PRIVATE CAPITAL FLOWS AND MACROECONOMIC PERFORMANCE:
GROWTH IMPLICATIONS OF SHOCKS FOR SUB-SAHARAN AFRICAN ECONOMIES

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ABSTRACT

In theory, private capital flows (PCF) strengthen domestic investment for economic growth. In sub-Saharan African (SSA) economies, Foreign Direct Investment per Capita (FDIC), Portfolio Investment per Capita (PIC) and Bank Lending per Capita (BLC) components of PCF grew inversely to Gross Domestic Product per Capita (GDPC). While growth rates of FDIC, PIC and BLC respectively averaged 269.6%, 31.7% and 55.6% in 1981-1990; 42.9%, 36.6% and 28.6% in 1991-2000; 30.7%, -174.7% and 24.2% in 2001-2010; GDPC growth rates were -1.3%, -0.4% and 2.2% over the periods. Previous studies have attributed this problem largely to recipient economies' structural features, with little attention paid to PCF shocks (sharp fluctuations from the equilibrium path). This study, therefore, investigated the effects of PCF shocks on the macroeconomic performance of selected SSA countries.

A stochastic model within a dynamic open-economy framework was developed to evaluate the relationship between shocks to gross inflows of PCF components (FDIC, PIC and BLC) and macroeconomic performance indicators (GDPC, Gross Fixed Capital Formation per Capita (GFCC), and Exchange Rate (ER)). Shocks were measured, using the Structural Vector Autoregressive (SVAR) model, as one-standard deviation of orthogonal structural errors. The Maximum Likelihood estimation technique employed yielded asymptotically efficient estimators which were invariant to the model's re-parameterisation. The effects of the shocks on GDPC long-term growth were determined using the instrumental variables regression method. Annual data on fourteen SSA countries from 1990 to 2010 were employed, based on data availability. The data were collected from the International Monetary Fund's International Financial Statistics Yearbook and the World Bank's Global Development Finance databases. Reliability and robustness of estimators were ascertained using Johansen-Fisher co-integration and SVAR stability tests. Statistical significance was determined at 0.05 level.

Shocks to PIC consistently reduced GDPC by \$0.33, \$0.31 and \$0.28 in the first, second and third post-shock years, respectively. Similarly, BLC shocks reduced GDPC by \$2.46, \$2.54 and \$2.49 over the same periods. Both PIC and BLC shocks respectively reduced GDPC long term growth rate by 0.9% and 1.2%. They also led ER to appreciate by 0.02 points and 0.22 points, while GFCC increased by \$0.35 and

$3.52, in that order. However, shocks to FDIC led ER to depreciate by 0.40 points but induced GDPC and GFCC to increase by $0.75 and $0.20, respectively. These results suggested that both real flows (FDI) and financial flows (PIC and BLC) enhanced capital formation. Only real flows effectively induced economic growth, though local currency depreciated because the induced increase in GDPC raised local demand for foreign currency. Financial flows hampered economic growth as the induced ER appreciation constrained GDPC.

Shocks to private capital flows significantly influenced macroeconomic performance of sub-Saharan African countries, with foreign direct investment being more growth inducing than private portfolio investment and bank lending. These countries should manage portfolio investment and bank lending flows more effectively to mitigate the negative effects of their shocks. Also, efforts should be intensified to attract foreign direct investment for rapid economic growth.

Keywords: Private capital flows, Structural vector autoregressive, Maximum likelihood estimation, Gross domestic product per capita.

Word count: 487

DEDICATION

This work is dedicated to Almighty God, Allah, *Subhaana'Lah Watahaala*, within whom everything exists!

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CERTIFICATION

We certify that this research work was carried out by Mr. Ibrahim Saliu ALLEY under our supervision in the Department of Economics, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria.

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TABLE OF CONTENTS

CHAPTER THREE: LITERATURE REVIEW

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Despite the promising economic outlook in the early 1960s (Collier and Gunning) and sizable natural resource endowments that provide unparalleled opportunity for economic growth and development (Lundgren, Thomas and York, 2013), sub-Saharan Africa still ranks the lowest income region in the world: it remains the poorest on the globe (Global Finance, 2013[1]), even in the current trend of rising global living standards (Bayraktar and Fofack, 2011). Since the 1970s, the economic fate of the region has suffered substantial setbacks (Collier and Gunning, 1999) which have retarded its economic performance. The region's gross domestic product (GDP) based on purchasing power parity (PPP) as percentage of the world total GDP has been down-benched by those of all other regions for a long time: it hovers under 3% from 1980 till date, the lowest of all the regions (Figure 1A, Appendix I).

Several reasons have been adduced for the region's relative economic underperformance: low life expectancy and high population growth (Blooms and Sachs, 1998); poor domestic policies (Collier and Gunning, 1999); lack of political will to push through major economic reforms (Gomanee, Grima and Morrissey, 2005), to mention a few. While Africa has a high level of natural resource endowment per capita (Wood and Mayer, 2001), the region is yet to break off the shackles of poverty. Despite the endowments, the sub-Saharan African region still lacks the requisite financial resources to spur its growth. This claim is supported by the Commission for Africa's (2005) argument that the region required an additional US$25 billion per annum by 2010 in aid of its economic growth, with a further increase of US$25 billion per annum in 2015.

[1] Using Gross Domestic Product (GDP) per Capita on Purchasing Power Parity (PPP) basis computed from data from International Monetary Fund's World Economic Outlook Database updated in April, 2013, Global Finance established Africa as the poorest continent, with the four poorest countries of the world (Zimbabwe, Burundi, Liberia and Congo) located in the Sub-Saharan African region.

The poor economic conditions of the region implied in low GDP suggest the existence of savings-investment gap (Figure 2A, appendix I), which in turn leads to poorer economic outcomes. Ajayi (2006a) suggests foreign direct investment (FDI) inflows - one of the three main categories of private capital flows, others being foreign portfolio investment and foreign bank lending (Fitzgerald, 1999) - as a means of tackling the saving-investment menace besieging the region. By augmenting the scarce domestic resources, other private flows may also bail out the capital-starved country from saving-investment gap menace, all things being equal. Implicit in the external financing of domestic growth is the concept of financial integration and globalisation.

Via globalisation and economic integration, countries - in the neoclassical theory - are better able to intertemporally achieve better optimal economic outcomes than what they can autarkically achieve (Obstfeld and Rogoff, 1996; Byrne and Fiess, 2011). According to Prasad et al. (2003), capital flows as a medium of globalisation and economic integration benefit the economy by augmenting domestic savings, lowering the cost of capital owing to better risks allocation, enhancing transfer of technology, developing the financial sector and inducing better policy formulation.

Not all financially integrated countries have however witnessed higher economic growth. In other words, not all countries which have benefitted from capital inflows have economically improved their lots. Prasad, Rajan and Subramanian (2007) show that, in contrast to the neo-classical theoretical models, developing countries (with saving-investment gap) which have relied on foreign financing have not grown faster in the long run; rather, they have grown more slowly (than those which have relied less on foreign finance). The story of the sub-Saharan African economies appears to agree with the 'negative' relationship between capital flows and economic growth highlighted by Prasad, Rajan and Subramanian (2007).

According to the International Monetary Fund (2011) external funding for domestic investments in the region has tremendously increased in the last two decades: aggregate capital flows into the region increased six-fold since year 2000. Bhinda et al (1999) agree that there has been rapid influx of private capital into the sub-Saharan Africa since 1990s with portfolio equity rising from US$4 million to US$1.4 billion from 1990 to 1996. Similarly, FDI peaked, according to UNCTAD (2011) from

US$257 million in 1980 to US$44.4 billion in 2009 before dipping to US$39.7 billion in 2010. Yet, the region's income relative to that of the world's has not only been low but has also not risen beyond the 1980 level (figures 1A). Figures 3A-5A suggest negative relationship between capital inflows (direct investment, portfolio investment and bank lending flows) and economic output in the SSA. The region's case of seeming negative relationship between capital flows and GDP is common to many capital-starved developing countries receiving foreign capital (Prasad, Rajan and Subramanian, 2007).

1.8 Statement of the problem

According to the open-economy neoclassical theory, an economy like that of the SSA (with so low economic output that hardly can domestic saving finance its investment and growth opportunities) can borrow from abroad in form of private capital inflows as a means of augmenting domestic resources in the growth process (Obstfeld, 2012). It may run current account deficit to finance the growth process. In other words, GDP should rise with current account deficit which, according to Higgins and Klitgaard (1998), is equivalent to capital inflows. With the inflows of investible capital, the hitherto higher domestic interest rate is expected to fall in convergence to lower global interest rate. Hence, investment should rise and output should consequently grow.

The SSA's case seems to defy this theory: the GDP of Sub-Saharan Africa cannot be said to be positively related to capital flows (see figures 3A-4A). The region's story agrees with Prasad, Rajan and Subramanian's (2007) empirical findings that developing countries relying more on capital flows (as implied by current account deficit) grow less than those who rely less on capital flows. Despite the inflows of foreign funds in forms of FDI and portfolio capital, the region has not been able to achieve higher economic wealth. Why?

Gourinchas and Jeanne (2013) reiterate the theoretical prediction that capital should flow more to countries with fast-growing economies than others. The poor relative performance of many Sub-Saharan African economies (see figure 1A) may, in line with Gourinchas and Jeanne (2013), suggest that the foreign capital attracted to the region may not be enough[2], and this may have been penalising their growth. This partly agrees with the Prasad, Rajan and Subramanian's (2007) observation that foreign capital has not been flowing to poor countries, as suggested by theory, at least not in the predicted quantities.

The theory posits that developing countries (dominating the southern hemisphere) with low capital to labour ratio should have higher marginal return to capital, relative to developed countries (in the northern hemisphere). In response, the return-seeking international investors would place more funds in financial assets in the developing countries and less in developed ones. Hence, international capital should flow downhill to developing countries like the sub-Saharan African countries. However, investors are also risk-conscious. Their optimal strategy is to maximise return per unit of risk. The risks to asset return in many of these developing economies are so high that the risk-adjusted returns to asset may be lower than what obtains in the developed economies. Capital thus flies to safe haven (developed countries), while developing economies may suffer scarcity in the presence of abundant global capital.

Besides attracting relatively low quantity of foreign capital, SSA economies have not been able to benefit from the amount received due to weak absorptive capacities (IMF, 2011) and diversification depth (Fitzgerald, 1999). Thus, rather than having a positive impact, the inflows destabilise the economies by exposing them to problems like real exchange rate appreciation (UNDP, 2011) which undermines the competitiveness of the manufacturing sector, deteriorates the current account and penalises output.

While many studies join IMF (1997) in recognising the impact of domestic shocks[3] as the main determinants of economic performance, few studies (Kaminsky, 2005; Ferreira and Laux, 2009; IMF, 2011, Converse, 2012) in the literature have paid

[2] Ajayi (2006b) notes that FDI inflows to Africa recorded an annual average of 1.8% of the world's total FDI flows between 1991 and 1996 while those to Latin America and the Caribbean as well as Asian and Oceania averaged 11.9% and 20.9% respectively over the same period. In 2010, FDI inflows to Sub-Saharan Africa was 3.2% of the of the world's total FDI flows while the United State of America alone gets18.4% of world's total FDI flows (UNCTAD, 2011).

[3] Domestic shocks here are conceived as sharp deviations of macroeconomic aggregates away from their long term path or expected (average values)

attention to the impact of capital flows shocks[4] on macroeconomic performance of developing countries. Moreover, very few of these studies (e.g. Culha (2006)) empirically examine the relationship between capital flows and macroeconomic shocks.

The recent global meltdown underscores the importance of capital flows as a channel for external shocks transmission, which in turn triggers shocks in hitherto stable economies. Prasad et al (2003) documents that capital flows to developing economies, following the recent liberalisation of their capital accounts, have worsened their vulnerability to external shocks; and this further undermines their macroeconomic stability. In the same vein, Kaminsky (2005) notes that volatility in capital flows is associated with cyclical booms and bursts in developing countries. Several other studies, in agreement with Prasad et al (2003) and Kaminsky (2005) have observed that capital flows pro-cyclically, against the theoretical proposition that it flows in a countercyclical fashion to allow open economies like sub-Saharan African countries to smoothen their consumption and maximise their welfare. Thus, it worsens, if not induces, consumption volatility and the underlying macroeconomic shocks; and hence inhibit growth.

This is problematic in the light of the most widely held view that developing economies with saving-investment gap need external financing for growth. Macroeconomic stability, on the other hand, is germane to growth (Cavallo, 2007); hence procyclical flows of capital may inhibit growth by worsening domestic macroeconomic shocks, instead of stabilising the economy by flowing countercyclically. Thus, there is a need to know by how much the flow behaviour of capital hurts the economy in terms of additional shocks induced and growth inhibited. This will inform necessary policy response to capital flows management such as capital control measures.

The flow behaviour of capital, on the other hand, is largely affected by efficiency of international capital markets. If the markets function properly without frictions or imperfections, capital should flow in response to the needs of countries with saving-

[4] Capital flows shocks refer to sharp deviations in capital inflows away from their long term path or expected (average values) and unpredictability of its timing

investment gap. International capital markets are however imperfect; rather than responding to the forces of demand and supply, they arbitrarily allocate capital which may not match with the quantity and timing of capital need of the domestic economy (Felices and Orskaug, 2005). The imperfections/frictions in the international financial market result in vagarious fluctuations of capital flows; they hence exacerbate the incidence of domestic economic shocks, or trigger disequilibrium in a hitherto stable economy. In other words, external disturbances that ignite volatility of capital flows can trigger domestic macroeconomic shocks (Kaminsky, 2005), which in turn affect economic growth (Cavallo, 2007).

On the basis of this hypothesis, this study endeavours to determine the role of capital flow shocks in macroeconomic performance of Sub-Saharan African economies.

1.9 Objectives of the study

This study broadly aims at estimating the relationship between shocks to private capital flows and the behaviour of macroeconomic variables in the sub-Saharan Africa (SSA).

Specifically, it seeks to:

i. Estimate the influence of shocks to gross and net inflows of foreign direct investment (FDI), portfolio investment and bank lending flows on macroeconomic variables in SSA.

ii. Quantify the impact of the flows and their shocks on the growth rate of SSA's output per capita.

iii. Evaluate the response of capital flows to domestic macroeconomic shocks in SSA.

1.10 Justification for the study

Many empirical studies in literature have examined the relationship between capital flows, macroeconomic volatility and economic growth in developing countries; only few however, deal with Sub-Saharan African countries in this direction. The few existing studies that have examined the direct impact of capital flows on economic growth of the region made limited attempt to explain why the region has not witnessed significant inclusive economic growth that should have significantly raised her income (relative to the world's) beyond the 1980 level, despite rising inflows of capital to the region.

While the economic features of capital-recipient developing economies have largely been blamed for their inability to translate capital flows to significant economic growth and higher economic wealth, little attention has been paid to the roles played by the intrinsic property of the inflows themselves: capital flow shocks. This creates the need to examine the effects of capital flows shocks on the macroeconomic variables in SSA, as a channel of impact transmission to her long-term economic growth.

Shocks to macroeconomic variables, especially output shocks, directly affect the economic agents in the short term. These short-run effects in terms of impact on agents' expectation (adaptive and rational) about economic outlook and their consequent economic decisions (consumption, saving and investment) translate into long-term economic growth. Thus, a major explanatory factor of economic growth is economic shocks, a link between capital flow and economic growth. Besides, understanding the response of macroeconomic variables to capital flows shocks (as well as the response of capital flows to macroeconomic shocks) is vital to the designing of capital flows management strategies as a way of managing their (capital flows) impact on economic growth. The analysis (quantifying the impact of capital flows shocks on macroeconomic variables and explaining growth behaviour of sub-Saharan African countries in the light of the shocks) has been largely neglected by empirical research, and is obviously yet to be well documented in literature.

Among the two basic channels (the trade link and the financial link) through which external shocks permeate the economy (Drummond and Ramirez, 2009), the financial link, and the associated capital flows, is however more important, given the reliance of domestic and global economy' functioning on finance provided by the financial markets – local/international, capital/money markets. Events in these markets as reflected in the direction of capital flows have serious implications for macroeconomic variables – interest rate, inflation, exchange rate, and even the trade volumes - that bear on output, its shock and growth. Hence, there arises a need to critically analyse the impact of capital flows shocks on the macroeconomic variables, which eventually determine output growth behaviour.

1.11 Scope of the study

Sub-Saharan Africa house many frontier markets (e.g. Nigeria, Kenya, Mauritius) which have sustained international investors' interest, and consequently been receiving huge volume of capital inflows in the past few decades (IMF, 2011). Despite the inflows the regions still remain the poorest. This study thus investigate role of shocks in capital flow-economic performance nexus, using this region as a case.

The research analysis is conducted, using data on fourteen (14) sub-Saharan African countries from 1990 to 2010. The sample includes Benin, Botswana, Cameroun, Cote D'voire, Gabon, Kenya, Mauritius, Namibia, Niger, Nigeria, Seychelles, Swaziland, South Africa and Togo. The spatial and temporal scope of the sample used in this study is purely informed by limited availability of data on disaggregated financial assets/liabilities in Sub-Saharan Africa. Though many countries in the SSA other than those selected have data on disaggregated capital flows, such data are scanty; inclusion of such countries in the sample would lead to too numerous missing observations which may bias research outcome.

The sample is however rich in representativeness. It cuts across various groupings into which the sampled countries can be categorised: regional groupings (west, east, central or south), income grouping (the low income, the lower middle income and the upper middle income) as well as the resource endowment grouping (natural resource rich and the natural resource poor)[5].

1.12 Plan of the study

The rest of this chapter presents the outline of the study. Chapter 2 discusses the behaviour of capital flows to the sub-Saharan region. Chapter 3 follows with presentation of the theoretical and the empirical literature. This chapter discusses various studies that touch the orientation of this study. Drawing from analytical perspectives discussed in Chapter 3, Chapter 4 sets out both the theoretical and

[5] Table 1A and table 2A in appendix II highlights the categories that these sampled countries belong to.

methodological frameworks for the study. This chapter highlights the structural vector autoregression (SVAR) model as well as the panel instrumental variable (IV) regression model, as specifically applied to this study. Chapter 5 follows with the analysis and presentation of the results while Chapter 6 reports the summary of the findings and recommendations.

CHAPTER TWO

CAPITAL FLOWS AND THE SUB-SAHARAN AFRICAN ECONOMIES

2.1 Trend in capital flows to sub-Saharan Africa

Capital flows to developing countries (Sub-Saharan Africa inclusive) have undergone dramatic changes over the years (Lartey, 2006), both in volume and composition. IMF (2011) documents that total capital flows to sub-Saharan Africa have increased sixfold in the past decade, and private flows have increased relatively more than non-private flows. With this rate of increase, the magnitude of the inflows relative to the region's GDP has become huge. This bears serious implications for macroeconomic stability in the region, given its weak absorptive capacity and lack of financial market depth.

Besides the change in size and composition of capital flows, a spectacular issue is the volatility of net private flows, the recently more important type of flows, magnitude-wise. Figure 1 shows that capital flows have not only changed, both in size and composition, but also both the aggregate flow and its components exhibit some volatility over the period. Ossei, Morrissey and Lensink (2002) opine that this (capital flow volatility) may lead to macroeconomic instability.

2.2 Procyclical nature of capital flows

The size of private capital flows (FDI, portfolio investment, and other private flows) to SSA has been huge in recent times (IMF, 2011). These flows are market based flows and are thus expected to, in theory, respond to market forces of demand and supply, bridge saving-investment gap across countries and act as a means through which open economies smoothen their consumption and maximise welfare. These flows are however more volatile[6] than non-private flows (Ossei, Morrissey and Lensink, 2002).

[6] Capital flows have been found to respond more to the idiosyncratic factors of the international capital market: they thus do not respond to forces of demand and supply: they are thus unpredictable and volatile (Felices and Orskaug, 2005).

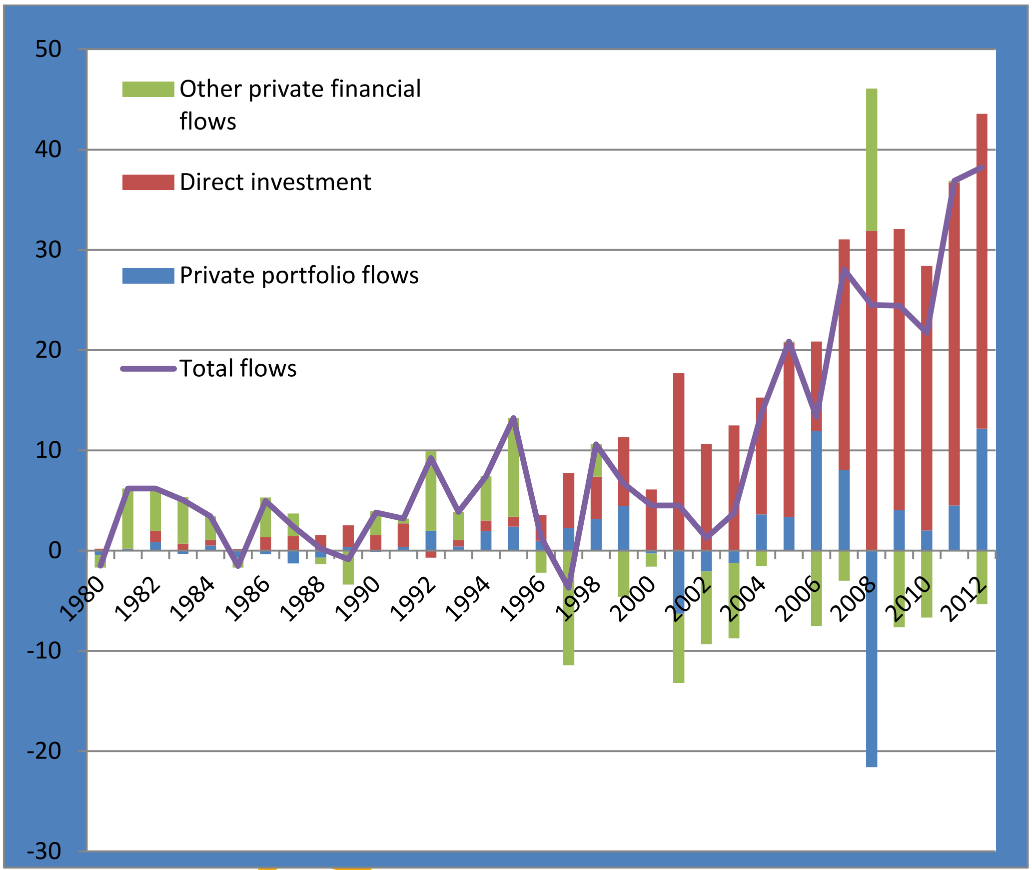

Figure 2.1: Net private capital flows (in billion of US Dollars) to sub-Saharan Africa

Sources: Constructed by the author from IMF's World Economic Outlook (WEO), 2012

Examination of data from the World Bank's Global Development Finance on Sub-Saharan Africa shows that net private flows are pro-cyclical. Cursory appraisal of the data reveals that, as table 2.1 below shows, the timing of ascent and descent in GDP growth rate synchronises with that of the capital flow components. For instance, average declines in the growth rate of GDP in periods 1980-83, 1990-92, 1996-99 and 2007-10 by -1.62, 0.36, 0.31 and 0.33 percentage points are associated with decline in growth rate of portfolio equity by 203, 286, 22.3 and 19.9 percentage points respectively as well as decline in growth rate of FDI by 75.9, 27, 0.84 and 2.83 percentage points respectively. On the other hand, rise in GDP growth rate in periods 1984-89, 1993-94 and 2000-05 by 0.68, 1.57 and 0.50 corresponds with rise in growth rate of portfolio equity by 99.5, 264, 3.53 percentage points respectively and rise in growth rate of FDI by 19.0, 18.7, 2.13 percentage points respectively.

This observation contradicts the theoretical proposition: while the permanent income hypothesis suggests that an economy saves/dissaves in periods of boom/burst (rising/declining GDP growth) in forms of foreign financial assets/liabilities, resulting in negative/positive net inflows capital flows, the Sub-Saharan Africa macroeconomic reality proves otherwise[7].

2.3 Significance of private capital flows in (sampled) SSA countries

Total inflows of private foreign capital to SSA have, in aggregate and absolute terms, been substantial: they are in billions of USD. When disaggregated however, the individual private, market-determined component of the flows such as the FDI and portfolio flows is not large, especially in the pre-2000 era (see figure 2.1 above). Moreover, the private capital flows to SSA, relative to the flows to other region, is low: the share of FDI flows to Africa relative to global FDI flows was 0.73%, 1.37%, 0.78% and 4.43% in 1980, 1990, 2000 and 2010 respectively (UNCTAD, 2011)[8]. Relative to GDP, private capital flows to the sampled SSA country, on the average, has been insignificant, with none of FDI, portfolio flows and bank lending flows attaining 3% in any year between 1990 and 2000. While FDI was below 3% for many years until 2004 beyond which it rose up to 7.5% in 2009 before declining to 4% in

[7] If the theoretical prediction holds, capital should flows countercyclically (net inflows of capital like FDI, portfolio equity should be positive when economic growth slows down or output declines, and vice versa). Table I, however, shows this does not hold in the case of the Sub-Saharan Africa.
[8] Figures were calculated using data from UNCTAD Handbook of Statistics, 2011.

Table 2.1: Average change in growth rate of sub-Saharan Africa's GDP, net inflows of portfolio investment and foreign direct investment (FDI)

	PERIODS OF SYNCHRONISED FALL				PERIODS OF SYNCHRONISED RISE		
PERIOD / VARIABLES	1980-1983	1990-1992	1996-1999	2007-2010	1984-1989	1993-1994	2000-2005
GDP	-1.62	-0.36	-0.31	-0.33	0.68	1.57	0.50
PORTFOLIO INVESTMENT	-203	-286	-22.3	-19.9	99.5	264	3.53
FDI	-75.9	-27.0	-0.84	-2.83	19.0	18.7	2.13

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

2010, portfolio flows and bank lending flows were each below 1% until 2005 after which they rose to about 4% post-2005 (Figure 2.2). Can these flows then drive macroeconomic aggregates?

One of the roles of private capital flows, especially FDI, is to augment domestic savings and bridge saving investment gap. The extent to which this role is fulfilled may determine the degree to which the flows drive macroeconomic aggregates. Figure 3 below presents the percentage of the saving-investment gap[9] these flows accounted for. Both portfolio flows and bank lending flows can for many years bridge above 50% of the gap while FDI can indeed eliminate the gap. This thus shows that these private flows are significant in the economies of the SSA countries, especially those under study.

Furthermore, private capital flows, especially FDI, to the sampled SSA countries as a percentage of gross fixed capital formation (GFCF) is significant. Figure 3 below shows that FDI was about 30% of GFCF in 1990 before declining to 15% in 2000 and below 10% in 2010; it was however above 15% of GFCF for many years. Portfolio investment too was for many years above 5% while bank lending was over 5% for some years.

[9] Saving-investment gap is calculated as the difference between gross domestic saving and gross fixed capital formation.

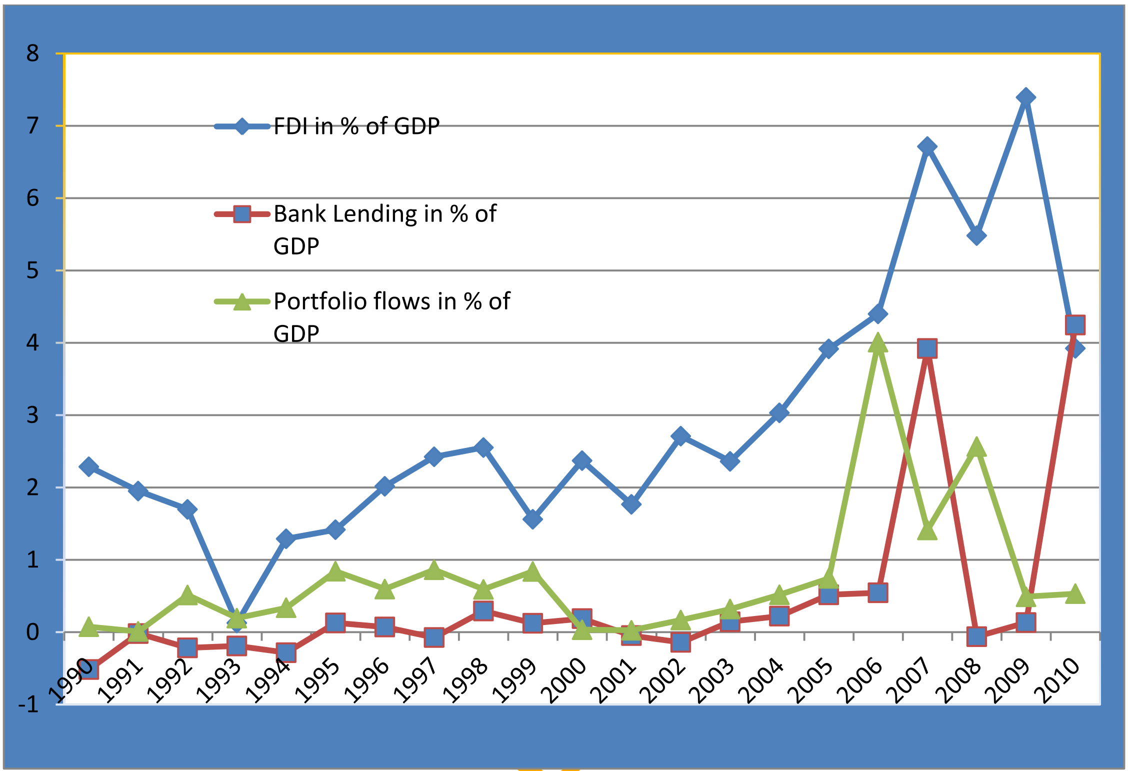

Figure 2.2: Private capital flows to the sampled SSA countries (on average) as a percentage of gross domestic product (GDP)

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

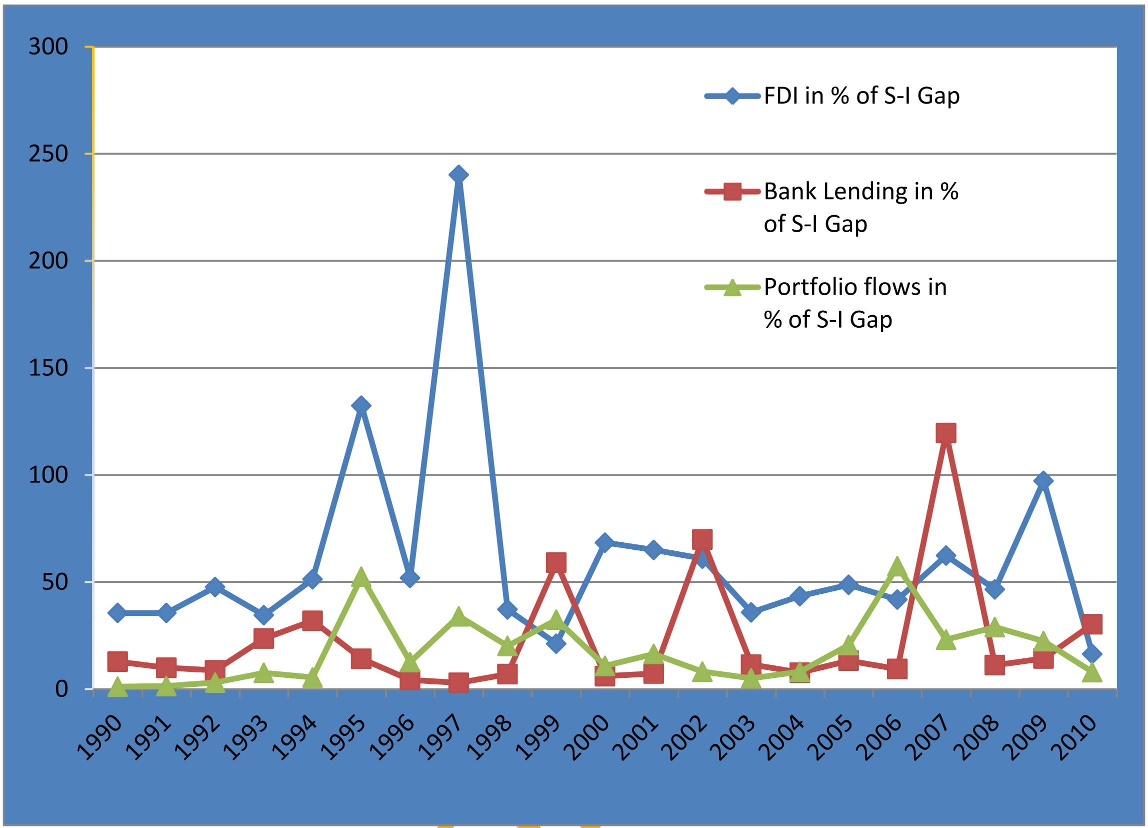

Figure 2.3: Private capital flows to the sampled SSA countries (on average) as a percentage of saving-investment (S-I) gap

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

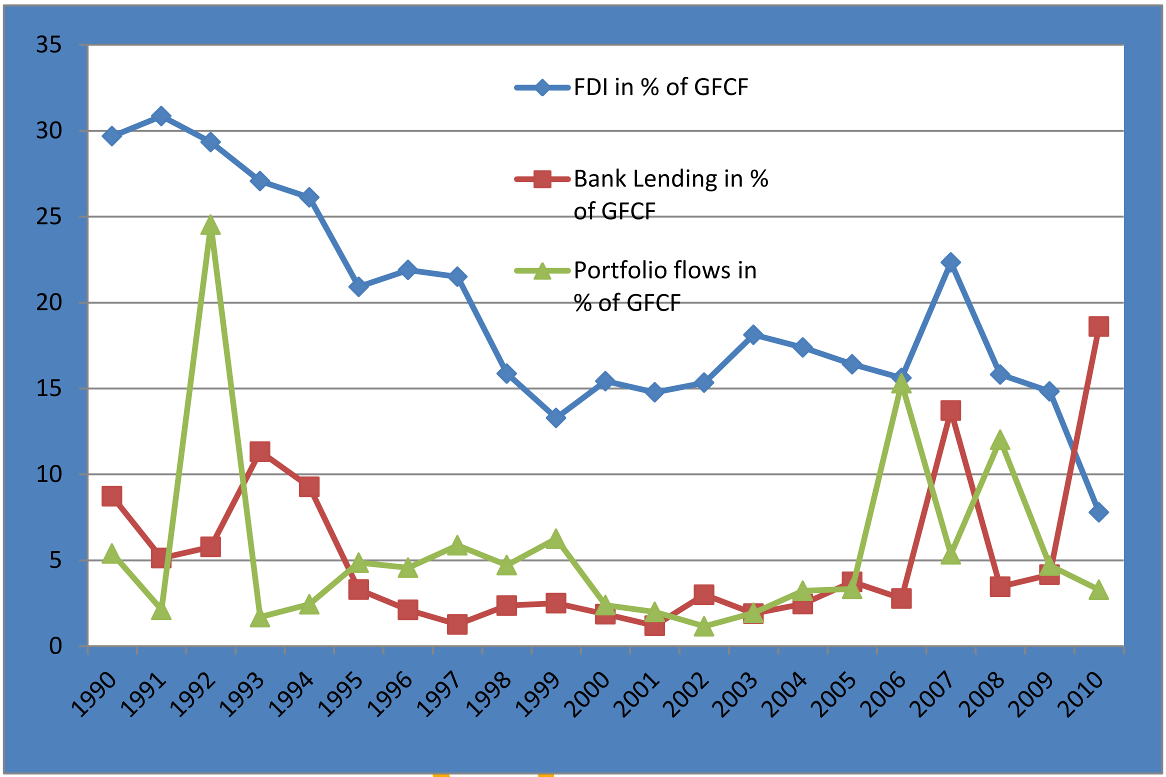

Figure 2.4: Private capital flows to the sampled SSA (on average) as a % of gross fixed capital formation (GFCF)

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

2.4 Capital flow shocks and performance of sub-Saharan African countries

Section 2.2 highlights the observed behaviour of capital flows and its association with economic performance from the aggregate perspective. Does the behaviour of disaggregated flows like FDI and portfolio flows bear any implication on individual countries in the sample? Three of these countries, one from each group of low income, lower middle income and upper middle income, are considered for a periscopic analysis. Moreover, these countries are from different regional and resource group classifications.

