. However, this may not be the case since the higher output and a higher expected rate of return on equities may induce short-term capital inflow, hence the net effect on short-term capital inflow in the short-run is ambiguous.

It is assumed that there will be short-term private capital inflow hence the shift in the BP^* curve will be greater than the shift in LM^1 curve. This will lead to a surplus in the balance of payment under a flexible exchange rate regime; as short-term private capital flows in, money supply in the economy increases, output increases as well as domestic prices, leading to an appreciation of the exchange rate. This causes the IS curve to shift downwards as the BP curve adjusts to settle at E_L where there is a new internal and external equilibrium. A decrease in money supply will cause the exact opposite of the process. The other mechanisms through which the model depicts exchange rate fluctuations include changes in global interest rates and fiscal policy.

[7] See Appendix 1 for the graphical representation of the Mundell-Fleming Model (IS-LM-BP Curve).

Ryou (2001) indicated that short-term capital flows of the capital account are not only affected by domestic and foreign interest rates but also by the rate of return of a share in the stock market. Calvo, Leiderman and Reinhart (1996) as quoted in Ryou (2001) argued that equity investment is sensitive to international interest rates, particularly the USA interest rate and, at the same time, it is considerably affected by its expected rate of return. Furthermore, equity investment depends on the rate of domestic interest rates to the extent that the later affects the rate of return in the stock market. The relationship between the expected rate of return and domestic interest rate is such that a rise in the expected rate of return will induce more investors into the stock market. On the other hand, an increase in the domestic interest rates makes equity investment less attractive. Therefore, domestic interest rate and the rate of return in the stock market eventually affect the real exchange rate.

3.2 Empirical Model

This study uses a multivariate approach to co-integration as initiated by Johansen (1988). This is achieved by the use of Vector Autoregressive (VAR) system of dynamic equations that examines the interrelationships between economic variables using minimum assumptions about the underlying structure of the economy.[8] The VAR model is preferred because it treats every endogenous variable in the system as a function of lagged values of all the endogenous variables in the system. The VAR technique enables this study to avoid the *a priori* assumption of endogeneity and exogeneity of variables, which has high potential of affecting inferences made in the analysis (Afari *et al.*, 2004).

Assuming that the data used in this study is I(1), then the VAR in error correction form (VECM)[9] can be written as:

$$\Delta Y_t = \lambda_0 + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \lambda D_t + \varepsilon_t \qquad \text{.....1}$$

[8] For a detailed analysis of the literature on the VAR methodology, see Johansen (1988) and Holden and Perman (1994).

[9] A Vector Error Correction Model (VECM) is a restricted VAR that has co-integration restrictions built into the specification, so that it is designed for use with non-stationary series that are known to be co-integrated. The VECM specification restricts the long-run behaviour of the endogenous variables to converge to their co-integration relationships while allowing a range of short-run adjustment dynamics.

Where $\Pi = \alpha\beta'$, $\Gamma = -I + A_1 + \ldots + A_P$ ( ) is an identity matrix, represents the constant term, D_t is a dummy variable to capture the election year 1997 and 2002 and Δ refers to differenced variables. As noted in Holden and Perman (1994), this way of specifying the system contains both the short-run and the long-run adjustments to changes in Y_t through the estimates and , respectively. Of paramount interest in this study is the vector which represents a matrix of long-run coefficients defined as a multiple of two (nxr) vectors, and '. The ' is nxr matrix of co-integrating vectors and it shows the combination of long-run relationships amongst the variables while is nxr matrix of weights, which denotes the speed of adjustment from the disequilibrium.

The equation estimated captures the relationship between real exchange rate and short-term private capital flow as well as accounts for the effect of other macroeconomic variables on the real exchange rate. The variables in the model include: short-term private capital flow (shrtflws), money supply growth rate (ms3xgrw), real exchange rate (rer), interest rate differentials (tbilldiff), inflation rate (inflation) and equities/stock turnover (stoctnover).[10]

$$\Delta Y_t = \alpha(\beta, \beta_D$$

Y_t = (shrtflws, ms3xgrw, inflation, tbilldiff, stoctnover, rer)

The variables in the model are treated as endogenous by assumption. However, a weak exogeneity test will be done to determine the variables that are weakly exogenous. A dummy variable (dummy) is introduced in the model as an exogenous variable to capture the effects of election years, 1997 and 2002.