2.4.1 The low income group, capital flow shock and GDP

Kenya is a low income country in the eastern part of Sub-Saharan Africa; she is resource poor in the sense that the country's economic performance is not primarily driven by natural resources (African Economic Outlook, 2012a). Though Kenya recently discovered oil, its influence on the economy is yet to be pronounced: it has neither contributed substantially to the revenue of the Kenya's government nor accounted for any significant portion of the national output. Moreover, the country is just moderately open to international trade: the sum of import and export as a percentage of GDP was never at anytime between 2003 and 2012 over 60%. The country has been running a current account deficit since 2006 when the deficit stood at 2.1% of the GDP. While the situation deteriorated over time with deficit standing at 5.3% in 2009, the situation was expected to worsen as the deficit was projected to rise to 12.4% of the GDP (African Economic Outlook, 2012).

As deficits are often financed with capital inflows, the current account deficit bears implication for capital flows into the country. Do the flows, in turn, have influence on the economy? Figures 2.5 - 2.7 below exhibit the relationship between capital flows as a percentage of GDP and the economic growth rate of Kenya.

It is observable that capital flows pattern is similar to the pattern of economic growth rate. Does this mean that capital flows aid growth; or the visual correlation has more implication on growth than mere association? The flows appear procyclical; and if this is the case, they may not assist Kenya in sharing its income risk with the rest of the world.

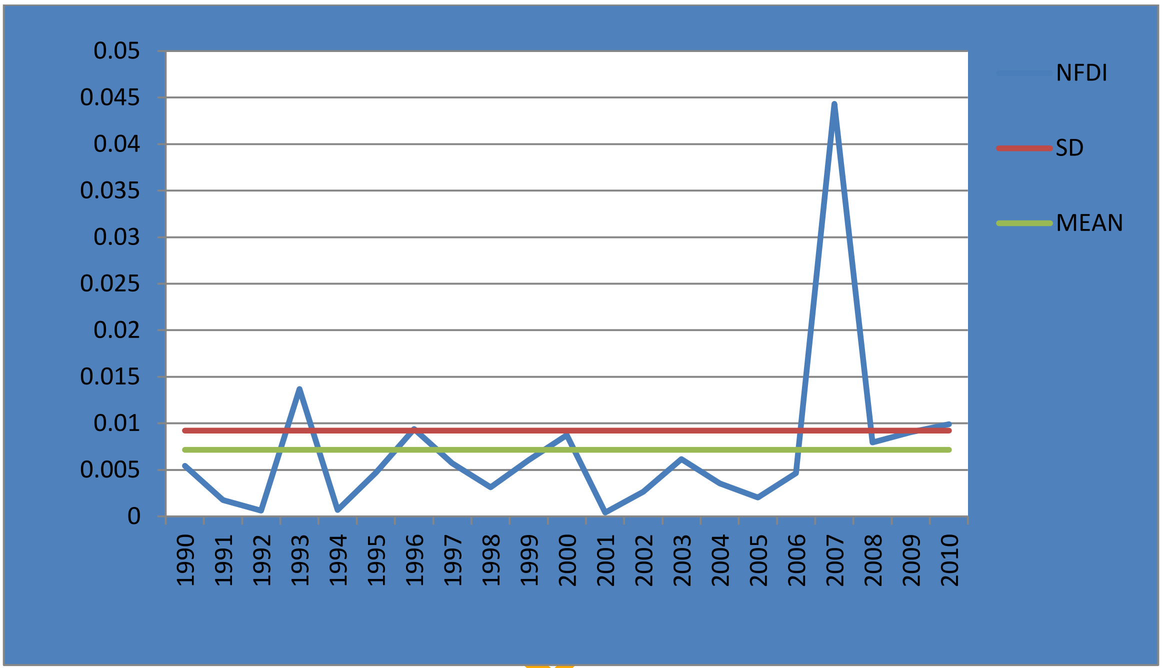

Figure 2.5: **Net inflows of foreign direct investment (NFDI) to Kenya as % of gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period

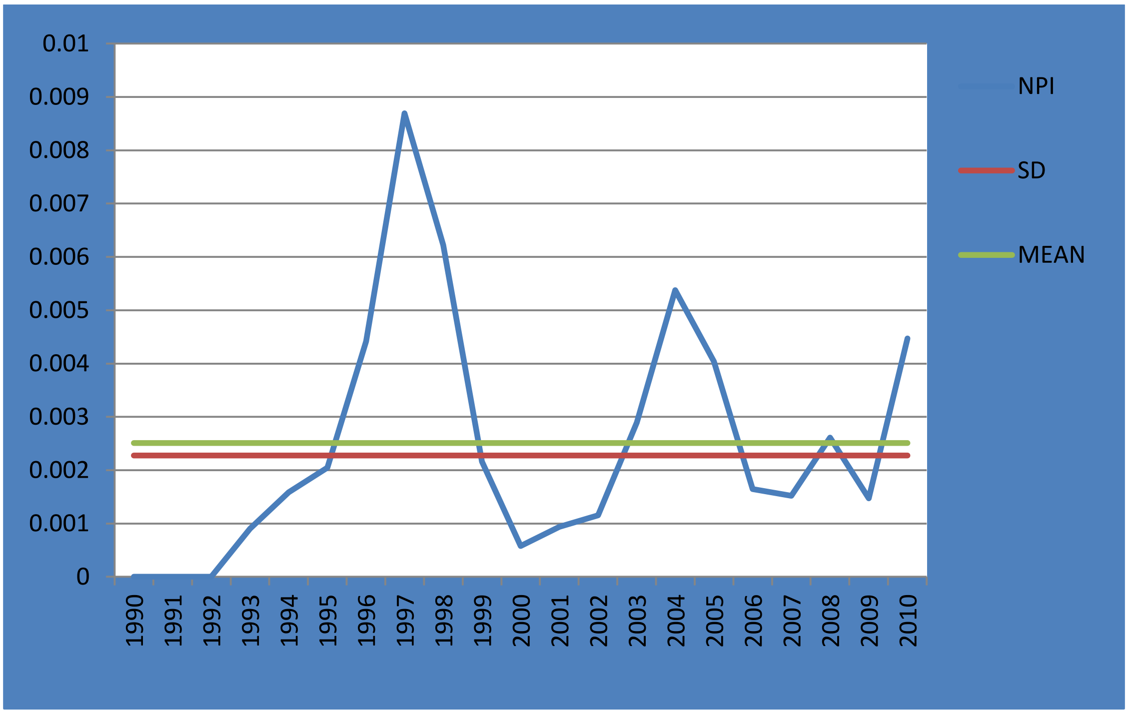

Figure 2.6: **Net inflows of portfolio investment (NPI) to Kenya as % of gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period

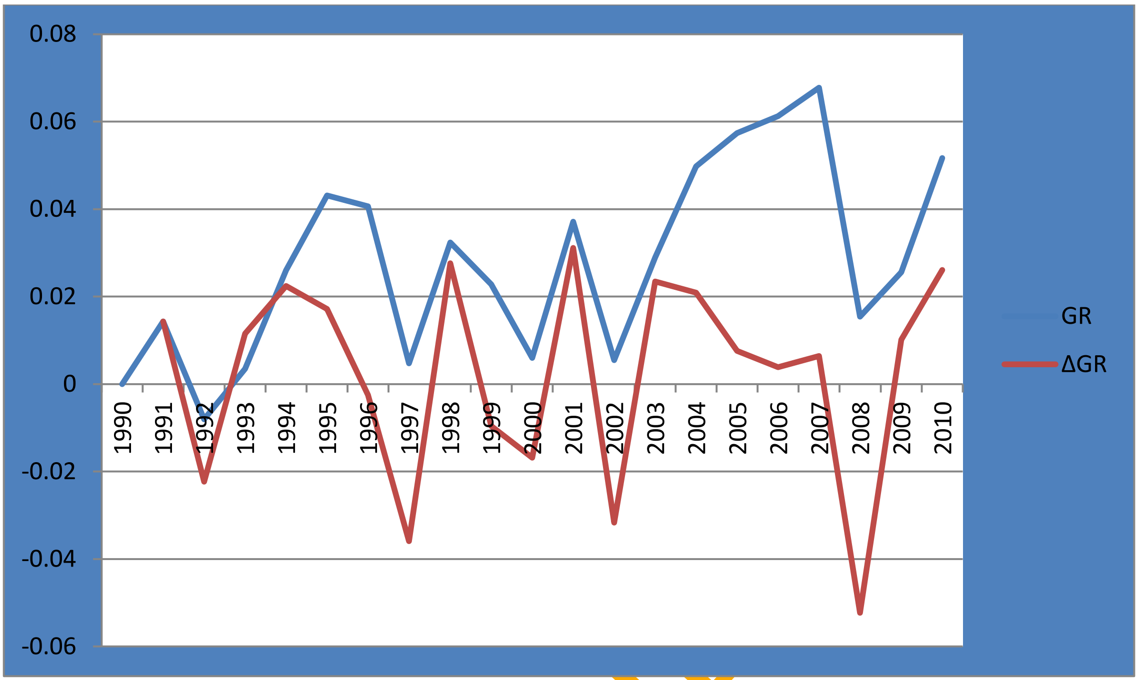

Figure 2.7: Kenyan economic growth rate (GR) and change in GR (ΔGR)

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

An observation worth of note is that the country's economic growth rate declines when either of FDI or portfolio Investment shoots above its standard deviation. For instance, net portfolio inflows as a percentage of GDP sprang over its standard deviation in 1995 and did not fall below the standard deviation until 1999. How did growth rate behave during this period? It fell.

This is visible in the change in growth curve. This curve was below the zero line between 1996 and 1998. Growth also slowed down (change in growth rate was negative) between 2007 and 2009 when the net FDI inflow as a percentage of GDP sharp leaped over its standard deviation. Are these mere coincidences? Or is there a significant association? These questions are answered in the next few chapters.

2.4.2 The lower middle income group, capital flow shock and GDP

Is similar pattern observable in countries in the lower middle income group? One of the sampled countries in this group is Nigeria. Located in the west of the sub-Saharan Africa, Nigeria is resource rich (IMF, 2010): oil accounts for substantial part of her GDP: it contributed over 33% of GDP in 2010 (Central Bank of Nigeria, 2013). The economy is relatively more open as the sum of import and export as a percentage of GDP is well over 60% for many years and has been running a current account surplus of over 12% of the GDP since 2007 (African Economic Outlook, 2011).

Current account balance and trade openness theoretically influence capital flows to an open economy like Nigeria. Figures 2.8 - 2.10 below highlight the behaviour of net inflows of FDI and portfolio investment to the country as well as that of the GDP growth rate over the same period.

While Nigerian economic growth rate exhibits considerable volatility, some association with sharp fluctuation in capital flows can be observed. Net inflows of portfolio investment went over its standard deviation in 2004 and 2009. Change in growth rate was negative in these periods. In the same vein, net inflows of FDI shot over the standard deviation between 2008 and 2010 and the economy slowed down in this period.

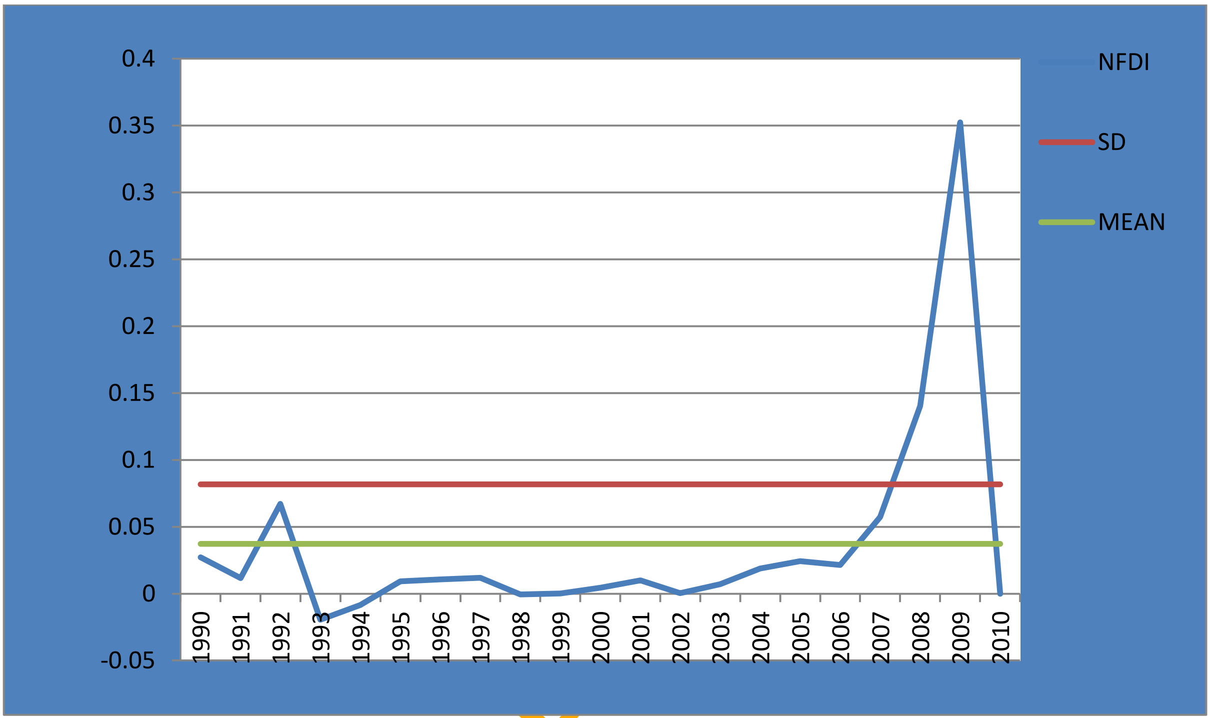

Figure 2.8: **Net inflows of foreign direct investment (NFDI) to Nigeria as % of gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period

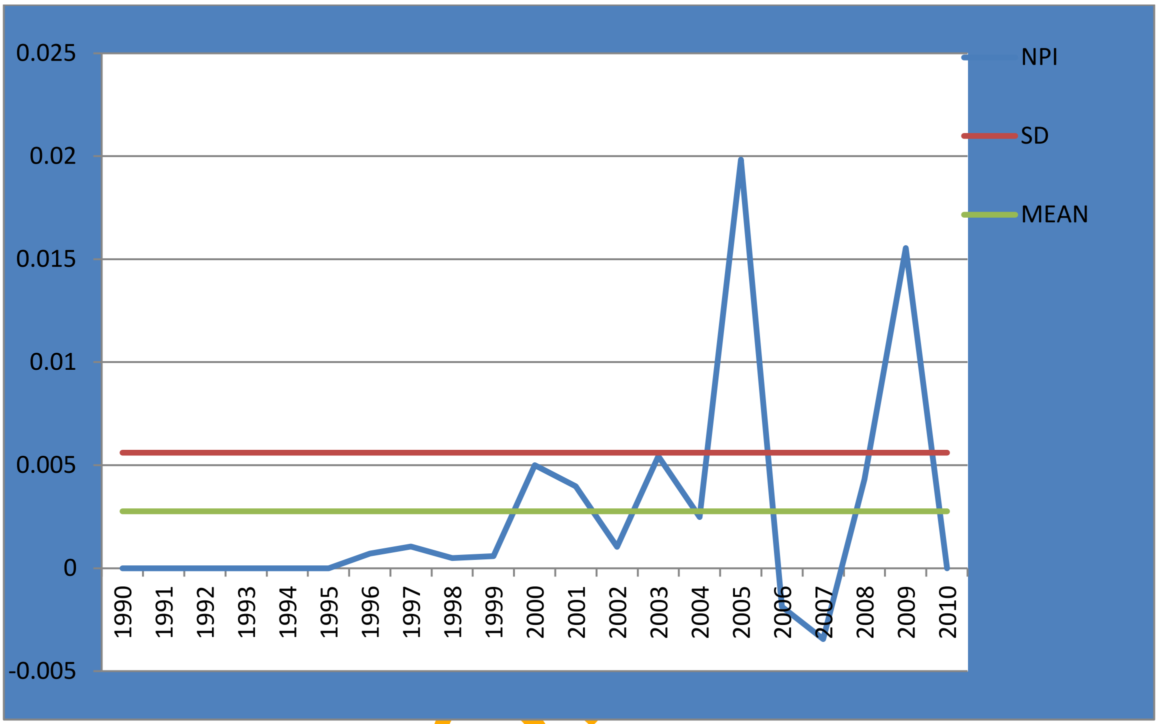

Figure 2.9: **Net inflows of portfolio investment (NPI) to Nigeria as % gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period.

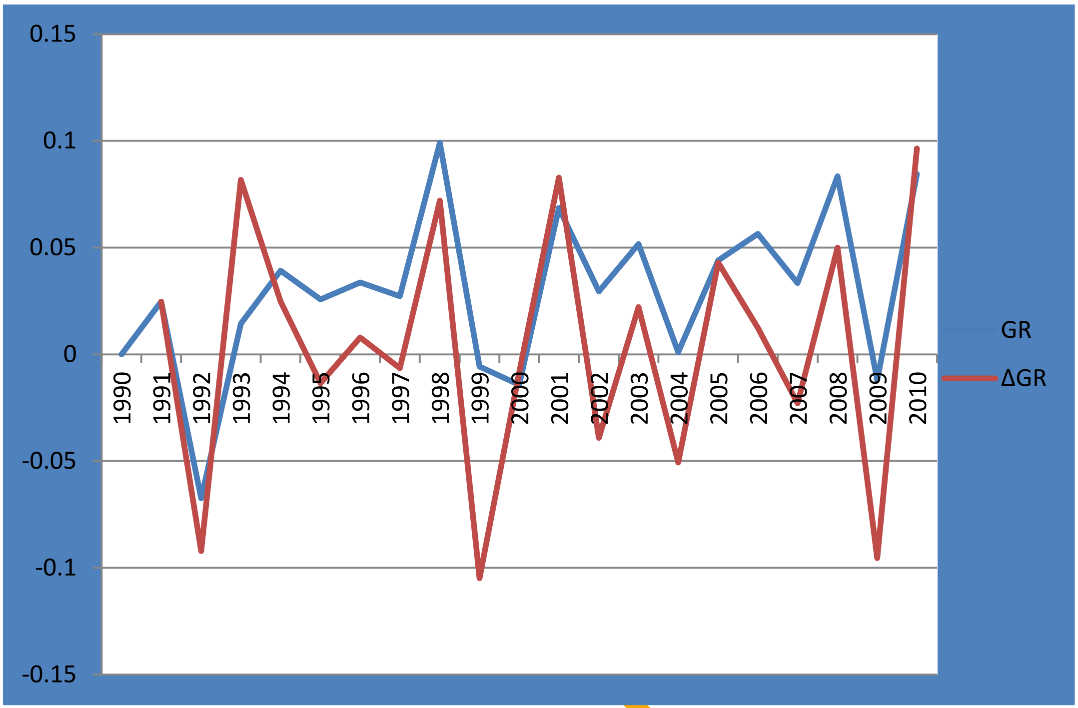

Figure 2.10: **Nigerian economic growth rate (GR) and change in GR (ΔG)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

2.4.3 The upper middle income group, capital flow shock and GDP

This subsection examines whether the observed association between sharp fluctuations and economic growth also obtains in the upper middle income group by considering South Africa, an upper middle income country, located south of Sub-Saharan Africa.

According to IMF (2010), South Africa is a coastal, non-resource-rich country. Mining and quarrying (excluding oil[10]) contributed only 8.4% and 9.8% of GDP in 2009 and 2011, respectively. While trade openness was for many years since 2003 less than 50%, the country has been running a current account deficit for many years till date; however, the deficit has been up to 10% of the GDP (African Economic Outlook, 2012b).

The relationship between capital flows (FDI and portfolio investment) and the growth of South Africa, if any, is highlighted in figure 2.11-2.13 below. Net inflows of portfolio investment as a percentage of GDP were over its standard deviation from 1996 to 1999; while net inflows of FDI as a percentage of GDP was over its standard deviation from 1994 to 1999 and from 2004 to 2009. It is curiosity-arousing to observe that growth rate declines in these two periods as change in growth rate is negative over these periods.

[10] Oil did not contribute to GDP, at least in these two periods

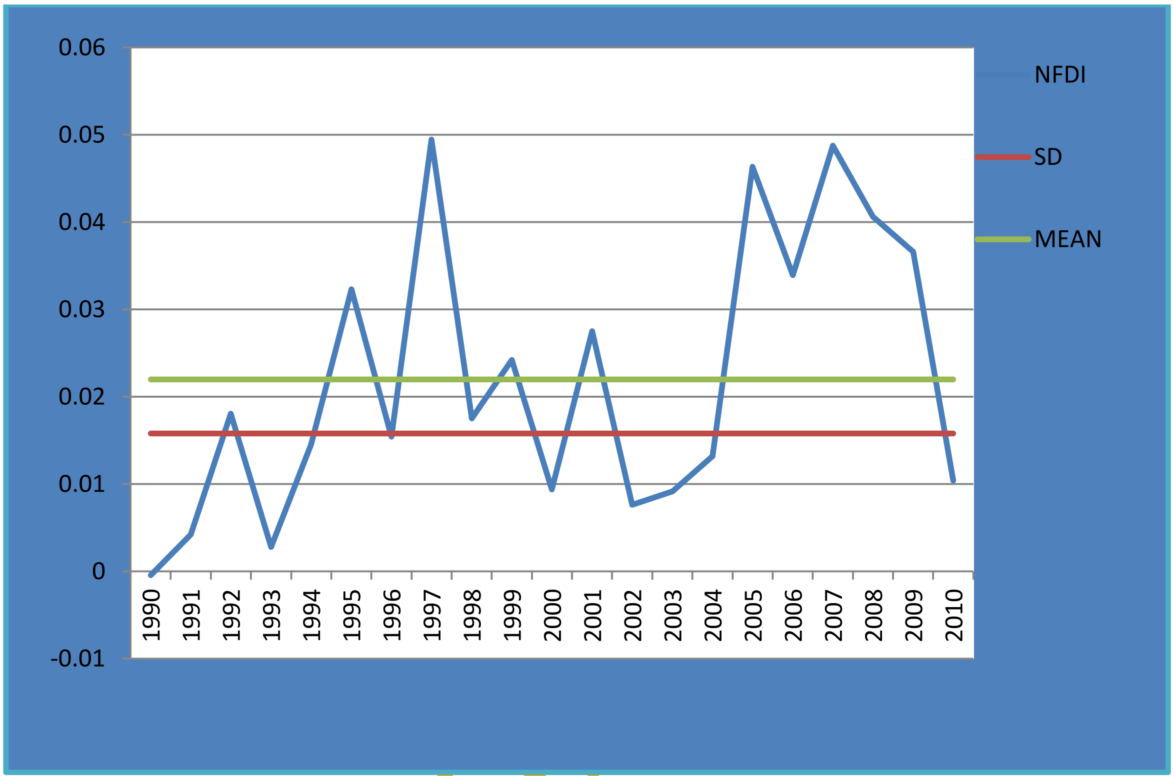

Figure 2.11: **Net inflows of foreign direct investment (NFDI) to South Africa gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period

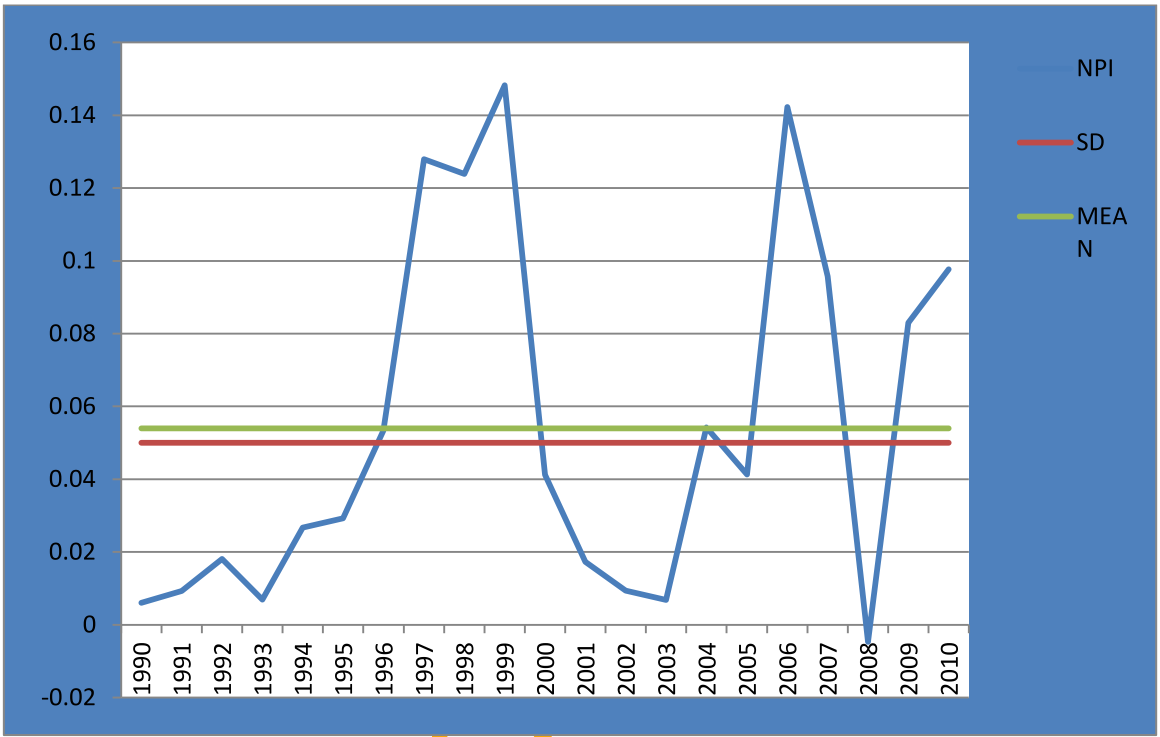

Figure 2.12: **Net inflows of portfolio investment (NPI) to South Africa as gross domestic product (GDP)**

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

SD – Standard deviation of the flow (as % of GDP) in the period;

MEAN – Average Value of the flow (as % of GDP) in the period

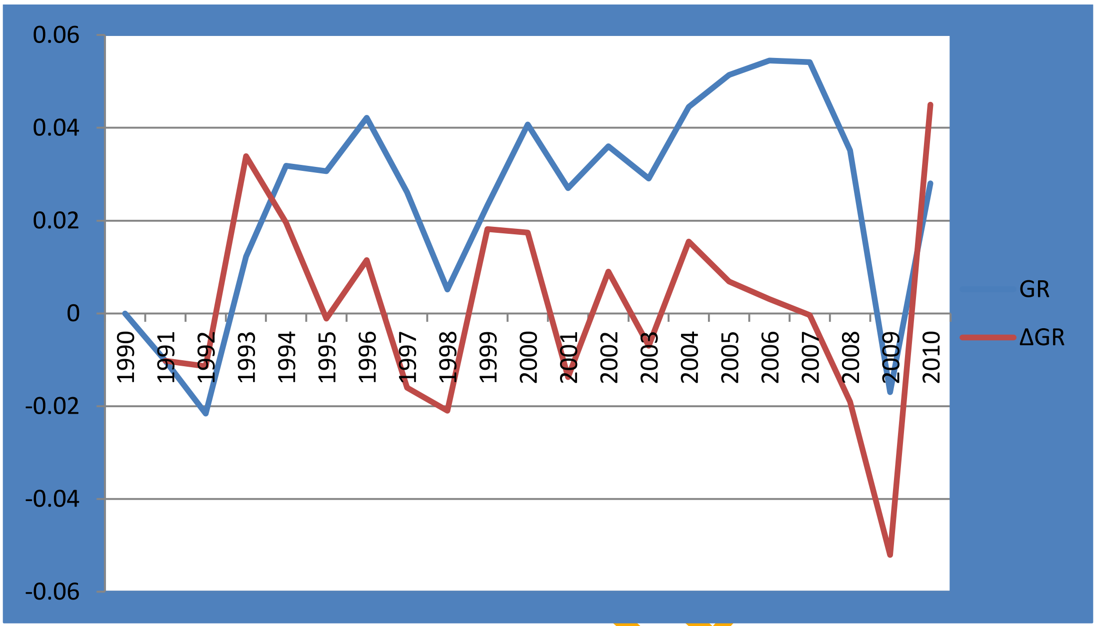

Figure 2.13: South African Economic Growth Rate (GR) and change in GR (ΔGR)

Sources: Constructed by the author from World Bank's Global Development Indicators, 2012

2.5 Summary

To the extent that the overshooting of a variable beyond its standard deviation is conceptualised as shock, it can be inferred that shocks to capital flows bears negative implication for economic growth of these sampled countries. This periscopic exercise informs the hypotheses about the impact of capital flows shocks on the economy which are rigorously tested with standard econometric tools in chapter 4.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

In this chapter, the review of previous studies is organised in three basic sections. The first section (section 3.2) discusses the theories underpinning the capital flows between countries. Section 3.3 follows with the presentation of perspectives and stances of empirical works on capital flows and their macroeconomic impacts. Methodological approaches adopted by previous studies are presented in section 3.4.

3.2 Theoretical groundwork

Numerous theories have attempted to explain the behaviour of capital flows between countries. Many of them have similar arguments rooted in the microeconomic behaviour of agents whose aggregated actions translate into macroeconomic interactions that underlie capital flows behaviour. On the other hand, many of these studies explain capital flows from the finance perspective. This section reviews a couple of these theories as a means of guiding the design of the analytical framework used in this study.

3.4.1 Microeconomic foundation of current account balance

An economy often consists of three domestic segments: the households (which are principally consumers and suppliers of production inputs – capital and labour), the firms (which principally invest in productive assets with resources provided by households on contractual terms) and the government (an institution established by convention to provide conducive environment - such as respect for property rights, rule of law safeguarding contractual agreements etc - for economic interactions). Besides the domestic interactions the economy often relates with the external environment - the rest of the world - for economic (and perhaps other) reasons.

Underlying the functionality of the two other segments is the activities of the households, hence the central position occupied by households in many theoretical models explaining macroeconomic behaviour and interactions (Blundell, 1988). As households often desire to maximise their utility, many behavioural models of current account rest on utility maximisation theory.

3.4.2 Intertemporal utility maximisation theory

To maximise its life-time utility, the household must choose its consumption for each period – the present and the future. By implication, consideration for future consumption affects today's consumption; that is, more consumption allocation to the future means less consumption (more saving) today. Affecting the intertemporal allocation of consumption between periods is the income path over time. The intertemporal choice can be made when the households have a perfect knowledge of their future incomes (Caroll, 2001) and market interest rate as well as when incomes and market rates of interest are stochastic (unpredictable).

3.4.3 Perfect foresight utility maximisation model

With fair certainty of the streams of future incomes and market interest rates, the household plans its present consumption and future consumptions (savings) within the limits of available incomes.

The problem, according to the perfect foresight version of Hall (1978), is mathematically summarised as follows:

$$Max \sum_{s=t}^{\infty} \beta^{s-t} U(C_s) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

subject to

$$\sum_{s=t}^{\infty} \left[\left(\frac{1}{1+r} \right)^{s-t} (C_s - Y_s) = A_t \right] \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where:

$$\beta = (1+\delta)^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

and

U= consumption dependent utility; β =discounted factor

δ = subjective discount rate; C_s = consumption at time s;

A_t = financial asset at the beginning of period t; Y_S = Labour income at time s;

r = interest rate; t = current period of interest; s = future period, with s $\geq$ t;

Equation (1) captures the present value of utility the household seeks to maximise today by planning consumption for each period (intertemporal allocation). The solution to the problem presented by equation (1) and equation (2) is given, as shown by Obstfeld and Rogoff (1996), by equation (4) below:

$$\frac{\beta U'(C_{t+1})}{U'(C_t)}(1+r_{t+1})=1 \qquad \text{.....................................} \quad (4)$$

The intertemporal equilibrium/steady state is characterised by equal consumption allocation for each period. Equation 5 below elucidates this position. The household equilibrium condition entails that consumption allocation be equal across periods.

$$\frac{U'(C_t)}{U'(C_{t+1})} = -\frac{\Delta C_{t+1}}{\Delta C_t} = \beta(1+r_{t+1}) = \frac{(1+r_{t+1})}{1+\delta} = 1 \qquad if \;\; r_{t+1} = \delta$$
$$\Rightarrow U'(C_t) = U'(C_{t+1})$$
$$\Rightarrow \quad C_t = C_{t+1} = \bar{C} \;\; \text{........................} \quad (5)$$

Where the assumption that $r_{t+1} = \delta \;\; \Rightarrow \beta(1+r_{t+1})=1$, a condition that holds when the capital market is perfect (Hall, 1978), is necessary for the solution above.

3.4.4 Permanent income hypothesis

The constant consumption level allocated for each period must be related to the present value of the all (present and future labour and non-labour) incomes in household's life time (finite or infinite) in some way. This consumption level is shown to be equal to the annuity value of wealth (Hall, 1978) which can also be called a permanent income (Friedman, 1957, Wang, 2006). The permanent income is a constant fraction of the present value of lifetime income, consumed each period (Romer, 2006).

The permanent income consumed each period implies existence of surplus income at times when current income is larger than the permanent income, creating the need for saving. If the excess income had not been anticipated and factored into the present value calculation of income, some of it is consumed when it is expected to be temporary; while all is consumed when it is expected to be permanent (Romer, 2006). On the other hand, deficit is created when the current income is lower than the permanent income: the household (the country) may have to borrow to finance the deficit. Saving and borrowing by the households/economy in periods of high and low income to ensure (constant) consumption of the permanent income is known as consumption smoothing, undertaken to maximise intertemporal utility.

3.2.5 Stochastic intertemporal model of current account

In an economy where pertinent economic variables such as streams of future incomes and market interest rates are not readily predictable with accuracy, economic agents grouped into a single macroeconomic entity seeking to maximise their life-time utility must, according to Obstfeld and Rogoff (1996), solve the problem presented in equation (6) and (7) below:

$$Max\left\{\begin{array}{l} U_t = E\sum_{S=t}^{\infty}\beta^{S-t}u(C_s) \quad \ldots\ldots(6) \\ s.t \\ E_t\left\{\sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t}(C_S+I_S)\right\} = E_t\left\{(1+r)B_t+\sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t}(Y_S-G_S)\right\} \quad \ldots\ldots(7) \end{array}\right\}$$

where:

E_t =the mathematical expectation conditional upon information available in period t;

U_t =expected utility as at time t; β = discounted factor

t = current period; s = any future period, with s > t

C_S = consumption at time s; I_S = investment at time s

B_t = financial asset at the beginning of period t; r = global interest rate

G_S = government consumption at time s; Y_S = output at time t

The utility function in equation (6) relates to the households in the economy whose population size is normalised to unity. The intertemporal budget constraint in equation (7) states that the present value of resources available for consumption and investment is equal to the sum of income generated from foreign assets and domestic income less government spending.

The solution to the maximisation problem in equations (6) and (7) is presented in equation (8) below

$$u'(C_{S}) = (1+r)\beta E_t\{u'(C_{S+1})\} \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Imposing the condition $\beta = (1+r)$ on (8) to ensure that consumption follows a trendless long-run path, and assuming a quadratic utility function, $u(C) = C - (\alpha_0/2)C^2$ with marginal utility $u'(C) = 1 - \alpha_0 C$, equation (8) yields:

$$E_t C_{t+1} = C_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9a)$$

Equation (9a) shows that economic agent maximises their utility when the their expected consumption over time are equal; that is,

$$E_t C_s = E_t C_{s-1} = E_t C_{s-2} = \cdots = C_t = C_s \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9b)$$

Substituting C_s for $E_t C_s$ into equation (7) and rearranging gives:

$$\sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t} C_S = E_t\left\{(1+r)B_t + \sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t}(Y_S - G_S - I_S)\right\} \quad \ldots\ldots\ldots\ldots (10)$$

Using the fact that the permanent level of a variable at time t is its annuity value as shown in equation (11) below:

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\bar{X}_t = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} X_s \Rightarrow \bar{X}_t = \frac{r}{1+r}\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} X_s \quad \ldots\ldots\ldots\ldots (11)$$

With the stochastic version being:

$$E_t\bar{X}_t = \frac{r}{1+r}\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} E_t X_s \quad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Equation (10) becomes:

$$C_t = \frac{r}{1+r}\left\{(1+r)B_t + \sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t} E_t(Y_S - G_S - I_S)\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Substituting (13) into current account identity in equation (14) below

$$CA_t = B_{t+1} - B_t = Y_t + rB_t - C_t - G_t - I_t \text{ ....} (14)$$

yields:

$$CA_t = \left(Y_t - E_t \bar{Y}_t\right) - \left(I_t - E_t \bar{I}_t\right) - \left(G_t - E_t \bar{G}_t\right) \text{ ....}(15)$$

where:

$Y_t - E_t \bar{Y}_t$ = output shock; $G_t - E_t \bar{G}_t$ = shock to government spending;

$I_t - E_t \bar{I}_t$ = shock to investment spending; $E_t \bar{Y}_t$ = long term trend (averages) of output

$E_t \bar{G}_t$ = long term trend of government spending;

$E_t \bar{I}_t$ = long term trend of investment spending

Equation (15) shows that the current account balance surplus result when positive output shock (the surplus of domestic income over the long-term trend) is in excess of positive shock to investment demand and government purchases (resulting when those expenditures are above their long term trend). In other words, current account surplus results when there is positive net output shock while current account deficit occurs when there is negative net output shock.

3.2.6 Current account balance, capital account balance and capital flows

As capital flows to a country at time *t*, which corresponds to changes in financial assets held by the country at that time, are recorded in the capital account, KA (Obstfeld and Rogoff, 1996), the balances on this account are equivalent to current account balance, albeit in absolute term. In fact, under an ideal situation of freely floating exchange rate regime, current account balance (CA_t) is a mirror image of the capital account balance (KA_t) - as captured by the equation (16) - in the sense that a credit balance on CA_t translates to debit balance of the same magnitude on KA. Under a regime of managed exchange rate, a situation that often obtains, government does manage the exchange rate from the effect of the international economic interactions,

$$CA_t = -KA_t = -CF_t \text{ ....} (16)$$

where:

CA_t = Current Account Balance; KA_t = Capital Account Balance;

CF_t= capital flows

reflected in the movement in CA_t and KA_t, by adjusting its reserve of foreign exchange (Tang and Fausten, 2006). In this light, the following relation, exhibited in equation (17) subsists between the current account and the capital account:

$$BoP_t = CA_t + KA_t + \Delta FX_t \equiv 0 \quad \text{.................................} \quad (17)$$

which translates into:

$$CA_t = -CF_t - \Delta FX_t \quad \text{.................................} \quad (18)$$

Where:

BoP_t = balance of payment at time t; ΔFX_t = change in foreign exchange reserves at time t

In summary, capital flows is a natural international economic phenomenon arising from the utility maximisation behaviour of households (described by the permanent income hypothesis) in different economies. In attempts to smoothen consumption pattern to achieve maximum utility, nations share their income risks with one another by lending out the excess of income (output) over their national consumption/absorption, and borrow (or draw from savings in international financial assets) in times of poor output/income.

The excess (shortage) of output over (below) national absorption creates current account surplus (deficit) which is either saved in (financed by drawing from) foreign reserves or international financial assets (liabilities) in forms of capital outflows (inflows) to (from) other countries. This is the reality modelled by equation 18 above.

3.2.7 International dynamic asset pricing models

The foregoing establishes that capital flows between countries originates from utility maximisation behaviour of economic agents via consumption smoothing. Some other models however perceive that consumption smoothing alone may not explain capital flows between nations. Rather, economic agents, while pursuing utility maximisation objectives may allocate their funds (capital) among different international financial assets on the basis of their return adjusted for risk, exchange rate movements, etc. One of such models is the international dynamic asset pricing model.

In a variant of this model, the Diamond's overlapping generation (OLG) model, economic agents are assumed to live beyond one single period; they live two periods: the youth period and the old period. They work in period 1 (youth period) and divide income between consumption and savings; and simply consumed in period 2 the savings and the interests earned (Romer, 2006).

Implicit in the behaviour of the hypothetical economic agent in the Diamond's model is the concept of investment. So long as the production function is concave over the economic life of the business enterprise, return to capital will be non-negative. Investors (households which lend their savings to firms) will always earn a positive interest on their investments, all things being equal.

Rational as they are, economic agents seek to maximise return to their investments because, once the assumption of local non-satiation holds for their preference functions, higher returns to investment translate to higher welfare. The uncertainty surrounding the business environment makes utility from investment expectational. The lower the uncertainty/risk is, the higher the expected utility. Thus rational investors seek to keep mean-variance efficient portfolio (Elton et al, 2007). In other words, they invest in assets that have higher return relative to risk, when faced with a choice.

In a multi-asset market, an investor needs to be able to predict returns to an asset for an investment decision. As prices of assets/stocks co-vary with the stock market index, a single-index model was developed to measure the extent a stock return co-varies with the market such that the return to an asset can be predicted, conditional upon the market index. Equation 19 below presents the single index model for an asset return forecasting (Elton, et al, 2007).

$$R_i = a_i + \beta R_m \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(19)}$$

where:

R_i = return to asset i; R_m = return to market index

a_i = components of return to asset *i* that is independent of the market

β = responsiveness of return to asset *i* to return to the market index

a_i can be further be decomposed into the its expected value, α_i and its random value, e_i.

Hence, equation 19 can be rewritten as equation 20

$$R_i = \alpha_i + \beta R_m + e_i \quad \text{..............................} \quad (20)$$

Related to the single index is the Capital Asset Pricing Model (**CAPM**) which relates the excess return of an asset or portfolio over the riskless asset to its risk, where the responsiveness to risk, β, now the price of risk, is the ratio of market excess return to market risk (Elton et al, 2007). Derivation of this model owes much to Sharpe (1964) and Lintner (1965).

The observed effects of variables other than the market index and the intrinsic risk in an asset's return led to the development of multi index models. Related to this is the Arbitrage Pricing Theory **(APT)**, due to Ross (1976), which defines an asset return as a function of various indices that may bear influence on it.

With globalisation and financial integration, national capital markets are integrated into a global market where an investor has the opportunity of investing on assets irrespective of its geographic origin. Besides having a large range of assets to invest in, global capital market offers portfolio diversification opportunity through which investors can minimise their portfolio risks, given low correlation between returns on domestic asset and foreign assets' returns (Basu, Oomen and Stremme, 2006). When the international capital/asset market is frictionless, that is, when there is free mobility of capital without any cost, a single index model can be used by investors in predicting asset returns, conditional upon the global market index (Lioui and Poncet, 2000). This model is what is known as the International Capital Asset Pricing Model (**ICAPM**).

However, the international asset market is not seamless across national markets. Capital is not freely mobile as investors face some risk-differentials from domestic and foreign investments, which in turn impose some costs on them. Besides the risk premium due to the global market index, the return to assets a domestic investor enjoys also depends on exchange rate risks, a factor that matters when the market is not seamless and the purchasing-power-parity does not hold (Wu, 2008). Hence, International CAPM that does not explicitly model exchange rate risk would fail to predict returns to international assets on the global capital market (Wu, 2008; Lioui and Poncet, 2000). This explains why the international dynamic asset prising model of Hodrick, Ng and Sengmueller (1999) which predict an asset's risk premium solely on its covariance with the global market portfolio fails in its prediction.

In summary, returns on assets, their risk, as well as exchange rate risks are some of the important determinants of international portfolio allocation.

Thus, international capital flows between countries are influenced by considerations other than the desire by countries to share income risks. Much of the private capital flows is decided by international investors pursuing their private objectives (not necessarily national income risk sharing) and reacting to a number of variables such as risks (economic, political, financial market, exchange rate) risks-adjusted return, and safety of investment. Therefore, the flow of capital may not be such that it enables countries to smoothen their consumption and maximise their utility. The allocation of international capital in response to factors highlighted in this section may explain procyclicality of capital flows observed in reality (see chapter 2).

3.2.8 Macroeconomic shocks and Volatility

Macroeconomic shocks (shocks to aggregated demand, supply, monetary policy variables, fiscal policy variables, etc) are sources of fluctuations in real macroeconomic variables such as GDP, unemployment, etc (Forni and Gambetti, 2010). Bhattacharya and Kar (2011) loosely define an economic shock as an unexpected exogenous disturbance that has a significant impact on the economic system. It is conceived as an extreme form of volatility or a significant change or dispersion of an economic variable or indicator from its underlying trend (Vanragis et al, 2004).

Volatility, on the other hand, refers to variation of a magnitude around some central trend (Vanragis et al, 2004). This central trend, according to Cariolle (2012) is the equilibrium value of a variable - statistically, the mean of the variable. Dispersion of a variable around this mean is conceived as volatility.

Volatility is often measured as standard deviation of the distribution of a variable, or its growth rate, around its mean. Many empirical studies such as Ramey and Ramey (1995), Acemoglu (2003), Raddatz (2007) and Di Giovanni and Levchenko (2010) measure volatility of a variable as standard deviation of growth rate of that variable. Measuring volatility with standard deviation is however subject to some drawbacks (Broto et al, 2008) including loss of observation. Given the loss of observation problem, use of standard deviation to measure volatility is limited in low-frequency data like annual data.

Volatility has also been measured in generalized autoregressive conditional heteroscedasticity (GARCH) models as standard deviation of residuals in a regression model. This measurement is suitable to a high frequency data such as monthly or daily data. Ferreira and Laux (2009) employ this model in measuring volatility of portfolio flows.

Unlike volatility that captures dispersion around a mean, shock refers to a significant change in the value of a variable from its underlying trend (not a constant mean). It captures occurrence of an (exogenous) event that triggers fluctuations of a variable. A shock to a variable is captured in a univariate system by error term of an autoregressive (AR) model. Devereux and Sutherland (2011) measure shock to a variable as the error term in the AR(1) equation that regresses the logarithm of variable on its lag value. In a multivariate system like the vector autoregressive (VAR) model, shocks are measured as deviation of orthogonal structural errors.

Shocks and volatility are both measures of dispersion of a variable; but the reference points from which the variable disperses are different. Volatility is measured as second moment of residuals while shocks are measured as the first moment. Volatility measures are point estimates (calculation of which results in loss of observation), thus high frequency data are required to have estimates for each of the periods used in empirical analysis. Measures of shocks do not suffer from this drawback and can thus be applied to a low frequency data like annual data.

A shock can either be positive or negative, depending on its effect on the economy. While positive shocks may be welcome, negative shocks often receive more attention in terms of empirical analysis and policy responses, given their welfare-reducing impacts (Bhattacharya and Kar, 2011). Moreover, the impact of shocks on the economy is asymmetric: some units of a positive shock to an economic variable do not undo the effect of the same unit of a negative shock to that variable as the latter's effects are often irreversible (Vanragis et al, 2004).

There are many types of shocks, and literature earlier than Forni and Gambetti, (2010) disagree with the exact number of shocks that (can) operate in an economy. While early real business cycle (RBC) models assume that only one shock, the supply shock, drives economic fluctuations, Smets and Wouter (2007) recognise the influence of at least ten structural shocks in fluctuating macroeconomic variables. Resolving this controversy has been attempted by several studies (see Forni and Gambetti, 2010) for a survey) many of which propose sets of information criteria for determining the number of shocks in the economy. Employing the three groups of criteria proposed by Amengual and Watson (2007), Bai and Ng (2007) and Hallin and Liska (2007), Forni and Gambetti (2010) arrives at an estimate of between two to six shocks affecting the economy. Using the set of criteria proposed by Onatski (2009) however, Forni and Gambetti (2010) identify three main categories of shocks affecting the economy. These shocks are private demand shocks, non-private demand shocks (monetary policy shock and fiscal policy shock) and supply shocks.

Capital flow shocks and other macroeconomic shocks discussed in this study fall into one or another category of shocks identified above.

3.2.9 Theories of economic growth

The concept of economic growth has generated a lot of debates in the academia and among policy makers, given its implication for the societal welfare. Many theories have been put forward to explain why economies grow and decline in size; or why some economies witness economic growth while some others experience retardation.

The theoretical model widely believed to be the departure point in the discussion of economic growth, given its simplicity of assumptions and significance of prediction is the Solow's growth model. Assuming that the production function is of constant returns to scale (based on other assumptions of the economy being so large that all economies of scale are exhausted and un-importance of natural resources); that output is explained by capital, labour and effectiveness of labour while other variables such as control and national characteristics/ environmental variables (saving rate, fertility rate, ratio of domestic investment to GDP, measures of the rule of law, democracy) and policy variables (ratio of government spending to GDP, e.g.) are considered exogenous, the theory posits that only technological progress, in terms of growth of knowledge, affects economic growth (specifically, the rate of growth of per capita output) and that accumulation of capital from increasing flow of domestic capital through saving (or inflow of foreign capital) bears no effect on the economic growth rate - increase in capital via permanent increase in saving rate only has level effect[11] and not growth effect[12] (Romer, 2006). In the same vein, shift in all exogenous factors has same effect and they (the factors) indicate the steady-state position of the economy[13]. However, the state variables (the initial values of physical capital, GDP per capita, human capital etc) affect growth rate as they may determine the influence of the exogenously determined variables. For instance, the initial level of population affects how large the population would be at every given moment, given a population growth rate[14].

Another neoclassical theoretical model of economic growth is the Ramsey-Cass-Koopmans' (RCK) model due to Ramsey (1928) Cass (1965) and Koopmans (1965). This model makes the same assumption about the production function in the economy as Solow's model. It however, unlike Solow's, does not assume saving rate as exogenous. The model was built upon several atomistic economic agents making inter-temporal economic decisions in which consumption and corresponding saving are determined for each period. The model arrives at the same position as Solow's – the

[11] Permanent shift in exogenous variable such as saving rate temporarily affect the economic growth rate which later returns to the initial rate. The level of economic output merely changes but its rate of growth remains the same as before the shift

[12]Growth effect occurs if permanent shift in exogenous variable such as saving rate leads to an enduring effect on the economic rate

[13] A higher level of an exogenous variable corresponds to a steady-state different from that to which its lower level corresponds. For example a higher level of fertility rate depresses the steady-state of output and thereby reduces growth.

[14] $L_t = L_0e^{nt}$; where $L_t =$ population at time *t*, L_0=initial population at time *0*, e=exponential factor with approximate value 2.718, n=population growth rate, t=time t

only determinant of economic growth, given the assumptions, is the rate of growth of technology – though via different analytical approach. Permanent change in factors that influence consumption (e.g. discount rate and government purchases under the Ricardian equivalence hypothesis) does not have growth effect on the economy but a shift effect (Romer, 2006).

Diamond model, presupposing turnover in the population (that is, new individuals are born while the old ones die) while retaining the assumptions of other models discussed in this subsection, also arrives at the same theoretical conclusion on irrelevance of capital accumulation in explaining long-term economic growth; albeit capital accumulation may shift the economy's growth path (implicitly affecting growth in the short run – during the shift process).

The neoclassical theories discussed above are similar in their conclusions: technological progress, which is exogenous, is the main source of per capita output growth. The new endogenous growth theories do not take the growth of knowledge (technological progress) as given; rather, they model it explicitly[15] as a means to explaining growth differences across countries and over time. A variant of these endogenous theories which presume decreasing returns to production of R&D goods (research and development – which, in turn, produce knowledge) and the conventional goods agrees, despite endogeneity of technological progress, with the neoclassical theories over convergence to balanced growth path. On this path, the economy grows at a constant growth rate, the growth rate of the endogenously determined technological progress. The assumption of the decreasing returns to production of knowledge ensures that its growth converges to a composite parameter (whose components including the population growth rate which may be constant over a period of time) as the growth rate of knowledge growth becomes nil at a particular level of knowledge growth. Though the initial values of knowledge as well as the fraction of labour and capital devoted to knowledge production influence the growth rate of knowledge (at which the per capita output grows), they do not affect the growth rate of

[15] In these model, the growth rate of knowledge is determined in the model; the growth of knowledge is endogenously determined, and not exogenously fixed as in the neoclassical theories

its growth. Shift in these initial values has in the long run[16] only level effect (and not growth effect), on the growth rate of knowledge (which is also the rate at the economy grows); it does not cause the economy to grow perpetually (as it bears no effect on the rate at which growth of knowledge changes over time (Romer, 2006).

The variants of the endogenous growth theories that assume constant returns to scale and increasing returns to scale to knowledge production however posit that shift (change) in (the initial values of) capital labour and knowledge bear influence on the rate at which the growth of knowledge changes (grows) over time (Romer, 1990). Thus with a rise in any of these variables, the economy grows indefinitely. This position, however, has not enjoyed empirical support as the historical reality holds that despite observed rise in rate of investment in the physical capital, increase in saving rate, increase in fraction of resources devoted to human-capital accumulation, and increase in the fraction of resources devoted to R&D (knowledge production) in many countries of the world neither the world's economic growth nor that of any country has exhibited such an indefinite upward trend (Romer, 2006).

In this light, the observed reality tends to favour the explanation of the neoclassical theories and the variant of the endogenous growth theory that assume diminishing returns to scale in the production of knowledge as to why countries grow at stable (constant) rate over time, and not at an increasing rate: convergence to a balanced growth path due to the real-life behaviour of the production function (diminishing returns to capital in goods production - assumed by both neoclassical and endogenous growth theories - and diminishing returns to scale in produced factors, especially knowledge - assumed by a variant of the endogenous growth theories) in the economy. According to the theories, a level of capital stock higher than the one consistent with the balanced growth path results in lower output per worker, given the larger effect of the diminishing returns to capital at higher level of capital stock. On the other hand, a level of capital stock lower than that corresponding to the balanced growth path sees output per worker increasing as the effect of the diminishing return to capital is minimal at lower level of capital stock. Thus, economies with higher level of capital

[16] In the short run, however, the growth rate changes in the economy's journey to a higher path of equilibrium trajectory

tend to grow at a lower rate than those with lower stock of capital, such that they tend to converge.

The neoclassical theory of growth provides another explanation for international flows of capital. Differences in the level of capital accumulation cause differences in returns to capital in different countries, as well as differences in their economic growth rates (Romer, 2006). Thus, a developing country with low capital stock and, consequently higher returns to capital and higher economic growth rate, is likely to attract more foreign funds (capital) from return-seeking international investors than a developed country with higher capital stock, lower returns to capital and thus lower economic growth rate. This forms the basis of the prediction of downhill flow of capital by the neoclassical theory (Alfaro, Kalemli-Ozcan and Volosovych, 2011). The flows of capital may thus enhance convergence of growth rates across countries as more flows to a developing economy raises the capital stock, lower returns to capital and economic growth rate.

3.2.10 Economic growth and macroeconomic shocks

The theoretical relationship between shocks (aggregate, sector-specific/technological) and growth has been documented in literature. Using two-sector AK model, Jones and Manuelli (2004) show that shocks theoretically have effect on economic growth. In their AK model, the social planner maximises the utility of the representative economic agent (given by equation 21).

$$\max E\left[\int_0^\infty e^{-pt}\frac{c_t^{1-\theta}}{1-\theta}dt \perp F_0\right] \quad \text{.................................(21)}^{17}$$

subject to the economy's feasibility constraints

$$dx_t = \left[\alpha_t(A-\partial_k)+(1-\alpha_t)(r-\partial_b)x_t\right]dt + \left[(\alpha_t\sigma_k+(1-\alpha_t)\sigma_b)dW_t+\alpha_t\eta_k dZ_t^k+(1-\alpha_t)\eta_b dZ_t^b\right]x_t \quad \text{.... (22)}$$

which derives from the feasibility constraints in each sector producing the two goods (capital, k - captured by equation 23; and any other good, b -captured by equation 24)

[17] The utility maximised is the expected present value of intertemporal utility captured by the constant relative risk aversion utility function $\frac{c_t^{1-\theta}}{1-\theta}$ for analytical convenience. This value is to be maximised on the basis of all available information, F_0 at time *t=0*.

$$dk_t = ((A-\partial_k)k_t - c_{1t})dt + \sigma_k k_t\, dW_t + \eta_k k_t\, dZ_t^k \quad \text{.................................}(23)$$

$$db_t = ((r-\partial_b)k_t - c_{2t})dt + \sigma_b b_t\, dW_t + \eta_b b_t\, dZ_t^b \quad \text{.................................}(24)$$

where

c= consumption of goods; θ = coefficient of relative risk aversion;

F_0 = information available at time $t=0$; k = stock of physical capital per capita

b= stock of the other goods per capita; A= stock of knowledge

x = total stock of goods in the economy per capita;

α_t =proportion of capital goods in the total stock of goods

∂_k = depreciation of capital stock; ∂_b = depreciation of stock of other goods

r=returns/productivity of the other goods; p = discount rate

σ_k = coefficient of volatility capturing the effect of aggregate (economy-wide) shock on capital productivity

σ_b = coefficient of volatility capturing the effect of aggregate (economy-wide) shock on productivity of the other good

η_k = coefficient of volatility capturing the effect of sector-specific shock on capital productivity

η_b = coefficient of volatility capturing the effect of sector-specific shock on productivity of the other good

W_t =aggregate shock; Z_t^j =sector-specific shock in sector j

The solution to the optimisation problem satisfies the following stochastic differential equation (25)

$$dx_t = \left[\frac{\mu(\alpha^*)-(\partial(\alpha^*)+\rho)}{\theta} - (1-\theta)\frac{\sigma^2(\alpha^*)}{2}\right]x_t\, dt +$$
$$\left[(\alpha^*(\sigma_k-\sigma_b)+\sigma_b)dW_t + \alpha^*_k\, \eta_k dZ_t^k + (1-\alpha_t)\eta_b dZ_t^b\right]x_t \quad \text{........ (25)}$$

and yields:

$$\gamma_t = \frac{dx_t}{x_t} = \left[\frac{\mu(\alpha^*)-(\partial(\alpha^*)+\rho)}{\theta} - (1-\theta)\frac{\sigma^2(\alpha^*)}{2}\right] +$$
$$\left[(\alpha^*(\sigma_k-\sigma_b)+\sigma_b)dW_t + \alpha^*_k\, \eta_k dZ_t^k + (1-\alpha_t)\eta_b dZ_t^b\right] \quad \text{.... (26)}$$

where γ_t = the economic growth rate

Equation (26) can be rewritten as

$$\gamma_t = \frac{dx_t}{x_t} = \left[\frac{\mu(\alpha^*) - (\partial(\alpha^*) + \rho)}{\theta} - (1-\theta)\frac{\sigma_\gamma^2}{2} \right] + \varepsilon_t \qquad \text{......................(27)}$$

$$\varepsilon_t = (\alpha^*(\sigma_k - \sigma_b) + \sigma_b)dW_t + \alpha^*_k \eta_k dZ_t^k + (1-\alpha_t)\eta_b dZ_t^b \qquad \text{................(28)}$$

Where

ε_t = stochastic disturbance component of the economic growth rate equation

Equation (26) reveals that shocks, including those associated with capital flows, dZ_t^b, have effect on economic growth. From equation (27), the impact of output shocks on growth depends on the magnitude of elasticity of substitution, θ. In line with Phelps (1962) and Levhari and Srinivasan (1969), equation (27) shows that output/technology shocks negatively affect growth when θ is positive but less than unity; the shocks, however, positively affect growth when θ is greater than unity, with no impact on growth when θ is unity.