Short-term capital flow is expected to reduce the real exchange rate because an increase in short-term flows increases the Net Foreign Assets in the economy. Investors purchase the domestic financial instruments using local currency. This means that the supply of foreign currency

[10] Interest rates differential is the difference between 3-month Treasury bills in Kenya and the USA.

will increase, hence appreciating the exchange rate. *Interest rate differential* an increase in domestic interest rate relative to world rates may drive in capital flows and appreciate the exchange rate while a decline in domestic interest rates relative to world rates may lead to capital outflow and, therefore, a depreciation of exchange rate. *Money supply* we expect a negative relationship since an increase in the supply of money in the economy normally affects the domestic prices, which tends to reduce the exchange rate. *Inflation* we expect an inverse relationship between inflation and real exchange rate. This is because as domestic prices rise, the currency will fall *ceteris paribus*. *Stock turnover* we expect a negative relationship . An increase in the stock turnover implies that the rate of return from the stock market is good, and hence acts as an incentive for foreign investors. As foreign currency flows in the economy through the stock market, the exchange rate appreciates.

3.3 Data Sources

Data used covers the period January 1994 to September 2006 and variables are in natural logarithm except money supply and interest rate differential. The datasets are mainly sourced from the Central Bank of Kenya database and the International Financial Statistics (IFS)-December 2006. The exchange rate is defined as units of domestic currency per unit of foreign currency. Data on real exchange rate is own calculation where: rer=e*WPI/CPI, e is the nominal exchange rate, WPI is the Wholesale Producer Index for USA to capture world prices and CPI is the Consumer Price Index for Kenya to capture the domestic prices.Data on capital flows captures short-term private flows as measured in the capital account of the balance of payment and is measured in net terms. Short-term private capital flows include net errors and omissions. In this case, the net errors and omissions are treated as short-term private capital flows. Stock turnover has been used to capture the stock market movements. Data on this variable was obtained from the Nairobi Stock Exchange database.[11] Data on USA Treasury bill rate, USA wholesale price index and the consumer price index for Kenya are from IFS 2006. The data series are seasonally adjusted using the census X11.2 (historical) method to remove the cyclical seasonal movement.

[11] Data series on stock turnover from 2001-todate is available online, website http://www.nse.co.ke/newsite.

4. Data Analysis and Results

4.1 Preliminary Data Analysis

The correlation matrix shown in appendix 2 shows that correlation between interest differentials and real exchange rate is positive. The other variables show negative correlation with real exchange rate. Plotting of the variables in their levels indicate that they may be exhibiting non-constant mean and variance (Appendix 3).

A test for the presence of unit roots in the macroeconomic time series using the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) method are performed. For ADF test, a joint test for the presence of an intercept term, and/or a time trend as well as a unit root is done and the results indicate that the logged form of the series have unit root (Table 4.1).[12] Real exchange rate, stock turnover and growth rate of money supply are pure random walk with drift and time trend, interest rate differentials is a pure random walk with drift while short-term private capital flows and inflation has unit trend with neither intercept nor trend and intercept in the equation. First difference of the series makes them all stationary.

The presence of unit roots in the above macroeconomic variables forms the basis of testing for co-integration to determine the existence of a stationary linear combination in these non-stationary series. Johansen's co-integration test is used. Both maximum Eigen value statistic and trace test confirms one co-integrating relationship at 0.01 per cent level of significance (Table 4.2). The co-integrating test results show that the linear combination of the non-stationary series is stationary, implying that there exists a long-run relationship among the variables.

Specifying a VAR in first difference when the variables are co-integrated would lead to wrong specification and inefficient estimates, hence a VECM is estimated to determine the effects of a shock brought about by short-term private capital flows on real exchange rate. Restrictions are imposed on the adjustment coefficients to determine

[12] At 95% confidence interval and 147 observations, the critical value for Φ_3 =6.34 while the critical value for Φ_1 =4.63. Money supply growth rate is stationary upto the 7th lag but non-stationary at the 8th lag.