3.2.11 Capital flows pattern and output/growth effect: explanation by the Neoclassical Theory

The direction of flows of capital flows, and how it bears on economic output, can be depicted in the Solow's growth model, as extended in this section subsequently. Under the standard assumption of diminishing returns to factor input (in the short run) and constant returns to scale, Romer (2006) describes Solow's dynamics of capital per effective labour (the rate of change of capital stocks) by equation 29 below.

$$\dot{k}(t) = sf(k(t)) - (n + g + \delta)k(t) \qquad \text{.................. 29}$$

Where:

$\dot{k}(t)$ = the rate of change of capital stock per effective labour at time t;

s = exogenous savings rate; n = population growth rate

g = rate of technological progress; $f(k(t))$ = output per unit of effective labour $k(t)$ = capital stock per effective labour at time t; δ = depreciation rate;

Assuming autarky, the dynamics of capital per effective labour (described by equation 29) and the resultant output per unit of effective labour, as pictorially illustrated by Romer (2006), is presented in figure 3.1 below.

The equilibrium capital per effective labour, k^*, is determined when the actual investment, $sf(k)$[18] equals the break-even investment, $(n+g+\delta)k$[19]. The equilibrium capital per effective labour, k^*, then strictly determines the equilibrium output per effective labour, y^*. The equilibrium output is limited to y^* as the economy employs k^*.

With global financial integration, production/output is not limited by k^* as capital flows influence the capital stock employed. Under the assumption of diminishing marginal returns, the marginal productivity of capital declines with accumulated capital stocks. Thus, two different countries with different level of capital stocks (assuming same level of technological attainment) will be located at different point on the actual investment path, $sf(k(t))$; hence, the marginal returns to capital (assuming factors are paid their marginal product) will be different in the two countries. The marginal returns (productivity) would be higher in the country with lower capital stock than the one with higher stock. The differential in marginal returns to capital thus stimulates capital flows between these two countries as international investors arbitrage by (re)allocation of capital.

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[18] $sf(k(t))$, the product of saving rate, s, and output per unit of effective labour, $f(k)$, is the saving which, in absence of financial friction or imperfection, translates into actual investment.

[19] $(n+g+\delta)k(t)$, the product of 'sum of population growth rate, growth rate of knowledge and depreciation rate' and capital per unit of effective labour, is that amount of capital required to maintain capital per unit of effective labour at the existing level. It is the additional investment that must be made such that maintain capital per unit of effective labour does not fall as population grows at rate n, knowledge at rate g, and as the capital stock depreciates at rate δ.

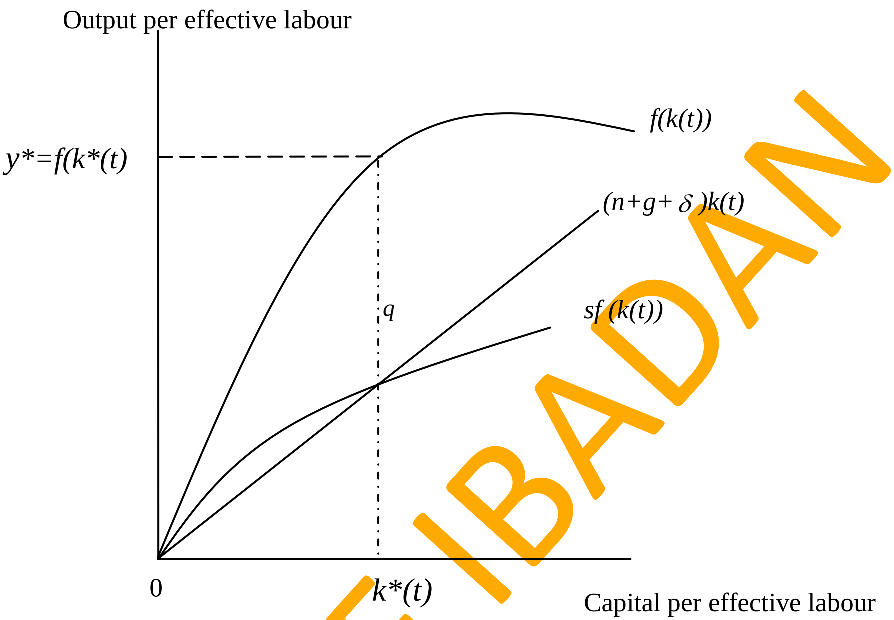

Figure 3.1: Capital per effective labour dynamics and output per effective labour

Source: Romer, D. (2006). Advanced Macroeconomics

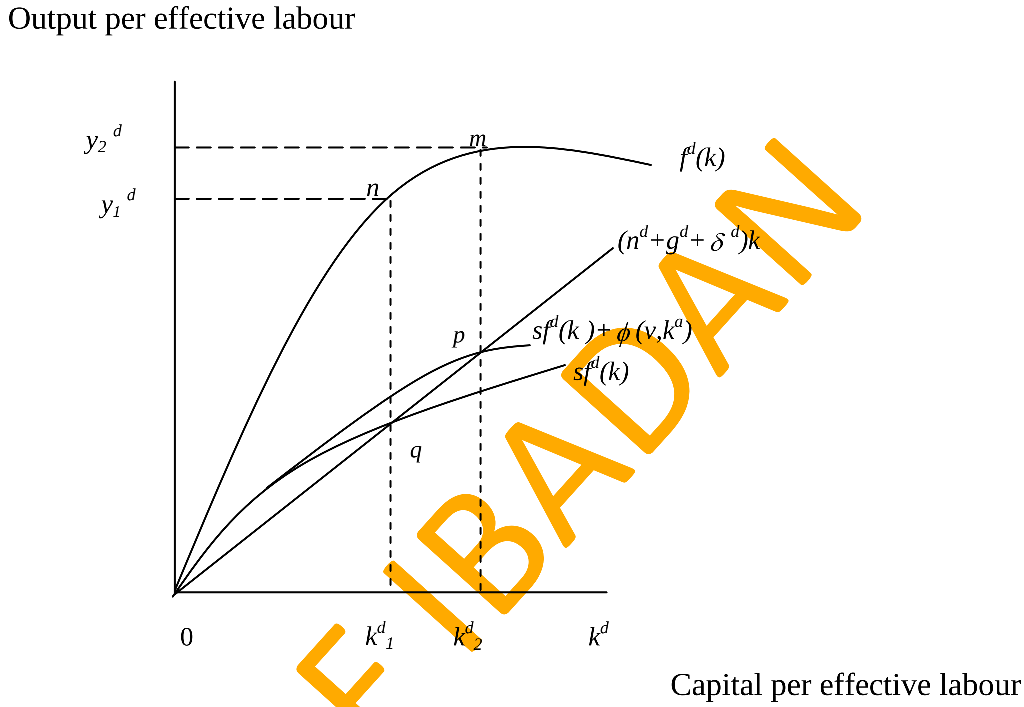

Figure 3.2: Capital dynamics and output in a developing economy

Source: Author's extension of Romer's (2006) graphical presentation of Solow's capital dynamics

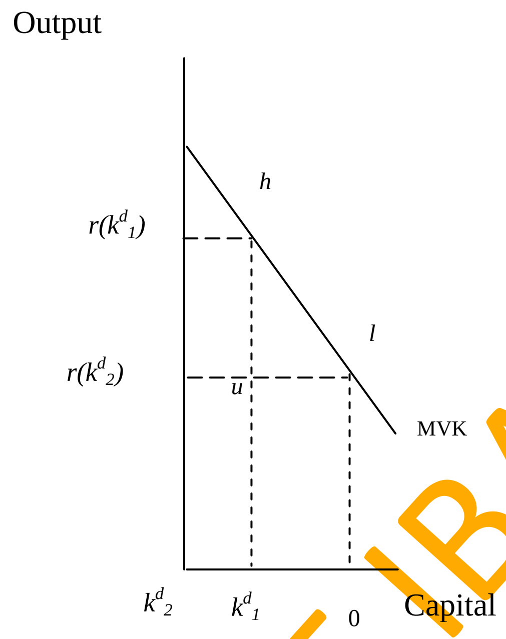

Figure 3.3 International capital flows and domestic interest rate movement in the developing economy

Source: Cardoso and Dornbusch (1989)

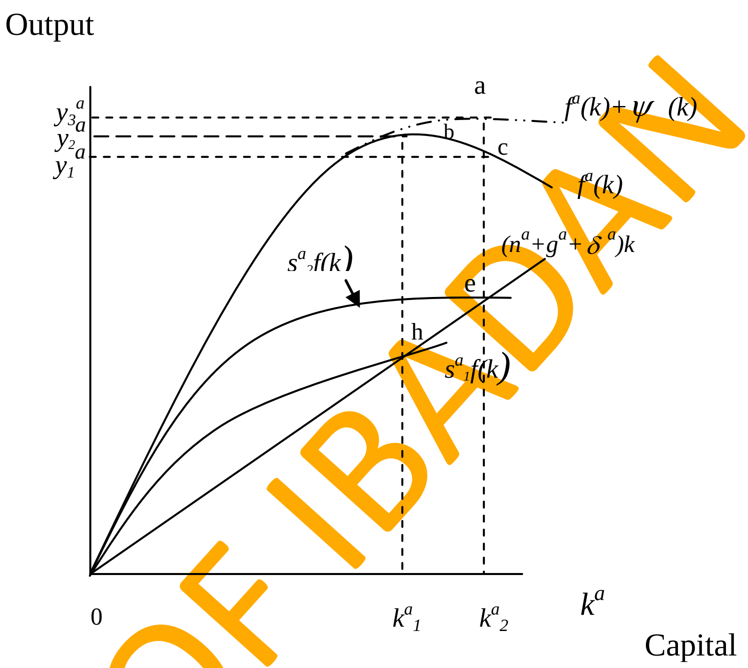

Figure 3.4: Capital dynamics and output in an advanced economy

Source: Author's extension of Romer's (2006) graphical presentation of Solow's capital dynamics

Assuming a two-country global economy where one country is capital-deficient and the other capital-surplus, figure 3.2 and figure 3.4 above respectively depict the dynamics of capital prior to and after financial integration. Prior to capital account liberalisation, high level of capital stock, $0k^a{}_{2,}$ (in capital-surplus, advanced country) arising from high path of saving, $s^a{}_2 f(k)$, correspond to lower output level $0y_1{}^a$ than that attainable ($0y_2{}^a$) with lower capital stock ($0k^a{}_1$) associated with lower saving path $s^a{}_1 f(k)$,, given the diminishing return to factor input[20]. Consequently, the return to capital at stock level $0k^a{}_2$ is lower than that at $0k^a{}_1$ (figure 3.4)

Hence there is incentive to reduce capital stock from $0k_2^a$ to $0k_1^a$ through decrease in saving (figure 3.4) because this takes the economy to higher output level $0y_2^a$. With the possibility of international capital mobility, the economic agents in this country can even attain a level of income higher than that autarkically achievable, without falling onto a lower saving path $s^a{}_1 f(k)$. The economy can continue to remain on the higher saving path, $s^a{}_2 f(k)$ (preferred by assumption), leading to higher capital stock, $0k_2^a$, without suffering output loss $0y_2{}^a$ - $0y_1{}^a$, but gaining $0y_3{}^a$ - $0y_1{}^a$ at higher capital stock $0k^a{}_2$. This is achieved by exporting excess capital $0k^a{}_2$-$0k^a{}_1$. This raises output from $0y_1{}^a$ to $0y_2{}^a$ while the return (interest) on foreign asset (exported capital) augments the domestic output/income such that the economy attains $0y_3{}^a$. The income function where this is attainable is given by $f^a(k) + \psi(k)$[21].

On the other hand, the marginal return to capital in the capital-deficient country is much higher at the autarkic balanced-growth-path level of capital $0k_1^d$, (since its initial/autarkic balanced-growth-path capital stock is lower than that of capital-surplus country). With international mobility of capital, investors in capital-surplus country arbitrage the return differential between the two countries by exporting capital to capital-deficient country where the return is higher. The inflow of capital (of amount $0k_2^d - 0k_1^d$) raises output from $0y_1^d$ to $0y_2^d$ (figure 3.2) though the marginal return to

[20] Assuming the economy is in full employment.

[21] Where $\psi(k)$ is a function of amount of capital exported, the equilibrium return on capital on the global capital market. The amount of capital exported captures the market conditions(including frictions) that impact on mobility of capital

capital declines, given the diminishing returns, from $r(k^d{}_1)$ to $r(k_2^d)$ on the marginal value of capital (MVK) function (figure 3.3).

The new balanced growth paths that guarantee higher global welfare in terms of output are point *p* and *e* respectively for the developing country and its developed counterpart. These growth paths are attained through financial integration whose mechanism involves export of (excess) physical capital[22] or financial capital[23] from developed country to the developing one. In the case of financial capital inflow, the foreign funds complement domestic financial market deposits in the developing country, increase its money supply, reduce the interest rate (see figure 3.3), encourage lending, and thereby increase investment in business projects[24]. All these lead to higher output and its growth. However, domestic savings may be discouraged in the light of lower interest rate and this may lead to partial consumption of foreign capital (FitzGerald, 1999).

3.2.12 Recent pattern of capital flows and output/growth effect: explanation by the Post-Neoclassical perspectives

Observation of recent behaviour of international capital flows reveals 'uphill' rather than 'downhill' flows, a paradox apparently announcing that the predictions of the neoclassical theory no longer holds water. For instance, Prasad, Rajan and Subramanian (2007) observe that capital flows, on net, from poor countries in the south uphill north to rich countries. In an early attempt to demystify the puzzle[25], Lucas (1990) explains that differences in effectiveness of labour and its externality effects on the productivity of other factors in the neighbourhood (in favour of the rich countries) diminishes the influence of (apparent) differential in the marginal productivity of capital (returns) in driving capital flows from capital-rich countries (where productivity and hence returns to capital is (assumed) low) to poor countries

[22]Foreign direct investments often entail inflow of physical capital like specialised equipments required for operation of multinational corporations in developing countries.

[23] Portfolio inflows are usually in the form of financial capital

[24] The financial capital gets transformed into physical capital when the funds are used to finance physical structures required by business projects for production of goods and/or services.

[25] The uphill pattern of international capital allocation is a puzzle in the light of the prediction of downhill flow by the neoclassical theory.

with higher returns to capital[26]. With higher level of education (years of schooling) in advanced countries than developing countries, the quality of effective labour is higher, implying that capital-effective labour ratio may actually be lower in advanced countries than widely assumed, despite their higher level of capital stock and lower population size. Hence, marginal capital productivity in rich advanced countries may not be actually lower than that of the developing countries; and capital may not be flowing downhill to developing countries. However, this explanation alone may not explain uphill flows.

Similarly, Casselli and Fryer (2007) argue that though the naive estimates of the marginal product of capital diverge immensely across countries, the returns to capital are essentially the same once the estimates are adjusted for cross-country differences in the share of non-reproducible capital in total capital and in the price of reproducible capital in terms of output, which are both higher in less advanced countries. This convergence in real returns to capital in developed and developing countries may explain why capital is not flowing downhill; it does not yet account for uphill flows of capital.

Another strand of literature on the pattern of international capital flows is the two-way flows of capital between rich, advanced economies in the north/west and developing/emerging economies in the south/east: in essence, capital flows both downhill and uphill, but in different forms. Devereux and Sutherland (2009) observe that many emerging economies (China particularly inclusive) accumulate, on the net, huge external non-contingent financial assets, particularly bonds (funded with capital outflows) while they are net debtors of FDI and portfolio flows (supplied by inflows of capital from advanced countries). Risk-sharing arrangement between emerging economies and advanced countries for mitigating domestic income shocks by diversifying investment globally informs the bidirectional flows of capital (Tille and van Wincoop, 2010; Devereux and Sutherland, 2009). von Hagen and Zhang (2011) explain the two-way flows from the perspectives of domestic financial frictions that place more borrowing constraints on productive investment in developing countries

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[26]The conception that marginal productivity of capital in advanced countries is lower than that in developing countries originates from agnostic assumption that conditions (effectiveness of labour, technology, constant returns to scale and concavity of production function) with exception of capital stock level in both economy types are the same.

than in advanced, leading to distortion in the two domestic interest rates in both economies: higher (lower) equity returns and lower (higher) loan returns in developing (advanced countries) prior to financial integration. With capital mobility, equity capital in forms of FDI and portfolio capital flows from advanced countries to developing economies while loan capital flows out (in acquisition of external financial assets like US treasury bills, and bond) from developing economies to advanced economies to arbitrage interest rate differentials.

In their contribution to resolving the puzzle, Gourinchas and Jeanne (2013) note that besides uphill capital flows to advanced countries (with slower growth, e.g. US), less of global capital flowing to developing economies are allocated to countries with higher factor productivity growth, while countries with lower or negative productivity growth get more, in contrast to the prediction of the neoclassical theories that capital flows to countries with higher productivity growth. By the permanent income hypothesis moreover, borrowings in terms of capital inflows (saving in forms of capital outflows) should increase (decrease) in countries with rising (declining) economic growth as a consumption-smoothening means to intertemporal utility optimisation. The flow of capital to low-growth economies is again by this hypothesis a puzzle. Gourinchas and Jeanne (2013) explain this puzzle in terms of saving wedge - a distortion that prevents consumption smoothening - arising from the financial market imperfections.

A positive wedge acts like a tax on savings (that is, a tax on the capital income accruing from past savings) while a negative wedge subsidises saving. A weak domestic financial market that fails to internalise growth of the economy in allocating funds to investment and consumption introduces this wedge. In a high-growth economy, such a wedge (in addition to inability to access, or a higher cost of obtaining, external finance – an imperfection of international financial market) may deny residents from borrowing against their future income. Saving is thus positive as borrowing (from both domestic and foreign sources) is very limited. This stunts inflows of capital. The same weak financial market also may not have diverse reliable financial instruments for store of wealth: residents may thus have to purchase foreign financial assets considered safe and need-satisfactory. This leads to outflow of capital from developing economies to the developed ones.

On the other hand, a weak domestic financial market may poorly allocate more funds to less productive activities/projects/firms (Song, Storesletten and Zilibotti, 2011; Midrigan and Xu 2009; Hsieh and Klenow, 2009; Jeong and Townsend, 2007) in a slow-growth, or growth-declining economy; and the foreign capital that flows into the economy via the market may be partially consumed (FitzGerald, 1999). This is a form of positive saving wedge which taxes savings as the existing domestic savings is being poorly used, leading to lower capital income from the invested savings.

With this, capital may flow into slow-growth (developed) economies and out of high-growth (developing) economies.

Besides the unidirectional influence of economic growth/productivity on pattern of capital flows, both from the neoclassical and post-neoclassical perspectives, the downhill pattern of capital flows may bear some influence on economic growth/productivity. The neoclassical theory predicts that downhill flows of international capital would positively affect output in both developing and advanced economies as the latter get higher capital income from exporting capital[27]and the former expand domestic investment financed with imported capital. Consequently, downhill flows increase aggregate global output. From the neoclassical perspective, uphill flows negatively affect output, globally and domestically. From a post-neoclassical perspective, von Hagen and Zhang (2011) argue that the two-way gross flows (uphill flows of gross financial capital (in terms of accumulation of foreign bonds) and downhill gross flows of FDI and portfolio capital) as well as uphill net flows of capital may actually benefit individual as well as the global economy, albeit under some conditions: no restriction to flows, especially that of the FDI and portfolio capital flows.

Outflow of financial capital reduces supply of credit while inflow of capital increases domestic demand in the developing economy. This raises interest rates on loan, encourages increased savings, and consequently leads to availability of more loanable funds which eventually allows for increase in domestic investment. Besides, higher loan rates increase cost of capital and thus prejudices less productive investment in

[27] Investors in advanced countries not only gain benefit from the positive interest rate differential through financial investment abroad (capital export) but also from rise in domestic return to capital following decline in stock of capital and rise in marginal productivity of capital.

favour of the productive ones. In addition, increased (downhill) inflows of FDI and portfolio capital increase supply of capital and thus lower return on equity. More investment project hitherto unprofitable can now be executed. The removal of distortion in the two interest rates (lower interest rate on loan and higher returns on equity than the social rate of return) which existed prior to capital mobility leads to increase in investment as well as greater output and economic growth.

In the advanced country, on the other hand, the two-way capital mobility also removes distortion due to the domestic financial market imperfection that obtains in financial autarky where the loan rates (and returns on equity) are lower (higher) than their counterparts in the developing economy. Loan rates (and returns on equity) fall (rise) with inflows and greater supply of financial capital (outflows and decline in domestic supply of FDI and portfolio), leading to higher investment due to lower cost of loanable funds. Moreover, rise in returns to equity prejudices low-return investments. This leads, again, to higher output and growth.

Global output and economic growth, consequent upon rise in output and growth in both the developing and the advanced country, rise, with the two-way uphill and downhill gross flows. This gain may not be diminished by net uphill flows; as long as it leads to removal of distortions in the financial market of both economies. Net uphill flows is likely to result from the fact that financial markets in the advanced economy are far more developed, and thus more able to attract more capital than their counterparts in developing economies.

3.2.13 Capital flows and output: welfare effect

Cardoso and Dornbusch (1989) highlight the theoretical impact of capital (in)flows on the gross domestic income. The impact, which is analysed by the figure 3.5 below, is shown to be positive as not only are capital (foreign and domestic) paid their marginal value product but there is a surplus (the rent on use of foreign capital) that accrues to the domestic economy.

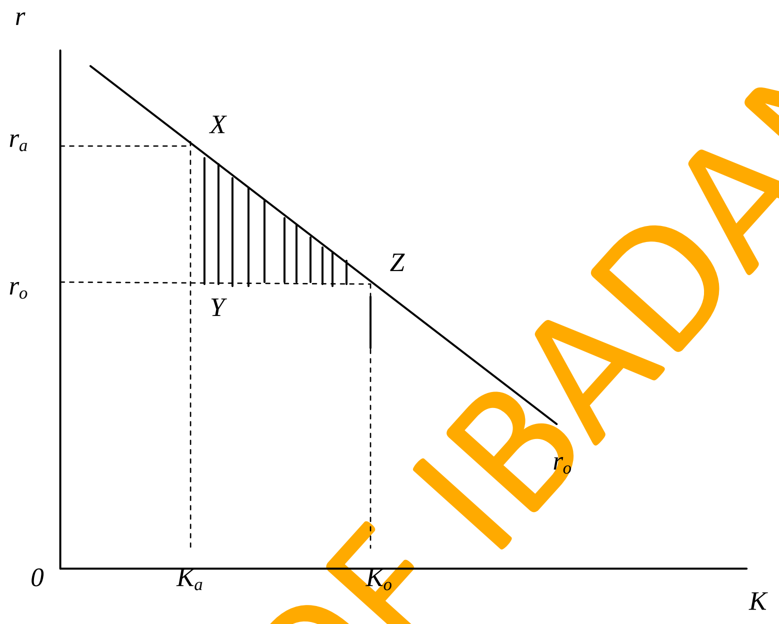

Figure 3.5: The welfare effects of capital inflows

Source: Cardoso and Dornbusch (1989)

In autarky, GDP and GNP are the same and worth $0r_aXK_a$. With financial openness and financial integration, capital resources available for production rises from K_a to K_o, thereby contributing to GDP expanding from $0r_aXK_a$ to $0r_aXZK_o$ and GNP rising by XYZ[28].

With income distribution pattern unchanging, higher GNP translates to better welfare for the populace. The magnitude of (positive) impact of capital in (flows) on output, and on welfare, however depends, as Cardoso and Dornbusch (1989) posits, on distributive share of capital and elasticity of substitution between imported capital and domestic capital. The smaller the share of capital in production and the lower the elasticity of substitution between foreign capital and domestic resources, the higher is the gains from inflows.

3.2.14 Capital flows and economic growth: the Two-Gap and the Three-Gap models

There are many routes via which capital flow impact on economic growth of a developing country. The two-gap model by Chenery and Strout (1966) identifies two routes for positive impact of capital flows on economic growth: relaxation of savings constraints and attenuation of problems of limited access to foreign exchange.

The poor economic situation of many developing countries captured by low level of income result in low level of savings, low level of investible (loanable) funds, thus low level of investment, output/income and growth. These developing countries may be in perpetual struggle to attain growth if the gap between the domestic savings and investment required for targeted growth (saving-investment gap) is not bridged by capital inflows (Gomanee, Grima and Morrissey, 2005; Taylor, 1991).

Moreover, many developing countries need to import capital goods like high-tech hardware and software because of low level of their technological attainment. Their ability to do this may be limited by insufficiency of foreign exchange earnings generated from export. The deficit between these earnings and foreign exchange financing requirement is known as the foreign exchange gap, and this is also bridged

[28] Assuming $r_aXYr_o = K_aYZK_o$

by capital inflows (Akinboade, Siebrits and Roussot, 2006; Cardoso and Dornbusch, 1989).

In addition to the two constraints highlighted by the two-gap model, the three gap model espoused by Baccha (1990) and Taylor (1991) underscores fiscal revenue constraint which results in fiscal gap between the public expenditure required to provide requisite infrastructure for economic growth and the limited revenue the government can generate to finance the expenditures (Zhang and Chen, 2012). The fiscal revenue constraints in developing countries, which often results from limitations on revenue generation such as underdeveloped financial markets from which government cannot raise finance for public investment/infrastructure, limited ability of the government to increase revenue by incessantly increasing inflation tax and income tax due to public/social constaints (Taylor, 1991), may be eased by inflows of public savings in forms of borrowings (such as loans from multilateral finance institutions e.g. IMF, World Bank) or official development assistance (ODA).

Capital inflows to developing economies spur economic growth by significantly contributing to bridging of the gaps by removing these constraints.

3.2.15 Theoretical determinants of capital flows

As discussed earlier, net capital flows (inflows less outflows) respond to the saving-investment differentials between countries and they result in flow of real resources from saving-surplus countries to saving-deficit ones in reaction to current account imbalance (Obstefeld and Rogoff, 1996).

On the other hand, gross capital flows respond to a host of determinants/factors that are distinct from current account imbalances which Obstfeld (2012) Citibank (2010) and Taylor and Sarno (1997) classify these determinants as **'pull'** and **'push'** factors.

Felices and Orskaug (2005) agree with Taylor and Sarno's (1997) description of **pull** factors of capital flows: they are country-specific elements that reflect domestic fundamentals - investment opportunities and inherent risks. They determine whether or not international investors seeking to hold mean-variance efficient portfolio invest in that country. These factors include rate of economic growth, interest rate, macroeconomic stability, degree of financial openness, level of foreign exchange reserves etc.

Besides the influence of the pull factors, certain factors are responsible for outflow of capital from donor to recipients. The direction of their influence is however different from that of the pull factors. Rather than exerting pulling effect, they spark outflow of capital from source country into the destination/recipient countries. They are thus known as the ‘**push factors**’. The factors are exogenous to the recipient country: they are located in the countries that are capital suppliers and are referred to as global determinants of capital flows (Felices and Orskaug, 2005; Amaya and Rowland, 2004). They include global interest rate and global rate of economic growth.

3.2.16 Summary of theoretical literature review

Theoretically, capital flows naturally originates from utility maximisation behaviour of economic agents via income risk-sharing: they correct short-term current account imbalances and thus enable countries to deal with output shocks (positive or negative). In this case, capital flows countercyclically. That is, capital flows out (in) when the economy is booming (depressed).

However, the countercyclical fashion of flows may give way to procyclical pattern when investors’ allocation of private capital responds to pull and push factors such as economic growth rate, return to capital, risks (political, exchange rate, etc) and global financial crisis. Rational investment behaviour suggests that international investors allocate capital to countries with higher economic growth and higher returns to capital. They withdraw their funds when the economic outlook deteriorates. This allocation style causes procyclical flows of capital which further aggravates domestic output shocks.

Do these theoretical predictions hold in reality? This study reviews in the next section empirical studies on these issues to find out which of the pattern of flows (procyclical or countercyclical) has been recognised in empirical literature as dominant, why, and what has been the implication of such pattern on developing economies, especially, those in the SSA.

3.5 Empirical studies - a review

Several studies have investigated the behaviour of international capital flows as well economic growth and performance. While many examine each of these phenomena independently, many others probe into interactions between them. This section reviews empirical works that have sought to examine the validity of theoretical hypotheses on these phenomena in the light of available data.

3.5.1 Current account, capital flows and GDP (level and growth)

The findings of many empirical studies agree on the theoretically proved relationship between current account, capital flows and economic growth. Chin and Ito (2007) find that high-income industrial countries usually run current account balance (surplus). This surplus is exported abroad to acquire financial assets abroad. Guerin (2006) notes that capital has been flowing from developed (usually high-income) countries to developing (low-income countries) and that inflow of capital to developing countries have been accompanied by current account deficit in such countries. Opoku-Afari (2005) observes that current account deficits in Ghana are financed by foreign capital flows.

In the same vein, Bosworth and Collins (1999), using a panel data on 58 countries from 1979 to 1995, find out that capital flows to developing countries have been used to finance current account deficit. Similarly, Lane and Milesi-Ferretti (2001) conclude, from the result of panel fixed effect regressions using data on 20 industrial countries and 38 developing countries over sample period of 1970 to 1998, that trade (current account) balance are associated with capital flows. In summary, these studies establish that current account balance is associated with capital flows.

On the relationship between capital flows and economic growth, some studies find that capital flows retard economic growth while many others find otherwise. Prasad, Rajan and Subramanian (2007), using data on various groups of developing countries from 1970-2004, find out that current account deficits (and the associated capital inflows) negatively correlate with growth. They find that countries with lower current account deficit (smaller inflows) or larger current account surplus (larger capital outflows) grow more than those with larger deficit. They conclude that capital inflows negatively affect economic growth.

In separate studies, Edison et al. (2002) and Kraay (1998) find that capital flows do not affect growth at all. Several reasons have been adduced for the negative or no-effect of capital flows on economic growth: post-flow decrease in precautionary saving, suggesting that some of the foreign funds are consumed and not invested (FitzGerald, 1999) as well as information asymmetry that prevents foreign funds from being profitably invested (Stiglitz, 2000).

Alfaro, Kalemli-Ozcan and Volosovych (2011) criticise the use of current account balance in testing the prediction of neoclassical models regarding capital flows trend and effect as uninformative: the current account is aggregative of both private flows and public flows (aid, debt, etc) while the neoclassical framework pertains to private flows. Kaminsky, Reinhart and Vegh (2005) support Alfaro, Kalemli-Ozcan and Volosovych (2011) in noting that current account balance is an imprecise indicator of capital flows. Thus, Prasad, Rajan and Subramanian's (2007) findings may not be indicative of the effect of capital flows on economic growth.

In the light of the above, many studies report a positive, however conditional, relationship between capital flows and economic performance. Klein and Olivei's (2008) findings reveal that capital account liberalisation and the associated flows improve economic growth though its positive effect depends on financial depth. Edwards (2001) and Arteta, Eichengreen and Wyplosz (2003) find that, conditional upon a significantly high level of economic and financial sector development, capital account openness (and the associated flows) positively affects growth.

In the same vein, Bailliu (2000), on examination of the role of capital flows on economic growth using data on 40 developing economies including some sub-Saharan African countries, finds that the impact of capital flows on the economy depends on the level of financial market development: capital inflows have positive (negative) effect on growth when the country is financially developed (underdeveloped). Mody and Murshid's (2011) findings also reveal that capital flows have positive effects on economic growth, once the volatility of the country's economic growth is below a particular threshold; higher volatility (beyond the threshold) renders the effect of capital flows on economic growth negative. The authors further explain that greater uncertainty inherent in economic volatility deters international investors from investing funds in the economy as they tend to take time for greater planning for risks involved. This may result in smaller capital inflows during periods of high volatility.

Alfaro, Kalemli-Ozcan and Volosovych (2011) also report that international capital flows net of government debt, or net of aid, are positively correlated with economic growth. In other words, private capital flows positively affect growth. These authors however find that government debt (a form of public capital flows) negatively affect growth.

Examining the conflicting results on the relationship between capital flows and economic growth for possible reasons, Quinn and Toyoda (2008) find that the conflicts in the results largely result from measurement error, difference in spatial and temporal scope considered and collinearity among explanatory variables. These authors show that, once the methodological problems (measurement error, differences in spatial and temporal scope and collinearity among explanatory variables) are controlled for, capital flows have significant positive effect on growth. Mody and Murshid's (2011) replication of Prasad, Rajan and Subramanian's (2007) analysis confirms Quinn and Toyoda's (2008) findings. When the sample size was expanded from sixty (60) countries to eighty-one 81 countries and the temporal scope was changed from 1970-2000 to 1980-2003, Mody and Murshid (2011) find that the impact of capital flows on economic growth reported by Prasad, Rajan and Subramanian (2007) reversed: capital flows now positively affect economic growth, against the original findings of Prasad, Rajan and Subramanian's (2007).

Related to the influence of measurement on the mixed results regarding capital flow-economic growth relationship is use of aggregate private flows in analysis. Several studies have found that different components of private flows have different impacts on economic growth. Choong et al's (2010) investigation of the impact of three different types of private capital flows on the economic growth of fifty one recipients of capital flows comprising both developed and developing countries show that FDI positively affects growth while foreign debt and portfolio investment do not. In the same vein, Kose, Prasad and Terrones (2009) had found a positive relationship between total factor productivity growth (TFP) and both FDI and portfolio flows, but the relationship between TFP and foreign debt is negative. In their analysis of the impact of capital flows on the economic growth of one hundred countries over the period of twenty years (1990-2010), Aizenman, Jinjarak and Park (2013) find that FDI positively influence growth while non-FDI flows (portfolio investment, debt and equity) do not bear any significant positive relationship on economic growth other than provision of access to foreign savings.

The dominant view in literature, from the foregoing, is that capital flows positively affect economic growth, albeit conditionally. This thus necessitates examining the mechanisms through which capital flows translate to economic growth.

Literature has identified a number of ways through which capital flows contribute to the economic growth. One is the bridging of saving-investment gap. Analysing the impact of capital flows on investment in twenty two transition economies from 1995 to 2005 Mileva (2008) reports that inflows of FDI and loan capital statistically increase level of investment. A dollar inflow of FDI stimulates domestic investment growth by 74 cents while a dollar inflow of loanable capital raises investment by 46 cents. Portfolio capital however does not have a statistically significant effect on domestic investment. These findings agree with literature that long term capital flows like FDI affect investment while short-term capital flows like portfolio capital do not. Several channels for the positive impact on investments have been identified. Inflows of loan capital lower interest rates on loan, reduce cost of capital and consequently raises investment (von Hagen and Zhang, 2011, Mileva, 2008). Moreover, FDI inflow results in technology spill-over (Gheeraert and Mansour, 2005; Borensztein, De Gregorio and Lee, 1998) which make domestic firms to be more productive (Mileva, 2008).

Another perspective in literature is the endogeneity of capital flows. While many studies affirm that capital flows affect economic growth, other studies have suggested that economic growth may also impact on flows of capital between countries. Similarly, the controversy as to the type (positive or negative) of effect capital flows have on economic growth also extends to the impact economic growth exerts on international flows of capital.

International inflows of capital may rise with economic growth as countries may liberalize their capital accounts when they expect that the nation's growth prospects are bright (Rodrik, 1998). This possible endogeneity informs use of generalised methods of moments (GMM) in capital-growth studies like Quinn and Toyoda (2008) and Bekaert, Harvey and Lundbland (2002). Gourinchas and Jeanne (2013), using data on sixty-eight non-OEDC developing countries to analyse capital allocation puzzle between countries, find that contrary to the neoclassical theory's predicted endogeneity of capital flow on productivity and economic growth, capital do not flow to developing countries with high economic/productivity growth; instead, capital flows to developing countries with lower productivity growth.

3.3.2 Capital flow volatility: sources and impact

Cross-border capital flows are believed to be inherently volatile, and this is manifested in sudden stops[29] (Calvo and Reinhart, 2000; Calderon and Kubota, 2011), with some components being more volatile than some others (Becker and Noone, 2009). Portfolio flows are generally considered to be the most volatile component of capital flows (Ferreira and Laux, 2008). Becker and Noone (2009) support this view, indicating that while portfolio flows and bank or money market flows are regarded as speculative and subject to sudden reversal, and are thus seen as 'hot money' and a very volatile source of finance (Ferreira and Laux, 2008), FDI flows are relatively stable.

The magnitude and pattern of capital flows volatility in developed economies are different from those in the emerging ones. Broner and Rigobon (2004), analysing data on a sample of fifty eight countries over a period of thirty nine years (1965-2003) conclude that capital flows volatility is higher in emerging economies[30]. Becker and Noone (2009), contrasting data on six industrial countries with those on six developing countries, find that overall volatility of aggregate flows (capital account) in emerging economies has been about double that of the industrial countries. Moreover, Teaser and Werner (1995) find that private capital flows (especially portfolio capital) are more volatile in emerging economies than in developed countries.

[29]A sudden stop is conceived in literature as unexpected, persistent and significant reversal of net inflows of capital.
[30]Broner and Rigobon's (2004) conclusion is based on their finding that the standard deviations of capital flows to emerging economies is 80% higher than that of the developed countries.

Becker and Noone (2009) explain their findings by suggesting existence of negative correlation between the components of capital flows in industrial economies, indicating the ability of the industrial countries to accommodate the variability in the mix of component flows via easier substitutability between these flows. This is indicative of higher level of financial market development in the industrial economies. The increasing level of volatility of net inflows of all components of capital flow is of great policy concern in the emerging economies as about 60% of capital flows to emerging Asian countries have abruptly disappeared in sudden stops (Balakrishnan et al, 2012).

Capital flows volatility is due to a number of factors. Martin and Rey (2006) indicate that relative timing of financial liberalisation and trade liberalisation bear effect on volatility of capital flows to a country: countries that liberalise their capital account prior to trade liberalisation are likely to witness higher volatility and are more vulnerable to risk of financial crash as a consequence. Aghion et al (2005) argue that the level of financial market development interacts with capital account liberalisation to determine the level of capital flows volatility that a country faces: capital flows volatility is higher in countries that open their capital account before the financial market is well developed. Maturity mismatch[31] has also been identified as a cause of capital flows volatility (Converse 2012). This mismatch often occurs in the presence of information frictions and agency problem which make it optimal for firms to mismatch finance and investment (Jeanne, 2009; Broner, Lorenzoni and Schmukler, 2010).

From the empirical evidence's point of view, Broner and Rigobon (2004) find that capital flows volatility is negatively correlated with level of GDP, institutional quality and financial development. Alfaro, Kalemli-Ozcan and Volosovych (2007) from their analysis of data on 122 countries from 1970 to 2000 support that capital flows volatility is negatively correlated with sound macroeconomic policies and institutional quality. From their analysis on 26 countries from 1973-2000, Kaminsky and Schmukler (2003) find that financial integration with global financial market increase volatility of FDI flows but has no significant impact for other flows in emerging

[31] Mismatch refers to non-synchronisation of term to maturity of investment projects and the loans used to finance them. Mismatch occurs when short term loans are used to finance long-term investment

economies; on the other hand, it reduces volatility of non-FDI flows in advanced countries. Broto, Diaz-Cassou and Erce-Dominguez (2008) provide extensive empirical evidence on determinants of volatility of different components of capital flows. These three authors find that FDI volatility has a significant (insignificant) relationship with institutional quality (rule of governance), no significant relationship with global factors (e.g. global economic growth rate, US interest rate) and non-linear inverted 'U' relationship with GDP per capita[32]. Volatility of portfolio flows was found to be significantly negatively correlated with GDP per capita, its growth, bank sector development and trade openness but positively correlated with domestic credit as a ratio of GDP and banking sector deposit as a ratio of GDP[33].

With regard to the impact of capital flow volatility on economic growth, Ferreira and Laux (2008), on the basis of analysis of data on 50 countries including 14 developed countries between 1988 to 2001, report that while openness to portfolio flows is conducive to growth, that the portfolio flows volatility associated with openness does not hurt any country's economic growth as the statistical relationship between the former and subsequent economic growth is weak. Aizenman and Sushko (2011) as well as Mody and Murshid (2005) report that portfolio flows have less beneficial effects on the economy than FDI flows do because the former is more volatile. In a panel regression on 15 emerging countries' data from 1991-2011, Converse (2012) finds that while portfolio flow positively affects output, its volatility reduces output via its dampening effect on investment.

3.3.3 Capital flows and macroeconomic shocks

Though the few studies on the relationship between capital flows and macroeconomic shocks have only focussed on countries other than those in the sub-Saharan region, it is worthwhile to review their empirical findings for reason of either providing a source of evidence for the findings of this study or identifying source of divergence if the sub-Saharan African's case disagrees with the relationship predicted in those studies.

[32]The non-linear inverted U relationship of FDI flows volatility with GDP per capita indicate that countries with average GDP per capita are bedevilled with high volatility while those with low GDP per capita and high GDP per capita do not experience volatility.

[33] High ratios of domestic bank's credit to GDP and banking sector's deposit to GDP indicates underdevelopment of capital market relative to the banking sector. This economy's ability to effectively deal with volatility is thus greatly undermined

The eventual findings of this study may contribute to development of a theoretical relationship between capital flows and macroeconomic shocks in sub-Saharan Africa, whether or not they agree with the prediction of the previous empirical works.

Fratzscher, Saborowski and Straub (2009) employed structural vector autoregression (SVAR) to model the relationship between private capital flows and monetary shocks in the United States. They find out that monetary policy shocks positively affect size and composition of flows to and from the United States via its effect on returns to various components of private capital flows. While the study contributes to expanding the list of capital flows determinants, it does not examine the effect of capital flows shocks on the economy.

Pradhan, Baqir and Heenan (2011) agree with Fratzscher, Saborowski and Straub (2009) on the impact of monetary policy shocks on capital flows. While the former authors considers various policy responses to contain the negative effect of capital flows on some economies like Brazil, Indonesia and South Africa, they also do not examine the effect of capital flows shocks on the economy.

Saatcioglu and Korap (2008) as well as Culha (2006) independently examine, within Structural Vector Autoregressive (SVAR) models, the relationship between macroeconomic shocks (both within and from outside the country) and capital flows into Turkey. Using monthly data from 2001 to 2007, Saatcioglu and Korap (2008) find a positive shock to domestic interest leads to portfolio outflows while a positive shock to domestic stock returns attract capital inflows. This agrees with the position of Devereux and Sutherland (2011) that the returns to which portfolio flows respond is the ratio of domestic output to the price of home equity (generating the output).

Using monthly data from 1992 to 2005, Culha (2006) also find that a positive shock to foreign interest rate (specifically the US interest rate) and US industrial production index increased outflows of capital from Turkey during that period, while a positive shock to interest rate causes outflows rather than attracting inflows (contrary to theoretical prediction). This shows irresponsiveness of capital flows to real interest rates.

Ferreira and Laux (2009) examine the influence of volatility of portfolio flows on economic growth, using data on fifty (50) countries including only three (3) in the sub-Saharan African region from 1988 to 2001. This study concludes that volatility of portfolio flows does not detract from growth as it only has negative but statistically insignificant impact on economic growth.

However, Converse (2012), using data on fifteen emerging market economies including the top ten recipients of capital flows[34] for period ranging from eight to twenty years finds that portfolio flows volatility negatively affect output to a statistically significant extent.

Bayraktar and Fofack (2011) find that public capital accumulation (which may vary with government spending) as well as profitability shocks (which Devereux and Sutherland (2011) regard as return to investment) positively affect private capital formation (which may be promoted by capital inflows) in the sub-Saharan Africa. On the other hand, they discover that macroeconomic stability indicators such as inflation and exchange rate volatility do not.

Mercado and Park (2011), using the generalised method of moment (GMM) on data collected on fifty emerging economies, report that institutional quality, financial openness and per capita income growth positively affect size of total capital inflows. On the other hand, trade openness and volatility of real exchange rate worsens volatility of total capital inflows and portfolio inflows respectively in emerging economies, while per capita income growth and financial openness reduce volatility of all capital inflows and portfolio flows respectively.

3.3.4 Capital flow management techniques

Capital flows have been shown to benefit countries from both the theoretical perspective and empirical viewpoint. However, surges in the flows have been observed to bear negative consequences for the recipients (see Reinhart and Reinhart, 2008; Mendoza and Terrones, 2008; Furceri, Guichard and Rusticelli, 2011 for a survey): asset price volatility and bubbles, rapid exchange rate appreciation, credit booms and unsustainable drops in risk premia, distortions in money markets, and disruptions in

[34] According to World Bank's Global Development Finance

monetary policy transmission are some of the detrimental effects capital flows may have on the recipient's economy (International Monetary Fund, 2012). In many cases, they induce financial and macroeconomic volatility by overwhelming domestic financial markets and stretching the capacity of macroeconomic policies to adjust. In response to these challenges that accompany capital flows, several management strategies or techniques have been advised both in literature and policy papers. These strategies can be grouped, according Ostry et al (2011), into three categories: use of macroeconomic policies, use of prudential policies and imposition or intensification of capital controls. These authors however suggest that the first two policies be first implemented to handle challenges of capital flows surges prior to the complementary use of capital controls as they may either be ineffective or complicate macroeconomic challenges facing capital recipients if the first two policies had not been properly implemented.

Macroeconomic policies suggested in literature include exchange rate policy, foreign exchange reserve policy, monetary policy and fiscal policy. On the other hand, prudential policies which can either be micro or macro in nature include (loan) provisioning requirements, loan-to-value (LTV) requirements, caps on credit growth, capital buffer, limit on banks foreign currency open position and restriction of domestic lending denominated in foreign currency. Lastly, capital control measures include taxes on flows from non-residents, unremunerated reserves requirements (URR) on capital inflows, special licensing requirements to receive inflows, and outright ban on inflows (Ostry, et al, 2011).

Exchange rate policy, a macroeconomic policy, has been suggested as useful in controlling inflows. Appreciation of the exchange rate discourages inflows and may be used in reducing the volume of inflows in times of positive surges Ostry et al (2010). This policy which has been used in emerging Asia (Pradhan, 2011) is however desirable only if the currency is not over-valued[35] (Ostry et al, 2011). Depreciation, on the other hand, encourages inflows and may be useful in attracting more flows in times

[35] If currency is already over-valued, exchange rate appreciation would likely penalise the international competitiveness of the economy's trade sector.

when the inflows significantly decline. Use of exchange rate appreciation should however be thoroughly examined

Foreign exchange reserve accumulation is another macroeconomic policy measure that can be used to contain surges in capital inflows by housing or mopping off the surges before they infiltrate the economy. The use of this policy can however be limited if the country already has huge reserves as excess reserves can have a repercussion on the economy. If there are inflationary concerns following reserve accumulation, the resulting excess liquidity can be sterilised through open-market market operations (Ostry et al, 2010).

Lowering of interest rate, as monetary policy tool, is useful in reducing the inflows as it minimises arbitrage opportunities available to international investors. The use of this policy tool may however be limited as it could lead to overheating of the economy[36]. While South Africa has been able to keep interest rates low to reduce capital inflows surges, Brazil and Turkey have tighten their monetary policy through higher interest rates to address potential overheating concerns (Pradhan et al, 2011).

Foreign exchange related prudential measures such as placing limits on domestic banks' open FX position, limiting their lending in foreign currency, as well as imposing differential reserve requirements on liabilities in local currency and foreign currency, go a long way in discouraging domestic banks' borrowing from their foreign counterparts, and hence reduce inflow surges. Implementation of these measures in Korea was successful in minimising the negative surges of capital inflows on the Korean economy (Ostry, 2011). Other prudential measures not related to foreign exchange policy such as restraining growth of lending generally through LTV ratio, limit on domestic credit growth, asset classification and provisioning rules, etc, have also been found effective at managing capital inflow surges, especially in Columbia, Croatia, India, Peru, to mention a few.

Capital control measures are advised only as complementary, and after other measures have been implemented and perhaps found not sufficient, especially under certain economic circumstances. They are however helpful when surges in capital inflows are

[36] Lowering interest rate may increase money demand and thus cause inflation.

temporary because use of macroeconomic policies or prudential measures may leave behind more lasting side-effects on the economy long after the problems posed by temporary surges have been resolved (Ostry, 2010).

3.3.5 Empirical perspectives on capital flows – gross versus net

Obstfeld and Rogoff's (1996) examination of current account reveals that current account gap bears implication for capital flows. The saving-investment gap in an economy creates a current account deficit that is financed by net financial flows (Prasad, Rajan and Subramanian, 2007; Higgins and Klitgaard, 1999). Thus what traditionally drives capital flows is the current account gap (Bruno and Shin, 2012), which is primarily filled by net capital flows. Net flows are important for short-run balance of payment equilibrium; they thus bear significant implication for short run economic stability. Thus some empirical studies on capital flow (e.g. Fratzscher, Saborowski and Starub, 2009) employ net capital flows, rather than gross flows in their analysis.

Recent developments in international capital flows show that gross capital flows bear greater implication for economic stability than net flows. The size of gross flows tends to be two to three times that of net flows (Cecchetti, 2011). The magnitude of gross flows relative to the economic size of many developing counties has been so worrisome that even countries with balanced current/capital account (with zero net flows) also complain about gross flows. Obstfeld (2012) observes that gross capital flows has been so large that they not only dwarf current account gaps (net flows) but also entail potential financial stability risks.

3.3.6 Empirical assessment of economic growth determinants

The implication of growth for welfare in the long run has spurred empirical research to establish significant determinants of economic growth by testing the validity of those determinants predicted by growth theories[37]. Review of the empirically validated determinants of economic growth is necessarily informative for subsequent modelling of SSA economic growth under the effect of capital flows shocks.

[37] Some of these were earlier discussed in section 3.2.9

In testing for absolute convergence predicted by theory, Barro (2003), using data on the 113 countries from 1965 to 1995, find that **initial level of GDP per capita** is only significantly negatively correlated with growth once the effect of other determinants are controlled for. His findings establish conditional convergence and repudiate absolute convergence. Prasad, Rajan and Subramanian (2007), using 103 countries from 1970-2000 to test the effect of aggregate capital flows (current account balance) on growth, find a significant positive relationship between initial level of GDP per capita (used in all equation specifications as a control variable) and per capita GDP growth. Similarly, Mody and Murshid's (2011) investigation of the impact of capital flows (and components) on economic growth under different volatility regimes using data on 61 and 87 countries (in different empirical specifications) between 1980 and 2003 reveal that the initial level of GDP per capita as a control variable is significantly related to growth.

The importance of **the initial level of human capital**, captured by educational attainment as a determinant of growth has been documented in literature (Barro, 1996). Educational attainment, measured as average years of schooling has been found to be positively related to growth of GDP per capita (Mody and Murshid, 2011; Barro, 1996).

Life expectancy, which may indicate the quality of life in terms of access to life-enhancing facilities from infanthood, has also been established to be positively related to growth at a statistically significant level (Prasad, Rajan and Subramanian (2007); Barro (2003)).

Fertility rate, a factor of population growth rate, is negatively correlated with growth (Barro, 2003) because unless the growth rate of capital formation takes care of it, capital per capita will decline and output will fall.

Government consumption as a ratio of GDP has been empirically established to negatively affect growth (Barro, 2003, 1996) because government spending does not directly induces production of private consumption goods and while associated tax revenues suppress private demand.

Degree of trade openness is found to have statistically significant effect on growth. (Prasad, Rajan and Subramanian (2007); Barro (2003)) while Mody and Murshid (2011) find a statistically significant positive relationship between growth and trade openness.

Rule of law, democracy and institutional quality are somehow related and have been established to have statistically significant positive impact by various studies (Barro, 2003). While **investment ratio** (gross investment as a ratio of GDP) is positively related to growth, **inflation** significantly affects growth negatively (Barro, 2003).

3.3.7 Capital flows and economic growth of SSA countries: any missing link?

Review of literature in the foregoing subsections shows that many studies establish a positive relationship between capital flows and economic growth. This relationship, especially the impact of the former on the latter, is conditional in many cases. Thus, Prasad et al's (2003) findings that some developing countries witness improvement in their economic growth following inflow of foreign capital while others do not is not surprising: many of those countries whose economies do not improve with increase in inflows may not have satisfied the requisite conditions needed for translation of capital inflows to improvement in economic growth.

Absence of such requisite conditions is however not the primary reason for the inability of recipient countries to translate capital inflows to economic growth. Many of the conditions are financial; and they are merely required to contain one primary challenge or another that either comes with capital inflows or is characteristic of the recipient countries. For challenges inherent in recipient countries, Prasad, Rajan and Subramanian's (2007) note that non-industrial countries like many sub-Saharan African countries have limited ability to absorb foreign capital. For sub-Saharan African countries, net capital flows as a percentage of the GDP, have been larger than other developing and emerging countries; hence, volatility of such flows bear serious consequences for the region (IMF, 2011).

For challenges arising with in-coming capital flows, Soto (2000) observes that short-term flows, mostly composed of private flows, have negative impacts on the economy.

Foreign (capital) financing has been noted by Mckinnon and Pill (1997) to often lead to excessive domestic bank lending, incidentally huge non-performing loans, and bank runs. Macroeconomic instability/shocks that result from these can be inimical to economic growth (Cavallo, 2007).

Despite this obvious transmission link (shocks to capital flows) that explains why capital flows may at least not have enhanced economic growth, very little attention has been paid to the roles of capital flows shocks in macroeconomic performance of the SSA region.

3.6 Methodological approaches

This section reviews various methods and approaches adopted by studies on capital flows-economic growth nexus as a means to guiding methodological design optimal for this research.

3.4.1 Panel data analytical framework

Panel data analysis has been employed by several studies on capital flows and related issues (See Converse (2012), Montoro and Rojas-Suarez (2012), Milesi-Ferretti and Tille (2010), Ferreira and Laux (2008), Taylor and Sarno (1997) for a survey) for the reason that the framework provides many data observations obtained from the combinations of time series and cross section of countries on each variable of interest. Besides providing additional information and a richer source of variations that allows more efficient estimation of parameters and testing of sophisticated behavioural models with less restrictive assumptions, panel data are better able to identify and estimate effects[38] that are simply not detectable in pure cross section and pure time series data (Baltagi, 2008).

3.4.2 The structural vector autoregression (SVAR) model

Some studies (e.g. Fratzscher, Saborowski and Straub (2009); Saatcioglu and Korap (2008); Culha (2006)) employed SVAR because it can be used to analyse dynamic

[38] Determination of the effect of occupation on labour earnings may not be feasible using a time series data as data on people (cross sections) in different occupations are needed; in the same vein cross-section data may not produce efficient estimate of the impact as time-variant factor such years of experience may interfere with the estimated effect. Hence, panel data provide richer information that allows efficient estimation of such an effect.

interactions between variables. Moreover, with SVAR, the impact of a shock on a system/economy can be estimated via the impulse-response function. Besides obviating the decision problem as to what contemporaneous variables are designated exogenous (by modelling all variables as endogenous), the VAR models enable the researcher not only to forecast but also to test for Granger causality between any pair of variables in the model (Greene, 2008).

The structural VAR retains all the benefits mentioned above. In addition, the relationship between the variables in the model is underpinned by theoretical/structural postulations.

3.4.3 The factor augmented vector autoregression (FAVAR) model

The vector autoregression models, an advanced form of which is the SVAR, are often criticised as analysing relationship between too few variables, and thereby vulnerable to omitted variable bias problem. To circumvent this problem, Mandilaras and Popper (2008) employ factor augmented vector autoregression (FAVAR) model to assess the response of capital flows to factors within and outside emerging market economies. This approach involves the basic variables (the benchmark variables) of a (structural) model regressed in a vector autoregressive manner, and successive inclusion of other variables capturing a particular effect/influence – in order to capture the impact of the influence on the behaviour of the benchmark variables. The successive inclusion of variables of exogenous influence is on a mutually exclusive basis: a set of variables is introduced into the model to examine a particular influence/factor, and is later removed to allow another set of variables to be examined for their influence.

3.4.4 Estimation techniques

A variety of techniques have been employed in estimating capital flows and economic performance within various models. Ferreira and Laux (2009) use ordinary least square (OLS) to estimate the impact of portfolio flows volatility on economic growth in a panel regression model, under the assumption that the endogeneity of flows, an explanatory variable, pose, according to Edison et al (2002), no serious problem in a neoclassical growth regression.

Converse (2012) employs instrumental variable (IV) regression in estimating the impact of portfolio flows volatility on output, also within a panel regression model. The choice of this technique is informed by the need to control for presumed endogeneity of capital flows.

Many VAR models in the aforementioned studies are estimated using OLS since the equations in the system have the same regressors. Hence the OLS estimates are both as efficient and consistent (Kozhan, 2010) as Generalised Methods of Moment (GMM) estimates (Hansen, 2012) even though the innovations may be contemporaneously correlated. However, the pattern matrices used in imposing theoretical restrictions on SVAR model is estimated with maximum likelihood technique.

Various econometric studies have immensely contributed to panel VAR estimations. Binder, Hsiao and Pesaran (2004) show that Fixed Effect Quasi-Maximum Likelihood (FE-QML) estimator outperforms both the standard and extended GMM estimators in panel VAR models (with fixed/short time periods and large cross-sections) as the variances of the latter is an increasing function of the variances of individual effects. Moreover, while GMM estimators impose restrictions on distribution of individual effects, FE-QML estimator does not require such restrictions. Though Random Effect Quasi-Maximum Likelihood (RE-QML) estimator is more efficient than its FE-QML counterparts; the requisite homogeneity restrictions on the initial observation and the inherent requirement that the individual effects be randomly drawn from probability distributions with finite fourth-order moments by the former make FE-QML technique more appealing.

Hayakawa (2011) however proposed an improved instrumental variable/GMM estimator which uses instrumental variables deviated from their past means, instead of using instruments in levels or first differences. This estimator is shown to outperform GMM estimators that use instruments in levels in many cases.

Notwithstanding, QML estimators, whether FE or RE, are, under certain regularity conditions, consistent and asymptotically normally distributed (as $N \rightarrow \infty$, with T fixed and short), irrespective of whether the underlying time series are (trend) stationary, integrated of order one, (i.e. I(1)) or cointegrated (Binder, Hsiao and Pesaran, 2004).

3.4.5 Summary of survey on methodological approaches – choice of methods

Discussions in the immediate subsections above show that methods and estimation techniques employed in a study are informed by the nature of the study and characteristics of the dataset. In this light, this study makes use of panel structural VAR model, as it uses data on several countries. Besides, that the study entails examination of shocks and their influences appeals to use of structural VARs, models that have been shown both theoretically and empirically to be suitable for economic analysis of shocks.

In addition, panel instrumental variable regression is employed to robust-check the results of the panel structural VAR models. Both methods take care of endogeneity problems that are faced by studies on capital flows and economic growth.

CHAPTER FOUR

METHODOLOGY

4.4 Introduction

This Chapter presents the methods of analysis employed in this study. Sections 4.2 and 4.3 discuss the theoretical framework within which the influence of capital flows and their shocks on the economy is analysed. They are followed by sections 4.4 and 4.5 where the empirical framework is presented. Sections 4.6 and 4.7 present diagnostic tests and a priori expectations respectively, while section 4.8 rounds off the chapter with types and sources of data collected.

4.2 The theoretical framework - stochastic intertemporal model of capital flows

The theoretical framework for analysing the relationship between capital flows and domestic macroeconomic variables, as well as their shocks is situated in the Stochastic Intertemporal Utility Maximisation Model of Capital Flows which draws largely from the Stochastic Model of Current Account by Obstfeld and Rogoff (1996). The assumptions underlying this model are stated below.

i. There are two open economies in a global world; one of which is designated the domestic/home economy (the Sub-Saharan African economy whose members are primarily net recipients of capital flows (net sellers of financial assets) and the other the foreign country group whose members are primarily net buyers of the assets.

ii. The economies are small enough not to affect the global interest rate.

iii. The agents in the economies are infinitely lived as their population is constantly replaced. The agents comprise the households, the firms and the government.

iv. Besides the commodity market, the economies trade financial assets in the international financial market which is accessible to all investors in different economies.

v. The net asset position of a country reflects the domestic economic balance between domestic absorption (demand) and domestic output (supply).

vi. Assets traded in the international financial market are distinguishable by geographical origin.

vii. Assets prices and returns are denominated in US dollars; hence investors in each country thus face exchange rate risk (against US dollar appreciation/depreciation).

viii. Future incomes and market interest rates cannot be predicted with certainty.

ix. The agents have adequate information about the market and are able to revise their discount rate to match the market interest (discount) rate.

x. The utility function may assume a quadratic form.

xi. In equilibrium, the government runs a balanced budget.