Table 4.1: The ADF test for unit root

Variable	Model specification	ADF-statistic	Joint test (F-statistic)	Conclusion
lninflation	Intercept and trend (random walk with drift and time trend)	τ_τ = -3.892892		I(0)
	Intercept (random walk with drift)	τ_μ = -4.016470		I(0)
	None (pure random walk)	τ = -1.445050		I(1)
Ms3xgrw	Intercept and trend (random walk with drift and time trend)	= -2.283206	= 5.279656	I(1)
	Intercept (random walk with drift)	τ_μ = -2.550315	= 5.757772	I(0)
	None (pure random walk)	τ = -1.478374		I(1)
lnshrtflws	Intercept and trend (random walk with drift and time trend)	τ_τ = -3.162743		I(0)
	Intercept (random walk with drift)	τ_μ = -2.692273		I(0)
	None (pure random walk)	τ = 1.346182		I(1)
lnstoctnover	Intercept and trend (random walk with drift and time trend)	= -0.745597	= 0.207176	I(1)
	Intercept (random walk with drift)	τ_μ = 0.412862	=0.369358	I(1)
	None (pure random walk)	τ = 1.692004		I(1)
tbilldiff	Intercept and trend (random walk with drift and time trend)	τ_τ = -3.21162	= 10.0963	I(0)
	Intercept (random walk with drift)	τ_μ = -1.704698	=1.37430	I(1)
	None (pure random walk)	τ = -1.389406		I(1)
lnrer	Intercept and trend (random walk with drift and time trend)	τ_τ = -1.80983	= 2.732508	I(1)
	Intercept (random walk with drift)	τ_μ = -1.382011	=1.315524	I(1)
	None (pure random walk)	τ = -0.815733		I(1)

Table 4.2: Johansen co-integration test

Unrestricted co-integration rank test (Trace)				
Hypothesized No. of CE(s)	Eigen value	Trace statistic	0.01% critical value	Prob.**
None *	0.3084	130.8080	104.9615	0.0000
At most 1	0.2192	75.1201	77.8188	0.0177
At most 2	0.1228	37.7558	54.6815	0.3128
At most 3	0.0827	17.9642	35.4582	0.5687
At most 4	0.0320	4.9348	19.9371	0.8157
At most 5	0.0002	0.0256	6.6349	0.8728
Trace test indicates 1 co-integrating eqn(s) at the 0.01% level * Denotes rejection of the hypothesis at the 0.01% level				
Unrestricted co-integration rank test (Maximum Eigen value)				
Hypothesized No. of CE(s)	Eigen value	Max-Eigen statistic	0.01% critical value	Prob.**
None *	0.3084	55.6879	45.8690	0.0004
At most 1	0.2192	37.3643	39.3701	0.0184
At most 2	0.1228	19.7917	32.7153	0.3557
At most 3	0.0827	13.0294	25.8612	0.4495
At most 4	0.0320	4.9092	18.5200	0.7533
At most 5	0.0002	0.0256	6.6349	0.8728
Max-Eigen value test indicates 1 co-integrating eqn(s) at the 0.01% level * Denotes rejection of the hypothesis at the 0.01% level				

whether the endogenous variables are weakly exogenous. The results (Appendix 5) indicate that the LR statistic cannot reject the null of weak exogeneity test for money supply growth rate and inflation whereas the null is rejected for interest rate differentials, short-term private capital flows, real exchange rate and the stock turnover.

4.2. Estimation Results

This study establishes that there is a long-run relationship between real exchange rate, short-term private capital flows, money supply growth rate, interest rate differentials, inflation and stock turnover. Over the long-run, real exchange rate appreciates as short-term private capital flow increases, since a 10 per cent increase in short-term private capital flows will appreciate the exchange rate by 0.5 per cent. Money

supply growth rate, inflation, interest rate differential and stock turnover also have an appreciating effect on the real exchange rate in the long-run. A unit increase in money supply growth rate will appreciate the exchange rate by 0.02 per cent while a 1 per cent increase in the stock turnover will reduce the exchange rate by 0.09 per cent.

The speed of adjustment process in the Vector Error Correction Model (VECM) for real exchange rate is consistent with economic theory since it shows that there is convergence towards the equilibrium and that 18.1 per cent of the adjustments will take place in the first month while the remaining 81.9 per cent of the disequilibrium will be transmitted in the subsequent periods. These findings are consistent with results obtained by Ndung'u (2001), which found the error correction term to be 18.4 per cent. The identified long-run equilibrium relation for real exchange rate is presented below.

LNRER =5.18 - 0.05* LNSHRTFLW - 0.02* MS3XGRW -

(0.0194) (0.009)

[2.44358]*** [1.83045] **

0.003* TBILLSDIF - 0.04*LNINFL - 0.09* LNSTOC

(0.0017) (0.0145) (0.0145)

[2.01758] ** [2.93489] *** [5.88223] ***

* Significant at 10%, ** significant at 5% and *** significant at 1%.

Figure 4.3 displays the impulse response function, which illustrates the impact of variable-specific shocks on the long-run equilibrium relationship between real exchange rate and the fundamentals.[13] Each plot shows the dynamic response of the real exchange rate to a one standard deviation shock to the innovations of the system at different periods. The plots reveal that the response of real exchange rate to a shock is persistent and has a significant permanent effect on the level of the real exchange rate in each case. The response of real exchange

[13] It should be noted that in a co-integrating VAR system, the impact of shocks on the individual variable is expected not to die out in the long-run, or equivalent, the variables will not return to their initial values if no further shocks occur. By contrast, the effects of shocks on the co-integrating relations will eventually die out and their time profiles can provide insights into system's speed of convergence to the long-run equilibrium path (Wang 2004).

rate to shocks in money supply growth is such that exchange rate appreciates in the first four months, and then stabilizes. Interest rate differential depreciates the real exchange rate in the first few months and then appreciates thereafter. Stock turnover, short-term private capital flows and inflation have an appreciating effect on the real exchange rate that is persistent.

Variance decomposition as presented on Table 4.3 provides information about the relative importance of each random innovation in affecting the variables. The historical innovations of real exchange rate are accounted for by its own history (36.42%), inflation (20.78%) and short-term private capital flows (8.21%), money supply growth rate (10.25%) and interest differential, which has the weakest effect of (3.08%) at the end of the forecast period.

Figure 4.3: Impulse response function

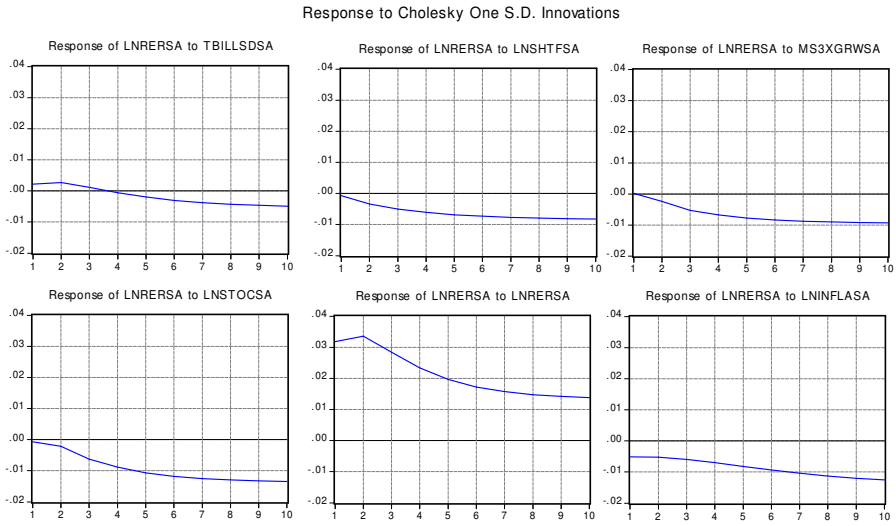


Table 4.3: Variance decomposition

Period	S.E.	LNSHTFSA	MS3XGRWSA	TBILLSDSA	LNINFLASA	LNSTOCSA	LNRERSA
1.00	0.29	0.05	0.00	0.44	2.52	0.04	96.95
5.00	0.60	2.63	3.01	0.38	4.48	5.11	84.38
10.00	0.84	5.39	6.72	1.32	10.40	13.21	62.97
15.00	1.03	6.75	8.44	2.10	14.94	17.13	50.64
20.00	1.19	7.47	9.34	2.58	17.76	19.19	43.66
25.00	1.33	7.91	9.88	2.88	19.56	20.43	39.34
30.00	1.46	8.21	10.25	3.08	20.78	21.27	36.42

Cholesky ordering: LNSHTFSA, MS3XGRWSA, TBILLSDSA, LNINFLASA, LNSTOCSA, LNRERSA

5. Conclusion and Recommendations

5.1 Conclusion

This study examines the relationship between short-term private capital flows and real exchange rate in Kenya. Using the VECM, the analysis establishes a long-run relationship between real exchange rate and its fundamentals, with most variables being significant in the co-integrating space. The study findings reveal that an increase in the short-term private capital flows will appreciate the real exchange rate. The analysis also confirms that increasing interest rate differential, stock turnover, money supply growth rate and inflation have appreciating effects on the real exchange rate.