As future incomes and market interest rates are not always non-stochastic (Chamberlain and Wilson, 2000): the household can only have a guess about the average incomes over time within which it seeks to maximise its utility. The problem faced by the household, according to Hall (1978) thus becomes:

$$Max \;\; E_t \sum_{S=t}^{\infty} \beta^{S-t} u(C_s) \quad \text{..................(30)}$$

subject to:

$$\sum_{s=t}^{\infty} \left[\left(\frac{1}{1+r} \right)^{s-t} (C_s - Y_s) = A_t \right] \quad \text{....................(31)}$$

where:

E_t = the mathematical expectation conditional upon all information available in period t;

U_t =expected utility as at time t; β = discounted factor

t = current period; s = any future period, with s > t

C_S = consumption at time s; r = interest rate

Y_S = income at time s $\qquad\qquad$ A_t = present value of (financial) asset held

The solution to the problem captured by equation 30 and 31 is presented below:

$$u^{''}(C_t) = (1+r)\beta E_t\{u^{'}(C_{t+1})\} \qquad \text{.............................}(32)$$

If, as shown by Hall (1978), the market real interest rate is so close to discount rate - which often is the case under a perfect market condition, $\beta = 1/(1+r)$; and if the utility function is quadratic ($u(C) = C - (\alpha_0/2)C^2$) with marginal utility $u'(C) = 1 - \alpha_0 C$, equation (32) simplifies to:

$$E_t C_{t+1} = C_t \qquad \text{.........................}(33)$$

Equation (33) shows that economic agents maximise their utility when their expected consumption over time are equal; that is,

$$E_t C_s = E_t C_{s-1} = E_t C_{s-2} = C_s \cdots C_t = \cdots \bar{C} \qquad \text{................ (34)}$$

where: $\bar{C}$ = the constant consumption level

Equation (34) implies that in an economy dominated with household only, the stochastic dispersion of incomes of the actual output/income from consumption creates a current account surplus or deficit. This surplus or deficit is recorded in the country's account with its trading partners. This account is called the 'Current Account'.

$$\begin{aligned} CA_1 &= Y_1 - C_1 \\ &= Y_1 - \bar{C} \end{aligned} \qquad \text{............................ (35)}$$ [39]

Where:

CA_1 = current account balance in periods 1

Others = as earlier defined

The surplus (deficit) created is used to acquire financial assets/bond (liabilities), yielding interest at the international market interest rate, r. The financial asset/liability acquired is symbolised B_{t+1} as it is active for interest-bearing from the beginning of the second period. In consequence, the current account balance - the sum of the trade

[39] Where the second line of equation 35 derives from equation 34

balance, (domestic savings, $Y_2 - C_2$) and return on the net asset at the end of the previous period, rB_2, (Chinn and Ito, 2007) - in the second period, $t = 2$, is captured by equation (36) as follows:

$$\begin{aligned} CA_2 &= Y_2 + rB_2 - C_2 \\ &= Y_2 + rB_2 - \overline{C} \end{aligned} \qquad \text{.............................} \ (36)$$

Where:

B = bond or financial asset acquired

Others = as earlier defined

Again, the second line of equation (36) uses equation (34). The current account balance in the second period builds upon the balance in the first period. Thus, it is the difference between the financial assets/liabilities acquired at the end of the second period (but active for interest-bearing from the beginning of the third period) and end of the first period (but active for interest-bearing from the beginning of the second period). Hence equation (36) can be re-written as follows:

$$CA_2 = B_3 - B_2 = Y_2 + rB_2 - C_2 \qquad \text{..........................} \ (37)$$

which generalises to:

$$CA_t = B_{t+1} - B_t = Y_t + rB_t - C_t \qquad \text{..........................} \ (38)$$

With the presence of firms, some of the national savings are converted to physical capital, K, for production purposes, with the rest used for financial asset/capital acquisition, *B*. Hence,

$$CA_t = B_{t+1} + K_{t+1} - (B_t + K_t) = Y_t + rB_t - C_t \qquad \text{..........................} \ (39)$$

With the physical capital evolution process described by the equation (39) below,

$$\begin{aligned} & K_{t+1} = K_t + I_t \\ \Rightarrow \quad & K_{t+1} - K_t = I_t \end{aligned} \qquad \text{........................} \ (40)$$

equation (40) becomes:

$$\begin{aligned} & CA_t = B_{t+1} - B_t + (K_{t+1} - K_t) = Y_t + rB_t - C_t \\ \Rightarrow \ & CA_t = B_{t+1} - B_t + I_t = Y_t + rB_t - C_t \\ \Rightarrow \ & CA_t = B_{t+1} - B_t = Y_t + rB_t - C_t - I_t \end{aligned}$$

$$\therefore \qquad CA_t = Y_t + rB_t - C_t - I_t \qquad \text{...................} \ (41)$$

Government presence in the economy results in decrease of funds available for financial asset investment as its purchases are financed, under a balanced budget, strictly by taxes. Therefore, equation (41) becomes:

$$CA_t = Y_t + rB_t - C_t - I_t - G_t \qquad \text{.................... (42)}$$

Equation (42) is the national budget constraint subject to which the utility function of all household may be maximised. The constraint however holds in any one period. For intertemporal maximisation of lifetime utility, there is need to consider the lifetime budget constraint, derived as follows:

$$B_t + rB_t = C_t + I_t + G_t - Y_t + B_{t+1}$$
$$\Rightarrow \quad (1+r)B_t = C_t + I_t + G_t - Y_t + B_{t+1}$$
$$\Rightarrow \quad B_t = \frac{C_t + I_t + G_t - Y_t}{(1+r)} + \frac{B_{t+1}}{(1+r)} \qquad \text{.................... (43)}$$

As B_t is implicitly defined, the explicit solution can be derived with iterative substitution and imposition of transversality condition. By iteratively substituting the lead term of B_t, that is B_{t+1} (defined in equation (44) below)

$$B_{t+1} = \frac{C_{t+1} + I_{t+1} + G_{t+1} - Y_{t+1}}{(1+r)} + \frac{B_{t+2}}{(1+r)} \qquad \text{.................... (44)}$$

into equation (43) to yield equation (45)

$$B_t = \frac{C_t + I_t + G_t - Y_t}{(1+r)} + \frac{C_{t+1} + I_{t+1} + G_{t+1} - Y_{t+1}}{(1+r)^2} + \frac{B_{t+2}}{(1+r)^2} \qquad \text{............. (45)}$$

which can be rearranged as:

$$(1+r)B_t = C_t + I_t + G_t - Y_t + \frac{C_{t+1} + I_{t+1} + G_{t+1} - Y_{t+1}}{(1+r)} + \frac{B_{t+2}}{(1+r)} \qquad \text{............... (46)}$$

Iterating and substituting the lead term again yields

$$(1+r)B_t = C_t + I_t + G_t - Y_t + \frac{C_{t+1} + I_{t+1} + G_{t+1} - Y_{t+1}}{(1+r)} + \frac{C_{t+2} + I_{t+2} + G_{t+2} - Y_{t+2}}{(1+r)^2} + \frac{B_{t+3}}{(1+r)^2} \qquad \text{....... (47)}$$

Successive iteration and substitution (indefinitely) to reflect the infinite lifetime of the household (an assumption underlying policy perspective that the state continues to live on and on), equation (47) implies

$$(1+r)B_t = \sum_{S=t}^{\infty}\left(\frac{1}{1+r}\right)^{S-t}[C_s + I_s + G_s - Y_s] + \left(\frac{1}{1+r}\right)^{\infty} B_{\infty} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (48)$$

Utility maximisation requires that the household (the human component and recipient of the risks and rewards inherent in other segments' activities) exhaustively consume its capital. This connotes transversality condition that:

$$\left(\frac{1}{1+r}\right)^{\infty} B_{\infty} = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (49)$$

With equation (49), the intertemporal budget equation (48), on rearrangement, stochastically becomes:

$$E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} C_s = E_t\left\{(1+r)B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - G_s - I_s)\right\} \ldots\ldots\ldots\ldots\ldots\ldots (50)$$

Equation (50) shows that the present value of household's consumption is the present value (PV) of the total income - the sum of the net financial assets (the initial and the return) and the present value of net income after government and investment expenditures.

Imposing utility maximisation condition in equation (34) on equation (50) implies that the total value of income is consumed evenly over the infinite lifetime. Consumption each period is thus an annuity. Using the relation of annuity with its PV (at time t+1 where t=0 indicates the initial period) stated in equation (51),

$$PV = \frac{1}{r} \bullet (1+r) \bullet Annuity$$

$$\Rightarrow \quad Annuity = \frac{r}{1+r} PV \qquad \ldots\ldots\ldots\ldots\ldots\ldots (51)$$

consumption annuity, is given by

$$\overline{C} = C_t = E_t C_s = \frac{r}{1+r} E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} C_s = \frac{r}{1+r} E_t\left\{(1+r)B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - G_s - I_s)\right\}$$

$$\Rightarrow C_t = \frac{r}{1+r}\left[(1+r)B_t + E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - G_s - I_s)\right] \quad \text{.............} (52)$$

Substituting (52) into (41) yields we have:

$$CA_t = Y_t + rB_t - I_t - G_t - \frac{r}{1+r}\left[(1+r)B_t + E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - G_s - I_s)\right]$$

$$\Rightarrow \quad CA_t = Y_t + rB_t - I_t - G_t - rB_t - E_t\bar{Y}_t + E_t\bar{G}_t + E_t\bar{I}_t$$

$$\Rightarrow \quad CA_t = Y_t - E_t\bar{Y}_t + rB_t - rB_t - G_t + E_t G_t - I_t + E_t\bar{I}_t$$

$$\therefore \quad CA_t = \left(Y_t - E_t\bar{Y}_t\right) - \left(G_t - E_t\bar{G}_t\right) - \left(I_t - E_t\bar{I}_t\right) \quad \text{............} (53)$$

where:

$Y_t - E_t\bar{Y}_t$ = output shock; $G_t - E_t\bar{G}_t$ = shock to government spending;

$I_t - E_t\bar{I}_t$ = shock to investment spending; $E_t\bar{Y}_t$ = long term trend (averages) of output

$E_t\bar{G}_t$ = long term trend of government spending;

$E_t\bar{I}_t$ = long term trend of investment spending

The second line of equation (53) uses the fact that the product of $r/1+r$ and the present value of each of the variables in the last bracket of the first line (Y_s, G_s, I_s) gives their annuity value, presented in stochastic form to retain the expectation notation from the initial specification ($E_t\bar{Y}_t, E_t\bar{G}_t, E_t\bar{I}_t$).

Equation (53) shows that the current account balance surplus result when positive output shock (the surplus of domestic income over the long-term trend) is in excess of positive shock to investment demand and government purchases (resulting when those expenditures are above their long term trend). In other words, current account surplus results when there is positive net output shock while current account deficit occurs when there is negative net output shock.

Using the relationship between current account and capital flows established by Tang and Fausten (2006) and represented in equation (54) below,

$$CA_t = -CF_t - \Delta FX_t \quad \text{..................................(54)}$$

Equation (53) becomes

$$\left(Y_t - E_t \bar{Y}_t\right) - \left(G_t - E_t \bar{G}_t\right) - \left(I_t - E_t \bar{I}_t\right) = -CF_t - \Delta FX_t \text{..........................}(55a)$$

which, on rearrangement and using the fact that $\Delta FX_t = FX_t - FX_{t-1}$, becomes:

$$CF_t = \left(I_t - E_t \bar{I}_t\right) + \left(G_t - E_t \bar{G}_t\right) - \left(FX_t - FX_{t-1}\right) - \left(Y_t - E_t \bar{Y}_t\right) \text{................} \quad (55b)$$

Equation (55b) is the stochastic model of capital flows, derived from extension of the stochastic model of current account.

Equation (55b) can be re-written as follows:

$$CF_t = \hat{I}_t + \hat{G}_t - \Delta FX_t - \hat{Y}_t \qquad \text{..............................}(56a)$$

where:

CF_t = capital flows in or out of a home country in time t

$\hat{Y}_t$ = output shock in the home country $(Y_t - E_t \bar{Y}_t)$

$\hat{G}_t$ = shock to government spending in the home country $(G_t - E_t \bar{G}_t)$

$\hat{I}_t$ = shock to investment spending in the home country $(I_t - E_t \bar{I}_t)$; and

ΔFX_t = change in foreign reserves $(FX_t - FX_{t-1})$

Obstfeld and Rogoff (1996) define shocks to a variable at a point in time as the dispersion of a variable at that time from its permanent (long-run/annuity) value. The expectational form of the annuity/permanent/long run value indicates that the annuity value changes as economic agents revise their expectation with stochastic variation in economic variables. In the same vein, Romer (2006) views disturbances of macroeconomic variables from the long-term path as macroeconomic shocks. Some of the shocks in real-business-cycle (RBC) models include investment shock and government spending shock (Justiniano, Primiceri and Tambalotti, 2009).

As depicted by equation (56a), capital flows to a home country is thus a function of macroeconomic shocks to output, investment, and government expenditures.

Similarly, capital flows to the foreign country relates to macroeconomic shocks as follows:

$$CF_t^* = \hat{I}_t^* + \hat{G}_t^* - \Delta FX_t^* - \hat{Y}_t^* \qquad \text{..............................(56}b\text{)}$$

CF_t^* = capital flows in or out of a foreign country;

$\hat{Y}_t^*$ = output shock in the foreign country $(Y_t^* - E_t \bar{Y}_t^*)$;

$\hat{G}_t^*$ = shock to government spending in the foreign country $(G_t^* - E_t \bar{G}_t^*)$;

$\hat{I}_t^*$ = shock to investment spending in the foreign country $(I_t^* - E_t \bar{I}_t^*)$;

ΔFX_t^* = change in foreign reserves of the foreign country $(FX_t^* - FX_{t-1}^*)$.

Borrowing from Devereux and Sutherland (2011) the macroeconomic relations for home country (equation 56a) and foreign country (equation 56b) can be combined to yield:

$$CF_t = CF_t^* + \left(\hat{I}_t - \hat{I}_t^*\right) + \left(\hat{G}_t - \hat{G}_t^*\right) - \left(\Delta FX_t - \Delta FX_t^*\right) - \left(\hat{Y}_t - \hat{Y}_t^*\right) \qquad \text{...................(57)}$$ [40]

Re-written as an implicit function, equation (57) becomes

$$CF_t = f\left\{CF_t^*, \left(\hat{I}_t - \hat{I}_t^*\right), \left(\hat{G}_t - \hat{G}_t^*\right), \left(\Delta FX_t - \Delta FX_t^*\right), \left(\hat{Y}_t - \hat{Y}_t^*\right)\right\} \qquad \text{....................(58)}$$

where:

$\hat{Y}_t - \hat{Y}_t^*$ = output shock differential (between the home and the foreign country)

$\hat{I}_t - \hat{I}_t^*$ = investment shock differential

$\hat{G}_t - \hat{G}_t^*$ = government spending shock differential

$\left(\Delta FX_t - \Delta FX_t^*\right)$ = differential of change in foreign reserve

[40] Subtracting equation 56b from equation 56a implies

$$CF_t - CF_t^* = \hat{I}_t - \hat{I}_t^* + \hat{G}_t - \hat{G}_t^* + \Delta FX_t - \Delta FX_t^* - \hat{Y}_t + \hat{Y}_t^*$$

$$CF_t = CF_t^* + \left(\hat{I}_t - \hat{I}_t^*\right) + \left(\hat{G}_t - \hat{G}_t^*\right) + \left(\Delta FX_t - \Delta FX_t^*\right) - \left(\hat{Y}_t - \hat{Y}_t^*\right) \qquad \text{...................(57)}$$

Equation (58) derives from combining home country and foreign country capital flow relations. The basis for this combination derives from the realistic assumptions about the financial integration among countries. Equation (58) describes capital flows to a home country as being influenced by not only domestic macroeconomic variables but also foreign factors. The equation agrees with the pull and push factors model of capital flows.

As capital flows between a pair of countries, each with a different currency, exchange rate becomes a factor that motivates an investor's allocation of capital to financial assets in either country of the pair. Since portfolio investments are used by investors to hedge consumption risk as a strategy to maximise inter-temporal utility, exchange rate, which affects relative value of investment and its effective ability to hedge the consumption risk, is often considered as a factor of international portfolio allocation (Devereux and Sutherland, 2011; Fratzscher, Saborowski and Straub, 2009). Hence,

$$CF_t = f\left\{CF_t^*, \left(\hat{I}_t - \hat{I}_t^*\right), \left(\hat{G}_t - \hat{G}_t^*\right), \left(\Delta FX_t - \Delta FX_t^*\right), \left(\hat{Y}_t - \hat{Y}_t^*\right), ER_t\right\} \quad \text{....................(59)}$$

ER_t = exchange rate;   Others = as earlier defined

Equation (59) forms the theoretical model within which this study analyses the relationship between capital flows (and implicitly shocks to the capital flows) and macroeconomic shocks.

4.3 Economic intuition underlying the model's variables

Capital flows into and out of the home country, according to the analytical model presented in equation (59), respond to a host of factors: capital flows to the foreign country, investment shock differential, government spending shock differential, change in foreign reserve differential, output shock differential as well as the real effective exchange rate.

The net capital inflow into a country represents the net investments by the aggregate international investors in the country's financial assets (claims on the endowments/output). Thus, the net private capital flows to both home country and the foreign country are connected by some portfolio constraints. First, the flow of capital to a country may reduce the flow to another due to wealth constraint: given an investor's budget constraint, more investment in country A may mean less of investments in country B. The mutual dependence of the capital flow is reinforced by borrowing constraints, a situation where investor may not hold negative weight of an asset (Haliassos and Hassapis, 1998); and concentration constraints, a situation where the amount of a country stock/asset an international investor can buy is limited in absolute terms (Pavlova and Rigobon, 2008). The less an investor can buy of a country asset may mean the more funds for other countries' assets. Thus, capital flows to countries are related via constraints. This underlines the importance of the capital flows to the foreign country in the model, as a variable explaining capital flow to a home Sub-Saharan African country/economy.

Output shock differential captures the excess returns of the home assets above the foreign countries'. Devereux and Sutherland (2011) suggest that the equities issued in period t are claims on output in period $t+1$. Thus the real rate of return on equities (financial asset) is given by

$$r_{E,t+1} = Y_{t+1} / Z_{E,t+1} \quad \text{..........(60)}$$

$$r^*_{E,t+1} = Y^*_{t+1} / Z^*_{E,t+1} \quad \text{..................(61)}$$

Where

$r_{E,t+1}$ = return on home equity (home risk asset);

Y_{t+1} = output of the home country[41];

$Z_{E,t+1}$ = price of the home equity[42]

$r^*_{E,t+1}$ = return on foreign equity (foreign risk asset)

Y^*_{t+1} = output of the foreign country;

$Z^*_{E,t+1}$ = price of the foreign equity

[41] Output, as the income generated from use of capital stock in a country, is the total return to capital stock. The claims to this stock are embedded in various financial assets owned by local and international investors.

[42] $Z_{E,t+1}$ defines the value of the capital stock in the home country. As claims to this stock is held in financial assets, the value of this stock (hence its price) is the present value of all the returns to the financial assets.

Following Devereux and Sutherland (2011), combining the second order approximation of both the returns on home equities and those of the foreign yields:

$$\widehat{r}_{x,t+1} = r_{E,t+1} - r^*_{E,t+1} = \hat{Y}_t - \hat{Y}^*_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots(62)$$

The output shock differential, $\hat{Y}_t - \hat{Y}^*_t$, in equations (59) represents excess returns, $\widehat{r}_{x,t+1}$ - as shown by equation (62) above, which influence capital allocation by international investors among financial assets of different countries. The role of excess returns (here captured by the output shock differential) in international capital allocation agrees with literature on investors' behaviour (Elton et al, 2007; Devereux and Sutherland, 2009; Fratzscher, Saborowski and Straub, 2009).

Shocks to government spending have been noted to affect other macro variables (Bouakez and Rebei, 2006; Edelberg, Eichenbaum and Fisher, 1998) which bear influence on returns to assets. Hence, its existence in the model is not only theoretically justified but empirically supported.

In a competitive equilibrium, capital is paid its marginal product. Though this may not be so in all situations there is still some relationship between rental price of capital and its marginal product in many cases. Investment shock which is a source of exogenous variation in the efficiency with which final goods can be transformed into physical capital (Justiniano, Primiceri and Tambalotti, 2009) may affect marginal productivity of capital, hence the returns. This feeds into the return-chasing investment behaviour of international investors when allocating capital among financial assets of different countries. Investment shock differentials may thus lead to differences in returns on financial assets across countries, hence, portfolio adjustment and capital flows across countries.

Macroeconomic shocks are in the class of second moment variables/parameters as do variances since they are conceived as disturbances from equilibrium. Devereux and Sutherland (2011) conceive a shock as logarithm deviation of a variable from its non-stochastic steady state (akin to the long-run/mean value of the variable). This conception follows the second moment computation of variances (the expected value of squared deviations of a variable from its mean value). The shocks in the model thus relate to risk (captured by variances). Therefore, the shocks as explanatory variables in the model represent risks to which investors (who allocate capital among financial assets in various countries) are sensitive.

The model is thus inclusive and considerate of various factors that may affect capital flows/allocation between participant countries in the international capital market.

4.4 Empirical framework on capital flows, output and macroeconomic shocks

An empirical analysis of capital flows to home country may require disentangling the shocks differentials such that each of the domestic shocks and foreign shocks can be identified.

4.4.1 Capital flows and determinants

From equation (59), it is clear that capital flows to a country is influenced by capital flows to the foreign country, domestic shocks (output shocks, investment shocks, shock to government spending), external shocks (shocks to the foreign country's output, shocks to the foreign country's investment, shocks to government spending by the foreign country), change in foreign exchange reserves of both home and the foreign country and the real home country exchange rate. This representation is captured by equation (63) below:

$$CF_t = f\left\{CF_t^*, \hat{I}_t, \hat{G}_t, \hat{Y}_t, \hat{I}_t^*, \hat{G}_t^*, \hat{Y}_t^* \, \Delta FX_t, \Delta FX_t^*, ER_t\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(63a)$$

Modelling capital flows as a function of both domestic and external shocks (in equation (63a) above) agrees with Çulha (2006). While Çulha (2006) relates capital flows to shocks on domestic and foreign factors (arbitrarily picked from literature) this study arrives at its own model, linking capital flows to shocks and some other macroeconomic variables in a relationship that derives from structural theoretical connections.

Since the structural shocks that explain capital flows cannot be observed directly (Saatçioğlu and Korap, 2008), unrestricted VAR equations are estimated with data on observable variables corresponding to the shocks. The model estimated in the VAR is given by equation (63b) below.

$$CF_t = f\left\{CF_t^*, I_t, G_t, Y_t, I_t^*, G_t^*, Y_t^* \, \Delta FX_t, \Delta FX_t^*, ER_t\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(63b)$$

The domestic variables are however endogenous as they are determined within the country while the foreign variables are exogenous. Thus, many of the explanatory variables in equation (63b) are endogenous; hence the need to model them explicitly. The resulting simultaneous equation model (SEM) solves the simultaneity bias that equation (63b) may likely suffer from. Thus we have:

$$CF_{it} = \alpha_1 Y_{it} + \alpha_2 I_{it} + \alpha_3 G_{it} + \alpha_4 \Delta FX_{it} + \alpha_5 ER_{it} + \alpha_6 CF^*_{it} + \alpha_7 Y^*_{it} + \alpha_8 I^*_{it} + \alpha_9 G^*_{it} + \alpha_{10} \Delta FX^*_{it} + u^{CF}_{it} \quad \text{..........(64)}$$

$$Y_{it} = \beta_1 I_{it} + \beta_2 G_{it} + \beta_3 CF_{it} + u^{Y}_{it} \quad \text{....................(65)}$$

$$I_{it} = \rho_1 Y_{it} + \rho_2 G_{it} + \rho_3 CF_{it} + \rho_4 FD + u^{I}_{it} \quad \text{..................(66)}$$

$$G_{it} = \phi_1 Y_{it} + \phi_2 IQ_{it} + \phi_3 CF_{it} + e^{G}_{it} \quad \text{.................(67)}$$

$$FX_{it} = \lambda_1 TOT_{it} + \lambda_2 OPEN_{it} + \lambda_3 CF_{it} + \lambda_4 ER_{it} + u^{FX}_{it} \quad \text{.....................(68)}$$

$$ER_{it} = \theta_1 Y_{it} + \theta_2 CF + \theta_3 TOT_{it} + \theta_4 OPEN_{it} + u^{ER}_{it} \quad \text{...................(69)}$$

Equation (64) derives from explicit modelling of capital flows to a home country as a linear function of its covariates.

Domestic output in equation (65) above is a function of investment and government expenditure (Blanchard, 2004) as well as capital flows (Fitzgerald, 1999).

Equation (66) explains investment as a function of real GDP (Greene and Villanueva, 1991; Michealides and Roboli, 2005) government investment (Aschauer, 1989; Rossiter, 2002); private credit available, approximated by the financial market development (FD)[43], and capital inflows, either in the form of aid (Gomanee, Grima and Morrissey, 2005) or private capital inflows (Converse, 2012).

Equation (67) defines government expenditure as satisfying Wagner's law (Peacock and Wiseman, 1961; Loizides and Vamvoukas, 2005): government expenditure is

[43] FD is measured as the ratio of bank and non-bank financial sector's deposit to GDP.

determined by real output per capita, institutional quality variables[44] (Shonchoy, 2010) and availability of foreign financial resources (via sales of government bonds to foreigners) which may alter the government budget constraints (Fitzgerald, 1991).

Finally, equation (68) defines foreign exchange reserves in terms of variables empirically found to explain it: terms of trade[45], degree of openness[46] and capital account - approximated with capital flows (Delatte and Fouquau, 2009) as well as the exchange rate (Khan, 2013).

Equation (69) models exchange rate as a function of real GDP, capital flows, term of trade and degree of openness, following Careera and Restout (2008).

Equations (64) to (69) re-expressed in per capita form[47], and then transformed into structural equation model presented below:

$$y_{it} = \Pi y_{it}^{*} + \Xi_{it} \qquad \text{..........}(70)$$

whose dynamic form, following Fornari and Stracca (2011), can be expressed in a VAR representation highlighted below:

$$y_{it} = \Lambda y_{it-1} + \Pi y_{it}^{*} + \Xi_{it} \text{..........}(71)$$

where:

$$y_{it} = \left(\mathrm{CFC}_{it} \quad YC_{it} \quad \mathrm{GC}_{it} \quad \mathrm{IC}_{it} \quad \mathrm{ER}_{it} \quad \Delta\mathrm{FXC}_{it}\right)$$

$$y_{it}^{*} = \left(\mathrm{CFC}_{it}^{*} \quad YC_{it}^{*} \quad \mathrm{GC}_{it}^{*} \quad \mathrm{IC}_{it}^{*} \quad \Delta\mathrm{FXC}_{it}^{*} \quad \mathrm{FD} \quad \mathrm{TOT}_{it} \quad I\mathrm{Q}_{it} \quad \mathrm{T}O\mathrm{P}_{it}\right)'$$

$$\Lambda = \Gamma^{-1}H; \qquad \Pi = \Gamma^{-1}\Theta; \qquad \Xi_{it} = \Gamma^{-1}u_{it}$$

$$u_{it} = \left(u_{it}^{\mathrm{CFC}} \quad u_{it}^{\mathrm{YC}} \quad u_{it}^{\mathrm{GC}} \quad u_{it}^{\mathrm{IC}} \quad u_{it}^{\mathrm{ER}} \quad u_{it}^{\Delta\mathrm{FXC}}\right)'$$

---

[44] These variables include but are not limited to the rule of law, political stability regulatory quality, government effectiveness and level of corruption.

[45] Terms of trade is defined as the price of export relative to that of import.

[46] Degree of openness is defined as the ratio of the sum of import and export to GDP.

[47] This entails dividing macroeconomic variables in each country (other than exchange rate, term of trade, institutional quality and trade openness) by its population size. This scaling is common growth studies that employ cross-sectional data.

$$
\Gamma = \begin{pmatrix} 1 & -\alpha_1 & -\alpha_2 & -\alpha_3 & -\alpha_4 & -\alpha_5 \\ -\beta_3 & 1 & -\beta_1 & -\beta_2 & 0 & 0 \\ -\rho_3 & -\rho_1 & 1 & -\rho_2 & 0 & 0 \\ -\phi_3 & -\phi_1 & 0 & 1 & 0 & 0 \\ -\lambda_3 & 0 & 0 & 0 & 1 & -\lambda_4 \\ -\theta_2 & -\theta_1 & 0 & 0 & 0 & 1 \end{pmatrix}
$$

$$
\Theta = \begin{pmatrix} -\alpha_6 & -\alpha_7 & -\alpha_8 & -\alpha_8 & -\alpha_9 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\rho_4 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\phi_2 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\lambda_1 & 0 & -\lambda_2 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\theta_3 & 0 & -\theta_4 \end{pmatrix}
$$

H = a square matrix describing the dynamic relationship between the endogenous variables; but whose structural form (array of elements) is not a priori defined but left to data to determine as restrictions on the lagged endogenous variables (capturing the structural relationship between the vector of endogenous variables and their past values) are difficult to justify from a theoretical perspective (Gottschalk, 2001); and

CFC_{it} = capital flows per capita in home country *i* at time *t*

YC_{it}= output per capita in home country *i* at time *t;* renamed as $GDPC_{it}$

GC_{it}= government expenditure per capita in home country *i* at time *t*

IC_{it} =investment spending per capita, approximated by gross capital formation per capita ($GFCC_{it}$) in home country *i* at time *t*

FXC_{it}= change in foreign reserves per capita in home country *i* at time *t*

$REER_{it}$= real exchange rate between home country's currency and the international market currency (USD)

CFC_{it}^{*}= capital flows per capita in foreign country *i* at time *t*

$GDPC_{it}^{*}$= output per capita in foreign country *i* at time *t*

$G_iC_{it}^{*}$= government expenditure per capita in foreign country *i* at time *t*

IC_{it}^{*}=investment spending per capita in foreign country *i* at time *t*, approximated by gross capital formation per capita ($GFCC_{it}^{*}$) in foreign country *i* at time *t*

FXC_{it}^{*}= change in foreign reserves per capita in foreign country *i* at time *t*

FD_{it} = financial development home country *i* at time *t*;

TOT_{it}= terms of trade home country *i* at time *t*

IQ_{it}= institutional quality home country *i* at time *t*;

TOP_{it}= trade openness home country *i* at time *t*

The endogenous VAR model in equation (71) is transformed into the unrestricted VAR model (equation 72), and the reduced-formed errors generated from estimation of equation (72) are transformed into structural shocks with use of appropriate sign restrictions.

$$y_{it} = \Psi y_{it}^{*} + A(L)u_{it} \quad \text{....................(72)}$$

where:

$$y_{it} = (CFC_{it} \;\; GDPC_{it} \;\; GFCC_{it} \;\; GC_{it} \;\; \Delta FXC_{it} \;\; ER_{it})'$$

$$y_{it}^{*} = (CFC_{it}^{*} \;\; GDPC_{it}^{*} \;\; GFCC_{it}^{*} \;\; GC_{it}^{*} \;\; \Delta FXC_{it}^{*} \;\; FD_{it} \;\; TOT_{it} \;\; IQ_{it} \;\; TOP_{it})'$$

u_{it} = vector of unrestricted errors, as defined under equation (71), with variance-covariance matrix Σ_u; and

$$A(L) = [I - \Lambda(L)]^{-1}$$

$$\Psi = A(L)\Pi$$

with $A(L)$ being pth degree matrix polynomial with lag operator L and number of lags p.

4.4.2 Identification of macroeconomic shocks

This study follows Fornari and Stracca (2011), Fratzscher, Saborowski and Straub (2009), Saatçioğlu and Korap (2008), Çulha (2006), Fielding and Shields (2000) in use of Structural VAR to model macroeconomic shocks with a view to measuring their effects on the economy. Following Blanchard and Quah (1989), many studies (including the aforementioned) employ Structural VAR to cull out, with a priori theoretical restrictions, structural macroeconomic shocks from reduced-form residuals of the unrestricted VAR (Engemann, Owyang and Zubairy, 2008). This is because, without such restrictions, the residual errors in the unrestricted VAR have no meaning as do the structural shocks. While the residual errors (prediction error) are likely to be correlated in an unrestricted Panel VAR, which necessitate simultaneous estimation of all the equations (Fielding and Shields, 2000), structural shocks are orthogonal (Caldara and Kamps, 2010), having originated from orthonormal transformation or rotation of the prediction error (Engemann, Owyang and Zubairy, 2008).

While equation (72) above gives the relationship between the vector of variables y_t and the vector of prediction errors u_t, equation (73) below specifies the relationship between the vector of variables y_t and that of the underlying orthogonal structural errors ε_t with variance I_k (Caldara and Kamps, 2010; Fielding and Shields, 2000), k being the number of variables in vector y_t.

$$y_t = \Psi y_{it}^* + C(L)\varepsilon_{it} \quad \text{......................(73)}$$

Where:

$$\varepsilon_{it} = \left(e_{it}^{\text{CFC}} \quad e_{it}^{\text{YC}} \quad e_{it}^{\text{GC}} \quad e_{it}^{\text{IC}} \quad e_{it}^{\text{REER}} \quad e_{it}^{\Delta\text{FXC}}\right)'$$

Equation (79) and (80) implies that

$$u_t = A(L)^{-1}\left[C(L)\right]\varepsilon_t \quad \text{...............................74)}$$

which can be re-rewritten as

$$u_t = F\varepsilon_t \quad \text{...............................(75)}$$

where

$$F = A(L)^{-1}\left[C(L)\right] \text{................(76)}$$

Matrix F (of dimension k x k) provides, according to Caldara and Kamps (2010), the exact factorisation of the variance-covariance matrix of the prediction errors. That is $FF' = \Sigma_u$. Matrix F can be decomposed into two components:

$$F = \tilde{A}Q \text{ ....(77)}$$

Where

$\tilde{A}$ = k x k matrix denoting the lower-triangular Cholesky factor of Σ_u, and

Q = k x k orthonormal matrix satisfying $QQ' = I_k$, and whose determinant det(Q) = 1

Thus, matrix Q is a rotation matrix which can be constructed as the product of at most $k(k-1)/2$ Givens rotations $G_{ij}(\theta)$, each acting on a two-dimensional subspace with rotation angle θ.