An implication of real exchange rate appreciation is the loss of external competitiveness, which hurts exports. This lowers the profitability of the trading sector of the economy, disrupts the process of trade liberalization while encouraging imports of foreign goods. The overall effect is a depressed current account balance. Moreover, there is real adjustment cost associated with real exchange rate appreciation and given the short-term nature of these flows, it severely disrupts economic growth and development within the economy.

The policy option of protecting exports through intervention in the market forces may be constrained by the fact that Kenya imports a large percentage of its raw materials and intermediate goods, which act as input in the production process.

The policy option to sterilize the additional injection of domestic currency by selling government securities may not be viable. This is because domestic Treasury bill rate may rise relative to the world rate in an effort to attract buyers of government securities and may lead to another phase of increased short-term private capital flows. Therefore, a critical issue for policy makers is how to manage the exchange rate and conduct monetary policy in an environment of increased short-term private capital flows.

5.2 Recommendations

Based on the findings of these results, this study provides two recommendations:

- It may be necessary to reduce domestic interest rates to close the gap in real interest rate differential. This may eventually lead to a reduction in net short-term private capital and the weakening of the shilling and would also attract private investment. However, this action may not guarantee capital outflow as the rate of return from the stock market and economic growth may trigger more foreign investors, more short-term private capital inflow and an appreciation of the shilling.
- The appreciation of the exchange rate must be viewed by the stakeholders as having its advantages and disadvantages. The government may take advantage of a strong shilling to pay its foreign debt.

5.3 Areas for Further Research

The following areas are suggested for further research:

- Effect of short-term capital flows on the real economy i.e. wages, unemployment and public debt e.t.c. in Kenya
- Effect of remittances on the Kenyan economy at the macro and micro (household) level.

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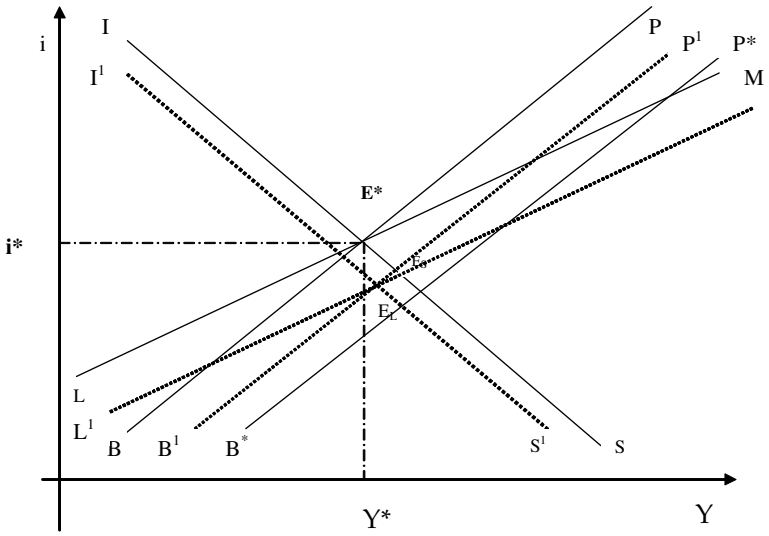
Appendices

Appendix 1: Graphical representation of the Mundell-Fleming model (IS-LM-BP Curve)



Appendix 2: Descriptive statistics

Correlation matrix

	LNRER	TBILLSDIFF	LNSHTFLWS	MS3XGRWSA	LNSTOCTNOVER	LNINFLATION
LNRER	1					
TBILLSDIFF	0.35	1				
LNSHTFLWS	-0.37	-0.33	1			
MS3XGRWSA	-0.06	0.07	-0.15	1		
LNSTOCTNOVER	-0.75	-0.58	0.49	0.01	1	
LNINFLATION	-0.30	0.20	-0.28	0.08	0.19	1