With appropriate theoretical restriction, both $\tilde{A}$ and Q components of F are used to recover structural shocks from the reduced-form prediction errors in the original VAR (Caldara and Kamps, 2010; Fielding and Shields, 2000).

The theoretical restrictions, imposed by this study, only on the endogenous (domestic) variables – as in Fornari and Stracca (2011), are captured, by equation (78) below.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} u_{it}^{CFC} \\ u_{it}^{YC} \\ u_{it}^{IC} \\ u_{it}^{GC} \\ u_{it}^{\Delta FXC} \\ u_{it}^{REER} \end{pmatrix} = \begin{pmatrix} 1 & * & * & * & * & * \\ * & 1 & 0 & 0 & 0 & 0 \\ * & 0 & 1 & 0 & 0 & 0 \\ * & 0 & 0 & 1 & 0 & 0 \\ * & 0 & 0 & 0 & 1 & 0 \\ * & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} e_{it}^{CFC} \\ e_{it}^{YC} \\ e_{it}^{IC} \\ e_{it}^{GC} \\ e_{it}^{\Delta FXC} \\ e_{it}^{REER} \end{pmatrix} \quad \text{................ (78)}$$

Equation (78) is the explicit representation of equation (75): the matrix in the RHS of equation (75) is the same as matrix F in equation (79). Hence,

$$F = \begin{pmatrix} 1 & * & * & * & 0 & * \\ * & 1 & 0 & 0 & 0 & 0 \\ * & 0 & 1 & 0 & 0 & 0 \\ * & 0 & 0 & 1 & 0 & 0 \\ * & 0 & 0 & 0 & 1 & 0 \\ * & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \quad \text{.......................(79)}$$

The theoretical restrictions captured in the matrix F derive from theoretical relationship summarised in matrix Γ under equation (71) after some modifications. While matrix Γ presents that capital flows are influenced by all domestic variables which are, in turn, affected by not only capital flows but also some other domestic variables; matrix F posits that once capital flows is explained by all domestic variables[48] with exception of change in foreign exchange[49], the impact of any domestic variable on another is captured via capital flows. Matrix *F* thus restricts the impact of the shock of a domestic variable on others to zero while the impacts of the shock of capital flows on domestic variables, and vice versa, are estimated as they are left unrestricted.[50]

4.4.3 The empirical model on capital flows, output and macroeconomic shocks

This study adopts equation (71) above as the model within which the analysis of the impact of capital flows and their shocks on the economy are located. The model estimates the relationship between the endogenous variables conditional upon a vector of exogenous variables. The endogenous variables are capital flows to the economy per capita (CFC), domestic GDP per capita (GDPC), domestic investment per capita (IC) domestic government spending per capita (GC), exchange rate (ER) and change in foreign exchange reserves per capita (ΔFXC) while the exogenous variables are capital flows to the foreign economy per capita, (CFC^*), foreign GDP per capita ($GDPC^*$), foreign investment per capita (IC^*), foreign government spending per capita (GC^*), change in foreign exchange reserves per capita (ΔFXC^*), financial development variable (FD), institutional quality (IQ), terms of trade (TOT) and trade openness (TOP).

The capital flows whose shocks are of interest are major components of aggregates flows: gross and net inflows of foreign direct investment (FDI), portfolio investment capital and bank lending flows.

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[48] Shown by the 1st row of matrix F where element in '1' denotes the effects of shock to capital flow on itself, and '*' denotes that the effects of shock to other macroeconomic variables on capital; '*' in other rows denotes the effects of shocks to capital flows on macroeconomic variables

[49] Dropping foreign exchange as one of the determinants of capital flows is merely an analytical convenience to ensure that the restriction complies with the econometric requirements that the number of restrictions required of n variables be $\frac{1}{2}n(n+1)$.

[50] Element ' $*$ ' in matrix F denotes that the impact of shock of a variable on another is non-zero, and is estimated.

4.4.3.1 Gross FDI inflow and the macroeconomic shocks

The impact of shock to gross inflows of FDI on the macroeconomic variables, and the response of the inflows to domestic shocks, is evaluated by estimating equation (71) where the vectors of variables are given as follows:

$$y_{it} = \left[FDIC_{it} \;\; GDPC_{it} \;\; GC_{it} \;\; GFCC_{it} \;\; \Delta FXC_{it} \;\; ER_{it} \right]' \quad \text{.........} \quad (80)$$

where

$$y_{it}^{*} = \left[FDIC_{it}^{*} \;\; GDPC_{it}^{*} \;\; GC_{it}^{*} \;\; GFCC_{it}^{*} \;\; \Delta FXC_{it}^{*} \;\; FD \;\; TOT \;\; IQ \;\; TOP \right]' \text{..................}(81)$$

$FDIC_{it}$ = gross FDI inflows per capita to a home country

$FDIC_{it}^{*}$ = gross FDI inflows per capita to the foreign economy, and

others = as earlier defined.

4.4.3.2 Net FDI inflows and the macroeconomic shocks

Equation 71 is also estimated to assess the impact of shock to net inflows of FDI on the macroeconomic variables, and the response of the inflows to shocks in macroeconomic variables. The vectors of variables in this case are:

$$y_{it} = \left[NFDIC_{it} \;\; GDPC_{it} \;\; GC_{it} \;\; GFCC_{it} \;\; \Delta FXC_{it} \;\; ER_{it} \right]' \quad \text{.........} \quad (82)$$

$$y_{it}^{*} = \left[NFDIC_{it}^{*} \;\; GDPC_{it}^{*} \;\; GC_{it}^{*} \;\; GFCC_{it}^{*} \;\; \Delta FXC_{it}^{*} \;\; FD \;\; TOT \;\; IQ \;\; TOP \right]' \text{..................}(83)$$

where

$NFDIC_{it}$ = net FDI inflows per capita to a home country

$NFDIC_{it}^{*}$ = net FDI inflows per capita to the foreign economy, and

others = as earlier defined.

4.4.3.3 Other flows and the macroeconomic shocks

The influence of shock to other gross inflows - gross portfolio investment inflows per capita (PIC) and bank lending inflows per capita (BLC) - as well as their net inflows per capita counterparts (NPIC and NBLC) on the macroeconomic variables, and the response of the inflows to domestic shocks is evaluated with analyses akin to those on FDI.

4.4.4 Impulse response function

The influence of shocks to each of the model's variables on the other variables will be examined using the impulse response function.

4.4.5 Explicit modelling of shocks – robustness check

The foregoing analyses, using the SVAR model, implicitly model shocks, as they (shocks to macroeconomic variables - capital inflows inclusive) do not enter the model directly, but are culled out from reduced form innovations by appropriate theoretical restrictions. Another method to examine the impact of shocks to capital inflows on output and its growth is by modelling them as a function of capital flows and shocks to these flows and other determinants. The following subsections present both the theoretical and empirical approaches to explicit modelling of capital flow shocks.

4.4.5.1 The Neoclassical Growth Model

This model provides the framework for analysing growth behaviour of economies from the perspectives of resources (tangible or intangible, domestic or foreign) available for production. It is built on some important assumptions which this study assumes to hold for the sampled economies of the SSA countries.

i. The economy produces a single composite product (e.g. Nigerian GDP) using the Cobb-Douglas production function below (Romer, 2006; Gourinchas and Jeanne; 2013)

$$Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha} \qquad 0 < \alpha < 1 \qquad \text{....................} (84)$$

Where

Y_t = the output of the single composite product

K_t = stock of physical capital input (into production process)

L_t = labour supply

A_t = level of productivity, which enters the model multiplicatively in labour augmenting fashion to yield effective labour $A_t L_t$

ii. The dynamics of macroeconomic variables, especially the output, is stochastic. Hence the representative production function, according to Azariadis and Stachurski (2006), becomes:

$$Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha}\xi_t \qquad 0 < \alpha < 1 \qquad \text{....................} (85)$$

Where

ξ_t = the aggregate economic shock to which macroeconomic variables in the model are subject to.

iii. The only resources the economy is endowed with are: capital and effective labour.

iv. The population in the economy comprises the quantity of labour units and the embedded productive capacity; hence population approximates effective labour.

v. The production function has constant returns to scale in its two arguments: capital and effective labour.

vi. The factor markets are perfectly competitive with free entry and exits of profit seeking/maximising firms.

vii. The output produced is maximum, given (v) above.

viii. The economy is open but so small that it cannot influence the global price (interest rate) and magnitude of capital flows.

ix. The economy can acquire financial assets (in terms of capital outflow) and accumulate financial liabilities (capital inflows).

The production function denoted by equation (85) may be rewritten in per capita form by dividing both sides of the equation with effective labour $A_t L_t$:

$$\frac{Y_t}{A_t L_t} = \frac{K_t^{\alpha}(A_t L_t)^{1-\alpha}\xi_t}{A_t L_t}$$

$$\Rightarrow \frac{Y_t}{A_t L_t} = \frac{K_t^{\alpha} A_t L_t \times A_t L_t^{-\alpha}\xi_t}{A_t L_t} = K_t^{\alpha} A_t L_t^{-\alpha}\xi_t$$

$$\Rightarrow \frac{Y_t}{A_t L_t} = \left(\frac{K_t}{A_t L_t}\right)^{\alpha}\xi_t$$

$$y_t = k_t^{\alpha}\xi_t \quad \text{..............................86}$$

where

$$y_t = \frac{Y_t}{A_t L_t}; \qquad k_t = \frac{K_t}{A_t L_t}$$

The capital per effective labour k_t used to produce output per capita y_t is supplied by both domestic capital, k_t^d, and foreign capital in forms of capital inflows[51], k_t^f (Bailliu, 2000). Hence equation (86) is represented to capture openness of the economy as follows:

$$y_t = (k_t^d + k_t^f)^\alpha \xi_t \quad \text{..............................(87)}$$

Capital flows per capita k_t^f is assumed to be determined by the following stochastic process

$$k_t^f = \overline{k_t^f} + v_t \text{........................(88)}$$

Where

v_t =exogenous capital flow shocks

Using equations (87) and (88), we have

$$y_t = f(k_t^d, \overline{k_t^f}, v_t, \xi_t) \quad \text{..............................(89)}$$

In many empirical estimation, $\overline{k_t^f}$ is approximated with k_t^f, hence equation (89) becomes:

$$y_t = f(k_t^d, k_t^f, v_t, \xi_t) \quad \text{..............................(90)}$$

In the same vein,

$$\Delta \ln y_t = f(k_t^d, k_t^f, v_t, \xi_t) \quad \text{..............................(91)}$$

$$\Delta \ln y_t^{LT} = f(k_t^d, k_t^f, v_t, \xi_t) \quad \text{..............................(93)}$$

Where

$\Delta \ln y_t$ =growth rate of y_t; $\Delta \ln y_t^{LT}$ = long term growth rate of y_t;

y_t (hereafter GDPC - gross domestic product per capita), $\Delta \ln y_t$ (hereafter GRC-growth rate of GDPC) and $\Delta \ln y_t^{LT}$ $\Delta \ln y_t$ (hereafter MGRC- long term growth rate of GDPC) are each a function of k_t^d (hereafter GFCC-gross fixed capital formation per capita), $\overline{k_t^f}$ (hereafter mean value of CFC-capital flows per capita), v_t (hereafter

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[51] The capital employed in production is the sum of domestically produced capital and foreign capital. The sum is larger than the domestically supplied capital in times of capital inflows and less in times of capital outflows.

CFCS – shocks to capital flows per capita) and ξ_t (the unobserved aggregate economic shocks).

4.4.5.2 Output per capita and capital flow shocks

The effect of capital flows and their shocks on output per capita are analysed by estimating equation (94) below:

$$GDPC_{it} = \phi_1 + \sum_{l=1}^{L} \delta_l CTRL_{l,i,t}^{GDPC} + \phi_2 \ln CFC_{it} + \phi_2 CFCS_{it} + \phi_3 GFCC_{it} + \varepsilon_{it}^{GDPC} \quad ....(94)$$

where:

$CFCS_{it}$ = shocks to the capital flow type whose impact on output is being examined

$CTRL_{it}^{YC}$ = control variables in GDPC equations including GC_{it}, FD_{it}, IQ_{it}, SE_{it}, TOP_{it}

Others = as earlier defined

4.4.5.3 Measuring capital flow shocks

The variable $CFCS_{it}$ is computed following Devereux and Sutherland's (2011) study which conceptualises shock, *v*, to a variable, X, as being produced from the following AR1 process:

$$\hat{X}_t = \psi \hat{X}_{t-1} + v_t \quad ....(95)$$

where: $$\hat{X}_t = \ln X_t - \ln \bar{X} \quad ....(96)$$

and

$\bar{X}$ = non-stochastic value of X .

This study adopts equation (95) but re-expresses equation (96) in non-log form[52], given by equation (97) below:

$$\hat{X}_t = X_t - \bar{X} \quad ....(97)$$

where:

$\bar{X}$ = the mean (non-stochastic) value of X

Using equation (97) in equation (95) implies:

[52] This non-log form is essentially convenient as some of the capital flows data, especially the net capital inflows, are negative.

$$v_t = X_t - \omega\bar{X} - \psi X_{t-1} \quad ....(98)$$ [53]

v_t, shocks to variable X is recovered as the residual from regression of the variable on its mean and lagged value. In this case, $CFCS_{it}$ for a particular capital flow variable is recovered from regression of the capital flows of interest on its mean and lagged value.

4.4.5.4 Estimation of the output per capita equation

Equation (94) was estimated for each of capital flow variable of interest under panel instrumental variable (IV) regression model. This choice is informed by likely endogeneity of capital flow variable: capital inflows per capita may be influenced by income per capita (return on equity[54]) as investors plan in time *t-1* to allocate capital in time *t* to reap the return in same period. The estimation technique employed here is the Two Stage Least Square (2SLS). The instruments used are output per capita, proxy for financial sector development, institutional quality proxy, the lagged values and the trend of the capital flow variables.

4.4.5.5 Economic growth and capital flow shocks

The model specified by this study to test the influence of capital flows shocks on economic growth follows Converse (2012) and Ferreira and Laux (2009) in modelling capital flows-economic growth relationship which, in addition, seeks to examine the effect of fluctuations in capital flows on growth. It however diverges from theirs by not modelling volatility but shocks[55].

The model is presented in equation (99) below

$$GRC_{it} = \beta + \sum_{k=1}^{K} \theta_k CTRL_{k,it}^{GRC} + \beta_1 \ln CFC_{it} + \beta_2 CFCS_{it} + \beta_3 GFCC_{it} + \varepsilon_{it}^{GRC} \;.........(99)$$

where:

---

[53] Where: $\omega = (1-\psi)$

[54] Devereux and Sutherland (2011) highlight that income/output as percentage of the price of equity perfectly approximates returns to equity (or any financial inflows/investment).

[55] Converse (2012) explicitly model volatility by including in his regression equation a volatility variable measured as standard deviation as a ratio of trend GDP. Ferreira and Laux (2009) also include in their regression equations volatility variables obtained from a GARCH portfolio volatility model. Shocks in our model are measured by equation (98) above, following Devereux and Sutherland (2011).

GRC_{it} = growth rate of GDP per capita at time t in country *i* [56]

$CTRL_{it}^{GRC}$ = control variables in each GRC equation including the initial value of GDPC, ($INGDPC_{it}$), FD_{it}, IQ_{it}, SE_{it}, TOP_{it}

CFC_{it} = capital flow per capita[57];

$CFCS_{it}$ = shock to capital flow per capita;

ε_{it} =the error term

Equation (99) estimates the impact of capital inflows (gross and then, net), as well as their shocks on actual growth rate of income per capita (comprising of the long term (trend) component and the cyclical component), in the presence of the control variables.

To estimate the impact of capital inflows (gross and then, net), as well as their shocks on long term trend component of growth rate of income per capita, this study estimates equation (100) below:

$$MGRC_{it} = \phi_1 + \sum_{l=1}^{L} \delta_l CTRL_{l,i,t}^{MGRC} + \phi_2 \ln CFC_{it} + \phi_2 CFCS_{it} + \varepsilon_{it}^{MGRC} \text{..........(100)}$$

where:

$MGRC_{it}$ [58]= long term trend component of growth rate of GDP per capita at time *t* in country *i*

$CTRL_{it}^{MGRC}$ = control variables in each MGRC equation including $INGDPC_{it}$, FD_{it}, IQ_{it}, SE_{it}, TOP_{it}

Others= as earlier defined.

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[56] Growth rate of income per capita, GRC is measured as change in the natural log of GDP per capita, i.e. $\Delta(\ln gdppc_t) = \ln gdppc_t - \ln gdppc_{t-1} = \ln \dfrac{gdppc_t}{gdppc_{t-1}}$, where $gdppc_t = \dfrac{GDP_t}{POP_t}$, POP_t = population at time t, and GDP_t = gross domestic product at time t

[57] The influence of each measure of capital flows will be tested separately, one at a time. The aggregate flows (gross and net) the component flows – FDI, portfolio investment flows, portfolio equity, portfolio debt, bank lending (gross and net). This exercise is frequently practised in the literature (see Ferreira and Laux (2009), Converse (2008) for a survey).

[58] $MGRC_{it}$ is the Hodrick Prescott filtered trend of GDP growth rate.

4.4.5.6 Estimation of GDP growth rate

Equation (99), the baseline panel regression equation and equation (100) are estimated using the panel instrumental variable regression technique for reason discussed in subsection 4.4.5 above. The instruments used under this IV technique are output per capita, proxy for financial sector development, institutional quality proxy and the trend of the capital flow variables.

4.5 Diagnostics

The models above were subject to a number of tests to ensure that their estimates and predictions are realistic, reliable and robust.

4.5.1 Descriptive statistics

Prior to conducting diagnostic tests, the statistical behaviour of the data for this analysis was x-rayed by tabularising their statistical properties as a means to understanding their contribution to the statistical validity of the main results of the study.

4.5.2 Panel unit root tests

Several panel unit root tests (Levin, Lin and Chu test, Im, Pesaran & Shin test, Augmented Dicky-Fuller-Fisher chi^2 test and Phillip-Peron -Fisher chi^2 test) were carried out to examine the stationarity of the variables in the model. Should all the variables be stationary (by being of order I(0)) estimation of the (model of) equations in levels gives a correct estimate of long-term relationships between the variables. If not, the existence of long-term relationship may have to be sought for, and established, via cointegration tests on the variables.

4.5.3 Cointegration tests

Fisher and Johansen's Panel Cointegration test and Kao Cointegration test were applied to examine cointegration between the variables once the unit roots test (above) showed that at least one of the variables is non-stationary. The test is necessary to establish the existence of any long-run relationships between the variables of interest[59], even if any of them is individually non-stationary. Existence of cointegration between the variables in a case where any of the variables is not stationary allows for reliable estimation of long term relationship between the variables.

4.5.4 Stability test

This test is relevant to the SVAR model. It is important to determine whether or not the model is stable/stationary enough to produce consistent results, even though the individual variables may not. In this wise, the inverse roots of the characteristic autoregressive (AR) polynomials were examined to find out if they lie within the unit circle. The null hypothesis that the system is unstable will not be rejected if the roots lie outside the circle (Greene, 2008). Stability of the model is essential for validity of some results such as that for the impulse-response analysis.

4.5.5 Optimal Lag-Length tests

This study selected the optimal lag length using Akaike information Criterion (AIC), Hannan-Quinn test, as well as Swartz Information Criterion (SC). However, priority was given to stability of the model as validity of its results, including impulse response result (which is critical to the analysis), depends on the model's stability.

4.6 A priori expectations

Though the theory (see section 3.2.10) suggests that shock to flows should be positively associated with growth, or at worse have an insignificant negative relationship with growth (Ferreira and Laux, 2008), this study expects that shocks to capital inflows will have significant negative effect on macroeconomic variables of interest, especially the long term trend component of GDP growth rate, and vice versa. This stems from the fact that fluctuations generally induce or worsen uncertainty in the economy; and this is injurious to macroeconomic performance[60].

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[59] These are variables analysed in the models presented in this chapter. See section 4.8 for a comprehensive listing

[60] Uncertainty hampers economic growth as economic agents hesitate to take decisions (consumption, investments etc) in periods of high fluctuation/volatility in macroeconomic variables so as to minimise risks. This reduces aggregate demand, output and hence growth. For instance, volatility of economic growth reduces flow of capital to a country (Mody and Murshid, 2011) as international investors are wary of allocating capital to such a country. On the reverse, however, volatility of portfolio flows negatively affect output Converse, 2012)

4.7 Data description, measurement and sources

This section describes the country-level data used by this study in its empirical analyses, discusses how they are measured and presents the sources from which they were obtained.

Data on capital flows are culled from the International Financial Statistics, IFS, (2012) database, the Balance of Payment Statistics yearbook (2011) and World Bank's Global Development Finance, GDF, (2012) Database. The capital flow variables are foreign direct investment (FDI), portfolio investment (PI), and bank lending (BL). As inflows of these variables represent financial liabilities, per capita gross inflows of foreign direct investment, portfolio investment and bank lending are acronymed FDIC, PIC and BLC[61], respectively. These three variables are respectively measured by dividing gross inflows of foreign direct investment, portfolio investment, and bank lending to each country of the sample by its population. Data on population are available in the International Monetary Fund's World Economic Outlook (WEO) database.

Per capita **net** inflows of foreign direct investment, portfolio investment and bank lending are acronymed NFDIC, NPIC and NBLC. The net inflows are measured by netting off gross outflows from gross inflows. The resulting net inflows into a country are divided by its population to yield NFDIC, NPIC and NBLC for that country.

Shocks to FDIC, PIC, NBLC, NFDIC, NPIC and NBLC, as variables themselves (FDICS, PICS, NBLCS, NFDICS, NPICS and NBLCS), are measured using equation (98).

Income/GDP per capita (GDPC) is measured by dividing GDP by the population. The growth rate of income per capita (GRC) is measured as change in the natural logarithm of GDPC[62]. The long term growth rate of income per capita (MGRC) is measured as the trend component of Hodrick-Prescott filtered GRC. Data on GDP are extracted

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[61] FDIC, PIC and BLC read foreign direct investment liability per capita, portfolio investment liability per capita and bank lending liability per capita.

[62] See footnote (56) for some details

from the Economic Policy and Debt (EPD) dataset of the World Bank's Global Development Finance (GDF) Database.

Government spending per capita (GC), gross fixed capital formation per capita (GFCC), change in foreign reserves per capita (CFXC) are calculated by respectively dividing data on government spending, gross fixed capital formation and change in foreign reserves (all culled from EPD dataset of GDF database) for each of the countries in the sample by its population.

Data on official exchange rate (ER) are culled from the financial sector dataset in World Bank's GDF database.

Data on trade openness (TOP), measured as merchandise trade - sum of export and import - as a percentage of GDP, are collected from private sector and trade dataset provided by World Bank's GDF database.

Institutional quality (IQ) variable is measured as the average of data on five variables: political stability, government effectiveness, regulatory quality, rule of law and corruption[63]. Data on these five variables are available in the Worldwide Governance Indicators database supplied by the World Bank.

School enrolment (SE) variable is measured as gross secondary school enrolment as percentage of the number of children in secondary school age. The data on this variable are available in the human development indicator dataset of World Bank's GDF database.

Data on financial sector development, measured as the ratio of bank and non-bank financial sector's deposit to GDP, are extracted from the World Bank's Financial Structure dataset.

Each of the 'foreign country' variables ($FDIC^*$, PIC^*, BLC^*, $NFDIC^*$, $NPIC^*$, BLC^*, $GDPC^*$, GC^*, $GFCC^*$, $CFXC^*$) with respect of a country *i*, is measured by aggregating the variable over all countries excluding country *i* itself, weighted by their relative real

[63] This follows Knack and Keefer (1995) as well as Mody and Murshid (2011).

income/GDP per capita (the ratio of country's *j* real income per capita to the sum of income per capita of all countries[64].

[64] This follows Fornari and Stracca (2011).

CHAPTER FIVE

INTERRELATIONSHIP BETWEEN CAPITAL FLOWS, MACROECONOMIC SHOCKS AND MACROECONOMIC PERFORMANCE: EVIDENCE FROM EMPIRICAL ANALYSES

5.1 Introduction

This chapter presents the results of analyses, following the methodology described in the previous chapter. Prior to discussing the main results, the results of diagnostic tests/analyses are discussed; sections 5.2, 5.3, 5.4 and 5.5 present the results of the descriptive statistics analysis, the unit root tests, the cointegration tests, and the stability tests and the lag-length tests, respectively. Sections 5.6 and 5.7 respectively present and discuss the results.

5.2 Descriptive analysis results

The results of the descriptive statistical analysis are presented in table 3A of appendix III. The results show that the data exhibit considerable variation between countries justifying the use of panel data estimation techniques (Mobolaji, 2008); this variation allows for more efficient estimation of parameters (Baltagi, 2008).

The overall mean of FDIC, PILC AND BLC are \$89.53, \$32.52 and \$23.48 respectively. While these appear small when compared to domestic macroeconomic aggregates such as YC, GFCC and GC whose overall mean are \$1759.60, \$449.30 and \$381.17 respectively, the volatility of the private capital flows is huge. The average FDIC to the sampled SSA countries was as low as -\$447.88 in some year and as high as \$2, 933.06 in some other year, leading to standard deviation of \$286.48. For some country, deviation of FDIC flow from the country's mean is as slow as -\$624.32; and it is as high as \$2,181.84 for some other country. Moreover, while the FDIC to some country in the sample in a particular year was as low as -\$29.60, it was as high as \$840.75 for some other country in another year.

The statistical properties for PIC, BLC, NFDIC, NPIC and NBLC are similar to those of FDIC (see table 3A). While the overall means for these variables are relatively smaller than the domestic macro-variables, the huge overall variation (Min-Max) and the large between and within variations would bear significant implication for the behaviour of domestic macroeconomic variables.

The behaviour of these international capital flows suggests that the flows are subject, and are carriers of, exogenous shocks originating from the foreign economy and now being transmitted to the recipient economy. Shocks to FDIC, PIC and BLC, namely FDICS, PICS and BLCS were, as highly negative as -$875.32, -$371.99 and -$384.86 respectively for some countries, and as highly positive as $1,418.55, $3, 242.61 and $2, 876.39 for some other countries. These shocks are relatively huge compared to YC and other domestic macro-variables. Hence the shock may bear significant implication for macroeconomic performance of the sampled SSA countries.

5.3 Panel unit roots tests result

The Panel tests of, Lin and chu, Im, Pesaran & Shin, Augmented Dicky-Fuller-Fisher chi-square and Phillip-Peron-Fisher chi-square (reported in table 4A of appendix III), reveal that at least one of the endogenous variables is non-stationary. This calls for the cointegration test to confirm if there exists a long run relationship between the variables. If yes, the systems of equation can be estimated without risk of spurious results

5.4 Cointegration tests result

The results of the Fisher and Johansen Cointegration test (table 5A) and Kao Cointegration test (table 6A) show that there exist cointegrating relationships between variables in the models estimated. This provides a basis for reliable estimation of the models in chapter 4.

5.5 Stability test results versus optimal lag length criteria

While many of the lag length selection criteria point at higher lag order (appendix IV), all the VAR equations exhibit stability at lower lag length - between 1 and 3. Given the importance of stability in the VAR system for validity of impulse-response result, a vital element of this research's analytical output, the VAR equations are estimated at lag lengths that guarantee the system's stability (Appendix V).

5.6 Shocks to gross capital inflows and macroeconomic performance

This section presents the analytical results on the influence of shocks to gross inflow of capital on behaviour of macroeconomic variables in the sub-Saharan Africa.

The results of SVAR analyses (presented in table 5.1 below) show that the impacts of shocks to gross inflows of capital on macroeconomic variables linger for many periods. For ease of exposition, the table presents, for the first four annual periods, the impulse-response results of SVAR analyses of the impact of (i) shock to gross foreign direct investment per capita (FDIC), (ii) shocks to gross portfolio inflows per capita (PIC) and (iii) shock to gross bank lending flows per capita (BLC) on macroeconomic variables of the model: income per capita (GDPC), government spending per capita (GC), gross fixed capital formation per capita (GFCC), change in foreign reserves per capita (CFXC) and exchange rate (ER).

It is apparent from table 5.1 below that shocks to gross inflows of capital bear significant implication for the economy. The impulse-response results of the SVAR analyses summarised in the table establish that positive shocks to gross inflows of portfolio investment (PIC) and bank lending (BLC) exert negative impact on output per capita (GDPC) with exception to a positive shock to gross inflows of FDI per capita (FDIC) which has positive effect on output per capita (GDPC). One standard deviation shock to PIC significantly leads to decline in GDPC by \$0.32, \$0.31, \$0.28 and \$0.27 in the first, second, third and fourth year after the shock respectively; while one standard deviation shock to BLC results in diminution of GDPC by \$2.4, \$2.5, \$2.5 and \$2.7 also in the first, second, third and fourth year after the shock respectively. On the other hand, one standard deviation shock to FDIC significantly leads to increase in output per capita by \$0.74, \$0.67, \$0.68 and \$0.82, respectively in the first, second, third and fourth year after the shock.

For clarity of exposition, the impacts of shocks to gross inflows of capital on output per capita in the sub-Saharan Africa are pictorially displayed in figures 5.1 – 5.3 below.

Table 5.1: Shocks to gross capital inflows (as impulse) and response of macroeconomic variables- evidence from the SVAR analyses

	RESPONSE OF MACROECONOMIC VARIABLES					
SHOCK TO	*YR*	*GDPC*	*GC*	*GFCC*	*CFXC*	*ER*
FDIC	1	0.747*** (0.04990)	-0.085*** (0.04706)	0.204*** (0.04584)	-0.506*** (0.04774)	-0.408*** (0.04784)
	2	0.676*** (0.05165)	-0.047213 (0.03899)	0.207*** (0.03549)	-0.236*** (0.01846)	-0.409*** (0.04839)
	3	0.686*** (0.04838)	-0.122*** (0.04008)	0.097*** (0.02358)	0.491*** (0.03007)	-0.373*** (0.04693)
	4	0.824*** (0.04840)	-0.233*** (0.04316)	0.160*** (0.02301)	0.308*** (0.01644)	-0.360*** (0.04586)
PIC	1	-0.325*** (0.01851)	0.019 (0.01831)	0.352*** (0.02795)	-0.128*** (0.02055)	0.018167 (0.01971)
	2	-0.313*** (0.02157)	-0.010 (0.01772)	0.263*** (0.02068)	0.038*** (0.00549)	0.020171 (0.01938)
	3	-0.285*** (0.02402)	-0.049*** (0.01751)	0.155*** (0.01506)	0.057*** (0.00401)	0.019274 (0.01904)
	4	-0.273*** (0.02687)	-0.077*** (0.01731)	0.069*** (0.01058)	0.037*** (0.00288)	0.017917 (0.01872)
BLC	1	-2.46*** (0.15343)	1.41*** (0.11316)	3.52*** (0.20397)	-0.747*** (0.06049)	0.217*** (0.014579)
	2	-2.54*** (0.16162)	0.371*** (0.05449)	2.03*** (0.12048)	0.287*** (0.02381)	0.220*** (0.014858)
	3	-2.49*** (0.15436)	0.169*** (0.04132)	1.18*** (0.07143)	0.534*** (0.03511)	0.217*** (0.014603)
	4	-2.65*** (0.15852)	-0.046*** (0.03199)	0.906*** (0.05986)	-0.061*** (0.01095)	0.211*** (0.014234)

Standard errors in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

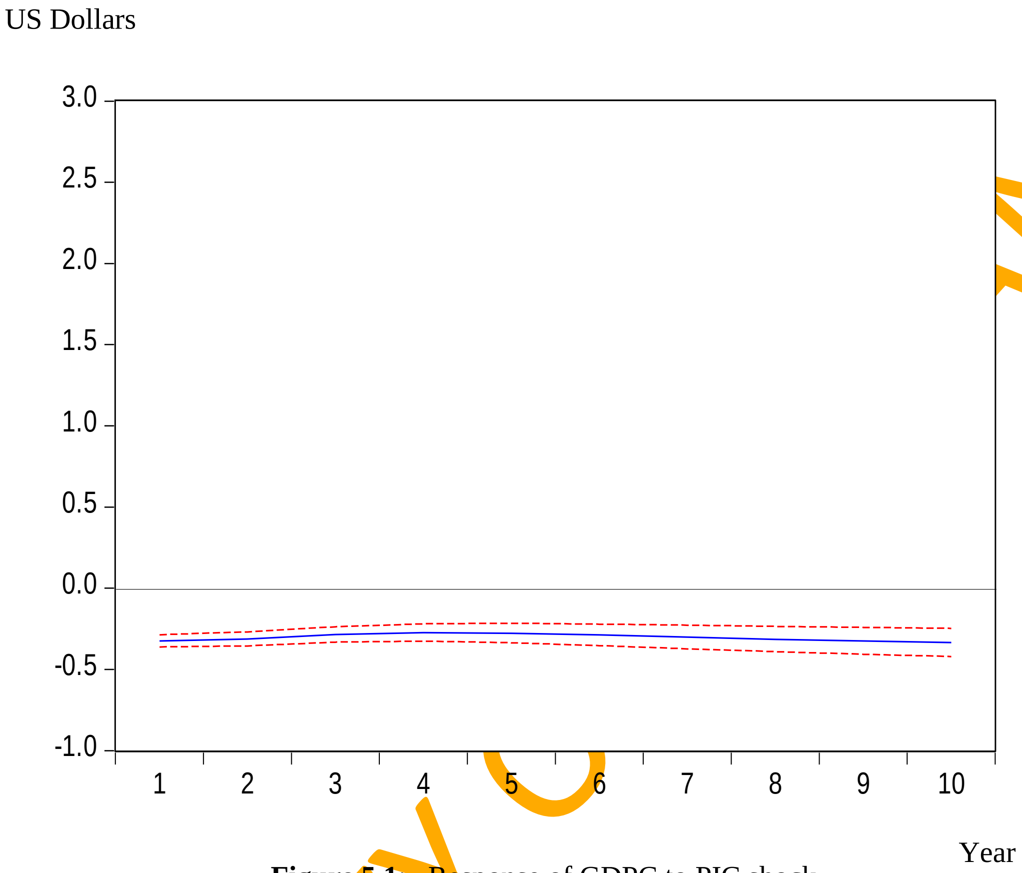

Figure 5.1: Response of GDPC to PIC shock

Sources: Author's computation

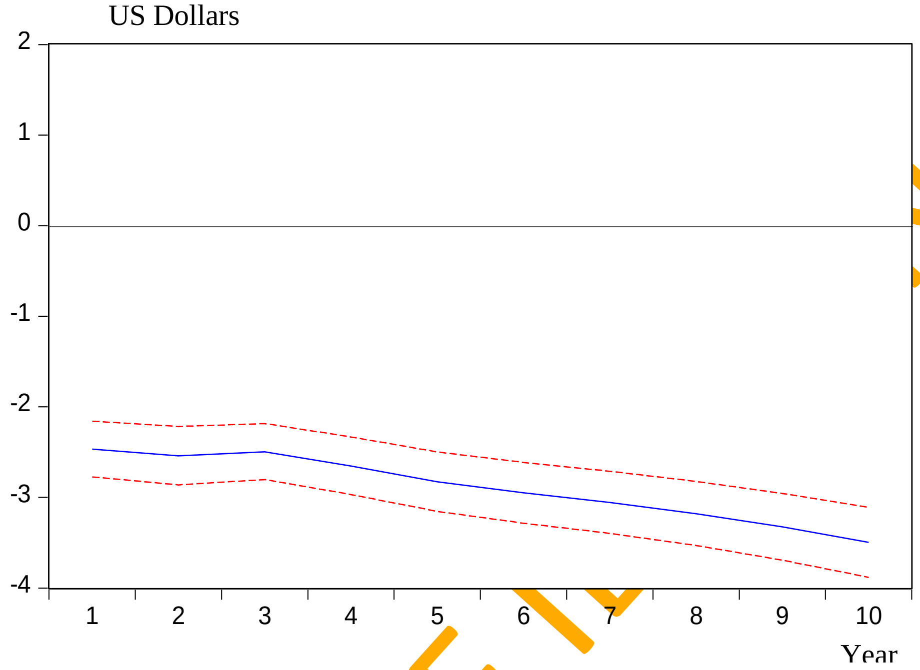

Figure 5.2: Response of GDPC to BLC shock

Sources: Author’s computation

US Dollars

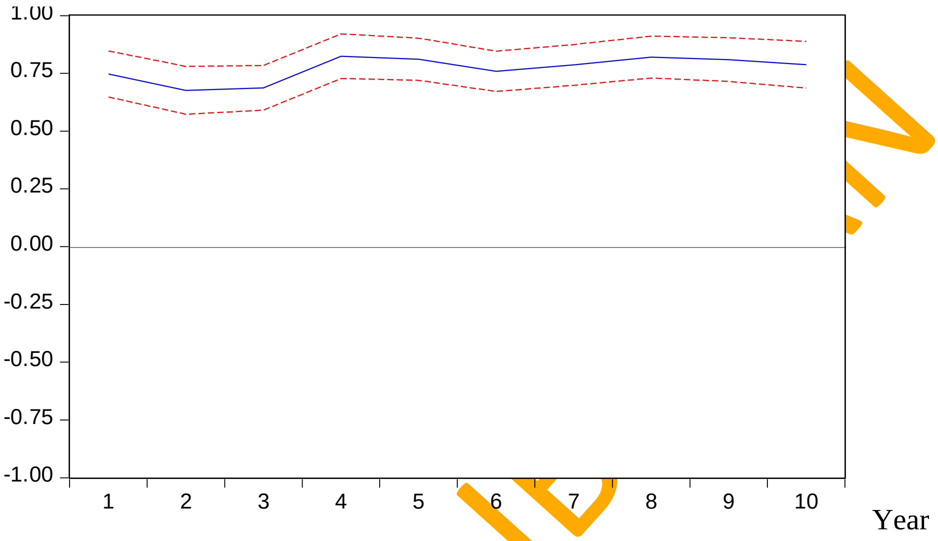

Figure 5.3: Response of GDPC to FDIC shock

Sources: Author's computation

Figure 5.1 and figure 5.2 show that positive shocks to gross inflows of portfolio investment per capita (PIC) and gross inflows of bank lending per capita (BLC) have negative effects on output per capita (GDPC). Moreover, the negative impact of shocks to PIC persist (at relatively constant level) for several periods up to the tenth year (figure 19); while the negative effects of shocks to BLC deepens over time as GDPC continues to decline till the tenth year (figure 20). Figure 5.3 however reveals that positive shocks to gross inflows of foreign direct investment per capita (FDIC) positively affect GDPC. Figures 5.1 to 5.3 suggest that the impact of the shocks reverberates infinitely in the economic system as the response functions do not converge to zero (axis). The response of all the macroeconomic variables to shock in gross inflows of FDI, portfolio flows and bank lending are shown in appendix VI.

Corroborating the results of the SVAR analyses regarding the influence of the shocks to gross inflows of capital are the results Two-Stage Least Square (2SLS) regression analyses presented in table 5.2 below. The 2SLS analyses were conducted to check the robustness of SVAR results above. There are six equations in table 5.2. Equations 1, 3, and 5 explain GDPC in terms of explanatory variables (including FDICS, PICS and BLCS respectively) with the exception of the interaction term between measure of financial development and capital flow shocks; while equation 2, 4 and 6 explain GDPC in terms of the explanatory variables including the interaction terms FDFDICS, FDPICS and FDBLCS respectively.

The results of the panel instrumental variable (IV) regression analyses (table 5.2) agree with the SVAR results with respect to the impact of shocks to PIC (*PICS*) and BLC (*BLCS*) in terms of the direction of effect, though not in magnitude. One unit rise in PICS results in statistically significant fall in GDPC by $18. It is also worth of note that BLC flow itself harms the economy as it reduces GDPC by $3.3. On the other hand, shocks to gross inflows of FDI (FDICS), according 2SLS analyses, reduce GDPC $0.77; whereas, the results of the SVAR analyses show that shocks to gross inflows of FDI positively affect GDPC.

Table 5.2: Output per Capita and Shocks to Gross Inflows of Capital - the 2SLS Results

DEPENDENT VARIABLE: ***GDPC***						
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
FDIC	1.266*** (0.000)	1.332*** (0.000)				
FDICS	-0.768*** (0.000)	0.501 (0.268)				
FD	1.948 (0.300)	1.393 (0.514)	-5.205** (0.049)	-5.87** (0.030)	-2.57 (0.331)	-3.308 (0.304)
FDFDICS		-0.025*** (0.000)				
PIC			18.22*** (0.000)	17.88*** (0.00)		
PICS			-18.00*** (0.000)	-17.99*** (0.000)		
FDPICS				0.005 (0.58)		
BLC					-3.302* (0.094)	-5.541*** (0.001)
BLCS					3.12 (0.115)	5.179 *** (0.002)
FDBLCS						0.0033 (0.407)
GC	0.098 (0.391)	0.466*** (0.000)	-0.034 (0.82)	0.016 (0.914)	0.234* (0.090)	0.839 *** (0.000)
GFCC	0.441*** (0.000)	0.547*** (0.000)	0.46*** (0.00)	0.503*** (0.000)	0.933*** (0.000)	1.092 *** (0.00)
IQ	101.29* (0.080)	129.92* (0.051)	127.52 (0.12)	141.79* (0.087)	191.92** (0.013)	274.7*** (0.003)
SE	0.867 (0.396)	0.081 (0.945)	2.64* (0.071)	2.55* (0.087)	0.951 (0.491)	-0.204 (0.900)
TOP	-2.789** (0.024)	-1.206 (0.391)	-3.0015* (0.088)	-2.42 (0.177)	0.0218 (0.989)	1.384 (0.427)
CONS	1591.0*** (0.000)	1305.3*** (0.000)	1322.5*** (0.000)	1269.0*** (0.000)	1741.6*** (0.000)	1247.2*** (0.000)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	65%	72%	69%	70%	78%	83%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

These negative effects of shocks to inflows (reported herein) have support in literature: portfolio flows have been documented to be most volatile ((Ferreira and Laux, 2008) and FDI relatively more stable (Becker and Noone, 2009). Thus, the positive effect of shocks to FDIC and the negative impact of shocks to PIC (both from SVAR analyses in table 5.1), as well as large coefficient of PICS (table 5.2), are corroborated in literature. The statistical significance of the results is not a surprise: Broner and Rigobon (2004) find that the standard deviation of capital flows to emerging economies is 80% higher than that of the developed countries. Thus, the magnitude of shocks to these inflows of capital to SSA (comprising developing and emerging economies) may be so large that their effects on the economy be significant. Furthermore, Converse (2012) confirmed that volatility of portfolio flows has significant negative effect on output.

The effect of shocks (in terms of the coefficient) to gross inflows especially PICS is larger in the 2SLS regression analyses than in the SVAR. This may be due to the fact that SVAR (an analysis of a system (of equations)) reports the effect of shocks to the inflows net of the positive effect of the flows themselves. It is observable that once the effect of the flows themselves (positive in the case of FDIC and PIC) is combined with the negative effect of their shocks (table 5.2), the net effect is positive in the case of FDI (in both equations – 1 & 2) but, in the case of PIC, it is positive in the first equation and negative in the second. Thus, once the impact of the financial sector development on capital flows shocks is taken into consideration, the net effect of FDI is positive while that of portfolio investment is negative. This indicates that the low level of financial sector development in SSA aggravates shocks to portfolio investment.

A more fascinating result is the net effect of bank lending on the economy: the negative effect of bank lending itself is greater than the apparently positive effect of its shock. Besides, it is negative in both equations. This indicates that financial sector development does not ameliorate the negative effects of bank lending inflows on the economy.

From table 5.1, the shocks (one standard deviation (s.d.)) to the gross inflows FDIC, PIC and BLC positively affect gross fixed capital formation per capita (GFCC). This agrees to the fact that gross capital inflows perform one of their theoretically predicted roles: augmenting domestic resources (Prasad et al, 2003). But why is the eventual effect of capital flows on GDPC negative? This must be due to the fact that productivity of additions to the fixed capital may be negative as the capital may be channelled into unproductive projects (Fitzgerald, 1999).

There appears to be collateral benefits attached to surge in gross inflows of FDI and portfolio investment in terms of fiscal discipline. Declines in government expenditures per capita (GC) are associated with positive shocks in to FDIC and PIC. Such a benefit is not seen with surge in inflows of bank lending. This may be due to the fact that bank lending flows have little or nothing to do with investment climate in the economy and dealers in such flows do not task government for such preconditions prior to investment. Besides, government may not pursue objectives related to increasing bank inflows: hence, fiscal discipline (entailing prudent appropriation of government funds/spending) may not be associated with bank lending flows (table 5.1).

Save the first two periods, shock in FDIC leads to accumulation of foreign reserves (CFXC). Accumulation of foreign reserves per capita increases by \$0.49 and \$0.31 in the third and fourth year after the shock (table 5.1). This trend continues for many more periods after the shock; it however dwindles toward the end of the ten-year period (Figure 29A). This result indicates that much of the inflows is being used to accumulate reserves, thus connoting existence of few productive/profitable investments in the country. Similar trends are associated with shocks to the other gross inflows (table 5.2, figure 9A and figure 19A).

Exchange rate appreciation trails positive shocks to PIC and BLC. This is not surprising, given the impact of these shocks on GDPC, and CFXC. Exchange rate significantly appreciates by 0.22 and 0.22 and 0.211 point in the second, third and fourth year after a shock to BLC; while the appreciation is not significant in the case of PIC. On the other hand, a shock of FDIC leads to depreciation of exchange rate by 0.41, 0.37 and 0.36 points in the second, third and fourth year after the shock (table 5.1). This is not unexpected given the positive influence of shock to FDIC on the economy. Besides, FDI is not a form of hot money: the investment often comes into the country in form of physical (perhaps relatively illiquid) asset and thus does not pose pressures on financial stability management in the recipient's economy, unlike the portfolio investment and bank lending.

Are gross capital flows actually injurious to the economy (output per capita)? The analyses presented in table 5.2 show that capital flows are not all injurious to the economy; but shocks to these flow are. In fact, FDIC and PIC exert positive influence on the economy, while BLC does not. A dollar increase in FDIC and PIC lead to a rise in GDPC by $1.26 and $18.2 respectively (Equation 1&3 of the table). On the other hands, $1 increase in BLC leads to decline in GDPC by $3.3 (equation 5). Contrary to the effect of gross capital flows, shocks to their flows took a different direction. Shock to FDIC (FDICS) and PIC (PICS) result in statistically significant decline of GDPC by $0.77 and $18 respectively; while shock to BLC (BLCS) leads to statistically insignificant rise in GDPC by $3.12 (table 5.2)

It is observable that the negative effect of PICS on GDPC is larger than that of FDICS. This finding shows PIC is hotter than FDIC[65], as documented in literature. Moreover BLC is indeed the hottest as the flows itself negatively affect GDPC.

Related to the hotness of the flows and their effect on the economy are the effects of the level of financial development on the economy in the light (under the influence) of these flows. Though not statistically significant at conventional levels, financial development proxy (FD) has positive influence on GDPC in equation 1 where the effects of FDICS on GDPC are analysed; on the other hand, the effects of FD on GDPC are significantly negative in equations where the effects of PICS on GPC are considered, and just negative where the effects of BLCS on GDPC are analysed.

Furthermore, with the interaction term FDFDICS (in equation 2) the effect of FDICS in equation in equation 2 is positive - as against the negative in equation 1 - (see table 5.2). The effects of FD on curtailing the negative effects of shocks to PIC and BLC, on the other hand, is negligible as both PICS and BLC still exert statistically significant negative effects on GDPC in the presence of interaction terms FDPICS and FDBLCS (see equations 4 & 6 in table 5.2).

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[65] FDI is usually more stable as it is of longer term while portfolio investment is less stable as it is of shorter term. Thus, the latter is more volatile and often conceived the hotter of the two.

The contributions of most of the other control variables to output appear to agree with literature. Government expenditure (captured with GC) positively affects GDPC except in equation 3 of table 3. Its effects are statistically significant at 1% in both equation 2 and equation 6 and at 10% in equation 5. Similarly Investment spending per capita (captured by gross fixed capital formation per capita, GFCC) also positively affects GDPC. Its effects are statistically significant at 1% in all the equations in the table.

Institutional quality (IQ) and school enrolment (SE) positively contribute to GDPC, as they do, according to literature, to economic growth. The effects of IQ on GDPC are statistically significant at least at 10% level except in equation 3. This shows that institutional quality matters for productivity in sub-Saharan Africa. Many of the components[66] of this index bear on safety and accommodativeness of investment climate, and this matters for foreign investment, and hence capital flows. Besides the indirect effects, some components (political stability and government effectiveness) of this index directly matter for productivity: stability ensures continuity of production process and its growth while effectiveness of government enhances direct (positive) impact of government spending on output. On the other hand, the effect of SE on GDPC is not statistically significant in most of the equations, save equations 3 and 4 where it is at 10% level.

5.6.1 Shocks to gross capital inflows and economic growth

Besides the analysis of the effect of gross inflows and their shocks on macroeconomic variables - and how the flows respond to the shocks of macroeconomic variables - this study also examines how these flows (and their shocks) affect **economic growth.** Table 5.3 presents the effect of shocks to gross inflows on actual economic growth (captured by growth rate of GDP per capita).

[66] These components include political stability, government effectiveness , regulatory quality, rule of law and corruption

Table 5.3: Gross Inflows and their Shocks and Actual Economic Growth

Dependent Variable: GRC						
	1	2	3	4	5	6
FDIC	0.003 (0.145)	0.004* (0.081)				
FDICS	-0.002 (0.480)	-0.009* (0.098)				
FD	-0.021 (0.219)	-0.233 (0.167)	-0.03* (0.087)	-0.268 (0.148)	0.0110 (0.543)	0.003 (0.989)
FDFDICS	-	0.001 (0.128)				
PIC			0.009* (0.062)	0.008 (0.135)		
PICS			-0.007 (0.166)	-0.011 (0.151)		
FDPICS			-	0.001 (0.408)		
BLC					-0.125** (0.034)	-0.007 (0.255)
BLCS					0.014** (0.023)	0.005 (0.467)
FDBLCS					-	0.003*** (0.002)
GFCC	0.0002 (0.790)	0.0001 (0.928)	0.0001 (0.874)	0.0002 (0.839)	0.0008 (0.350)	0.0009 (0.300)
INGDPC	-0.000 (0.416)	-0.000 (0.359)	-0.000* (0.096)	-0.000 (0.144)	-0.000 (0.126)	-0.000 (0.111)
SE	0.031** (0.012)	0.032*** (0.008)	0.031 (0.005)	0.021 (0.017)	0.028 (0.012)	0.028 (0.009)
IQ	-044 (0503)	-0.432 (0.507)	0.511 (0.488)	-0.311 (0.638)	-0.020 (6.975)	-0.054 (0.930)
TOP	-0.005 (0.584)	-0.002 (0.758)	0.006 (0.433)	0.008 (0.361)	0.013 (6.975)	0.013 (0.070)
CONS	0.231 (0.794)	0.423 (0.626)	0.664 (0.369)	0.289 (0.759)	-0.356 (0.660)	-0.132 (0.869)
R_o^2	3.7%	4.4%	4%	5%	4.4%	8%
$p(\chi^2)$	0.12	0.07	0.014	0.08	0.035	0.001

p-values of the z test in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

The flows exhibit the same influence on economic growth as they do on output. However, the impacts of FDIC and PIC, and their shocks, are not statistically significant at 5%; but the influence of BLC and its shock are. The statistical insignificance of FDICS and PICS on actual economic growth (GRC) is akin to the findings of Ferreira and Laux (2008): the volatility of portfolio flows exerts negative but statistically insignificantly effect on economic growth. The authors thus conclude that volatility of portfolio inflows does not affect economic growth.

It is worth of note that actual economic growth is driven by the short-term business cycle component, running on the long-term (trend) growth path. The possible correlation between the short-term component and the short-term private capital flows (caused by the common short-termism) may have doused the significance of the negative impact of the flows' fluctuations. To examine the true effects of private capital flows' fluctuations, their impacts on the long term economic growth (MGRC) are analysed. Table 5.4 below presents the highlights.

Gross inflows of FDI and portfolio investment positively affect the long term (trend) growth of the economy, to a statistically significant extent. A dollar increase in FDIC and PIC respectively lead to 0.3% and 0.9% point increase in long term growth rate of income per capita (MGRC). However, shocks to FDIC and PIC negatively affect MGRC: a unit increase FDICS and PICS reduce MGRC by 0.4% and 0.9% point respectively

On the other hands, BLC pulls down economic growth: a dollar rise in BLC retards MGRC by 1.2%. Notwithstanding this, BLCS, having taken consideration of the negative impact of BLC, appears to have a positive effect on MGRC. A unit increase in the BLCS leads to increase in MGRC by 1.2% point.

The effects of gross capital inflows and their shocks are almost of the same magnitude but of reverse signs; thus the net effects on the economic growth are virtually nil. The consequence of this outcome is that the flows have no net (positive) effect on economic growth.

Table 5.4: Gross Inflows of Capital and Long Term (Trend) Economic Growth

Dependent Variable: MGRC						
	1	2	3	4	5	6
FDIC	0.003*** (0.000)	0.004*** (0.000)				
FDICS	-0.004*** (0.001)	-0.006*** (0.007)				
FD	-0.003 (0.636)	-0.004 (0.521)	-0.02*** (0.00)	-0.217*** (0.000)		
FDFDICS		0.000 (0.386)				
PIC			0.009*** (0.000)	0.009*** (0.000)		
PICS			-0.009*** (0.000)	-0.009*** (0.000)		
FDPICS				0.004 (0.997)		
BLC					-0.012*** (0.000)	-0.012*** (0.000)
BLCS					0.012*** (0.000)	0.012*** (0.000)
FDBLCS						0.002 (0.990)
GFCC	-0.0006* (0.082)	-0.0007* (0.052)	-0.0003 (0.203)	-0.0003 (0.203)	0.0003 (0.325)	0.0003 (0.325)
INGDPC	-0.003 (0.280)	-0.008 (0.248)	-0.005 (0.000)	-0.001 (0.000)	-0.001 (0.000)	-0.002 (0.000)
SE	0.021*** (0.000)	0.021*** (0.000)	0.028*** (0.000)	-0.031*** (0.000)	0.027*** (0.000)	0.027*** (0.007)
IQ	-0.78*** (0.001)	-0.76*** (0.001)	-0.217* (0.063)	-0.459** (0.028)	-0.114 (0.588)	-0.114 (0.589)
TOP	-0.007* (0.092)	-0.008* (0.083)	0.003 (0.32)	0.003 (0.277)	0.007*** (0.003)	0.007*** (0.003)
CONS	0.876** (0.022)	0.919** (0.017)	0.880*** (0.000)	0.581** (0.037)	0.000 (1.000)	0.002 (0.999)
R_o^2	10.9%	11.1%	21%	22%	22.2%	22.2%
$p(\chi^2)$	0.0000	0.0000	0.000	0.000	0.00	0.00

p-values of the z test in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Thus, the theoretically anticipated positive effects of capital flows on growth do not hold for gross inflows of capital in the sub-Saharan Africa, at least in the long run.

5.6.2 Macroeconomic shocks as determinants of gross capital inflows

Do gross capital inflows respond to domestic macroeconomic shocks in the economy? Table 6 below provides some information. FDIC declines with a positive shock to GDPC: FDIC falls by \$0.2, \$0.08 and \$0.05 in the first, second and third year following a positive shock to GDPC.

This inverse relationship indicates that the inflows would rise with negative shocks to income per capita. This puzzle is documented in literature. Gourinchas and Jeanne (2013) show that capital flows more to countries with negative productivity growth; and less to countries with positive productivity shock. These two authors explain this puzzle in terms of the positive saving wedge (tax) in Africa which discourages saving and encourages borrowing. Moreover, the negative shock to output per capita, without a similar shock to national absorption, creates negative current account balance, financed by capital inflows (Obstefeld and Rogoff, 1996). This indicates that FDI flows countercyclically and may help sub-Saharan Africa countries smoothen their consumption and optimise their intertemporal welfare. In addition, this supports the behaviour of FDI flows: it is recognised to be stable and less volatile than other forms of private capital flows. The stability of FDI flows is pertinent for welfare maximisation.

Portfolio investment per capita, on the other hand, significantly rises with a positive shock to income per capita: PIC rises by \$0.38 and \$0.29 in the first and second period, following the shock to GDPC. Fratzscher's (2011) findings that domestic macroeconomic shocks positively affect portfolio inflows in Africa[67] lend support to this study's finding. BLC does not significantly respond to shock in GDPC except in the second year when it declines by \$0.06 (Table 5.5).

[67] Fratzscher (2012) find that a unit increase in domestic shocks leads to 1.85 increase in total portfolio flows (at 10% level of statistical significance) while a unit increase in shock to domestic equity market increases total portfolio flows by 0.048 (at 1% level of statistical significance). One of the component variables in calculation of domestic shock is percentage change in GDP.

Table 5.5: Macroeconomic Shocks as Determinants of Gross Inflows– the Impulse-Response Result

	ONE S.D. SHOCK TO MACROECONOMIC VARIABLES					
RESPONSE OF	**YR**	**GDPC**	**GC**	**GFCC**	**CFXC**	**ER**
FDIC	1	-0.232*** (0.05421)	-0.624*** (0.07533)	1.05*** (0.06774)	0.000000 (0.00000)	0.222*** (0.07198)
	2	-0.084*** (0.02771)	-0.236*** (0.04150)	0.638*** (0.03665)	0.405*** (0.00067)	0.062** (0.03692)
	3	-0.046*** (0.02132)	-0.096*** (0.03270)	0.498*** (0.02539)	0.168*** (0.00094)	0.064** (0.02813)
	4	-0.057** (0.02687)	-0.138*** (0.03853)	0.432*** (0.03135)	-0.019*** (0.00074)	0.183*** (0.03445)
PIC	1	0.381** (0.01692)	-0.263*** (0.01425)	-0.035*** (0.00761)	0.000000 (0.00000)	0.168*** (0.01211)
	2	0.297*** (0.02636)	-0.262*** (0.01910)	0.162*** (0.00606)	-0.487*** (0.00021)	0.069*** (0.01387)
	3	0.088*** (0.00846)	-0.114*** (0.00585)	0.038*** (0.00137)	-0.146*** (0.00032)	0.048*** (0.00399)
	4	0.03*** (0.00340)	-0.062*** (0.00240)	0.015*** (0.00036)	-0.033*** (0.00022)	0.042*** (0.00158)
BLC	1	0.052624 (0.13142)	1.88*** (0.11892)	-0.681*** (0.10050)	0.000000 (0.00000)	0.658*** (0.13418)
	2	-0.060** (0.03572)	0.532*** (0.03413)	-0.037*** (0.02823)	-0.057*** (0.00117)	0.188*** (0.03776)
	3	-0.0279 (0.06693)	1.19*** (0.06181)	-0.187*** (0.05299)	-0.189*** (0.00144)	0.366*** (0.07016)
	4	0.007543 (0.03501)	0.631*** (0.03478)	-0.214*** (0.02692)	-0.079*** (0.00085)	0.250*** (0.03603)

*Standard errors in parenthesis; *, ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Positive shocks to government expenditures per capita (GC) significantly depresses gross inflows of FDI as FDIC declines by \$0.62, \$0.24 and \$0.096 in the first second and third year after a positive shock to GC, while PIC also declines by \$0.26, \$0.26 and \$0.11 over the same periods (Table 6). The negative effect of the shocks to GC however diminishes over time as FDIC get restored to its equilibrium level around the 5^{th} to 6^{th} year after the shock; and thereafter, FDIC responds positively to the original shock to GC (table 32A). Similarly, PIC gets back to its equilibrium level around 8^{th} to 9^{th} year after shock (figure 12A). On the other hand, BLC positively responds to shock in government expenditures: BLC rises by \$1.9, \$0.53 and \$1.19 in the first, second and third year after shock, but the positive effect of shock to GC dwindles over time (figure 22A).

Explanation for the behaviour of capital flows to government spending shocks can be located in the relevance of investment climate and the effect the private-public mix in determining capital flows. FDIC and PIC are more associated with investment (mostly private) than BLC which is not attached to particular investments but merely provides floating funds that the resident banks can allocate to any investment considered worthwhile. Hence, the investment climate matters more for FDIC and PIC. Hence, a positive shock to government spending may be perceived as the public (government) dominating the economy, and by extension crowding out private operations. Investors thus refrain from allocating more capital; in many cases they call back their investment. Many business ventures - perhaps contracts - (as well as their returns) that BLC eventually funds may correlate with budget allocations. Hence, BLC increases with a positive shock in government spending.

The foregoing argument is buttressed by similar pattern of response of the gross inflows of capital to a positive shock to gross fixed capital formation per capita (GFCC). While FDIC and PIC positively respond to GFCC shock, BLC shows a negative reaction. FDIC rises by \$1.05, \$0.64, \$0.49 and \$ 0.43 in the first, second, third and fourth year after the shock respectively; in the same vein, PIC increases, by \$0.16, \$0.04 and \$0.02 in the second third and fourth year following the shock, respectively. On the other hands, BLC diminishes by \$0.68, \$0.04 and \$0.19 respectively in the first, second and third after the shock.

The positive response of FDIC and PIC revolves around the fact that they are directly associated with particular investments. Rise in the magnitude of investment (and fixed asset) signals profitability; hence a positive shock to GFCC indicates surge in profitability which FDIC and PIC flow in to take advantage of. As BLC is not associated as such with domestic investment or profitability of private assets, such positive response is absent. Besides, there may be an inverse relationship between returns to private asset and returns to public asset. A government-dominated economy may favour higher returns to government related projects above those to private projects; whereas a healthy economic climate with a thriving private sector may favour higher returns to efficient investment projects above the returns to (bureaucratic) government related business opportunities. Hence, BLC, given its positive association to government spending shock may not be stimulated by surge in investment spending.

While foreign reserves may provide informal collateral (as the reserves indicate repayment capability or credit-worthiness of the indebted/recipient country (Montoro and Rojaz-Suarez)) for gross inflows, positive shocks to foreign reserves may have a negative signal to international investors. Foreign reserves accumulation may indicate declining national absorption which further connotes diminishing growth/investment opportunities in the country. If this obtains, international investor reduces allocation of capital to such a country during period of slow growth of investment opportunities. Whether surge in reserves is seen by an investor as collateral accumulation or indication of declining investment opportunities depends on the type of investment in question: is it long-termed or short-termed?

The preceding paragraph explains the response of different capital flows to a positive shock in change in foreign reserves per capita (CFXC). FDIC positively responds to a positive shock in CFXC: it rises by $0.41 and $0.17 in the second and third year after shock. On the other hand, both PIC and BLC negatively respond to CFXC shock. While PIC falls by $0.49, $0.15 and $0.03 in the second, third and fourth year respectively after the shock to CFXC; BLC respectively declines by $0.06, $0.19 and $0.08 in the second, third and fourth year after the shock (table 5.5).

Since literature document that FDI is relatively stable (compared to other flows) it can be seen as longer-termed, relative to others. Thus, collateral concerns matter for this type of investment as it takes a longer period of time to relocate the investment elsewhere; hence FDIC's positive response to a positive CFXC shock. On the other hand, both portfolio investment and bank lending flows are short-termed. Thus, return-chasing effect of these flows may dominate security/collateral concern effect in this case. Consequently, declining investment opportunities (and the return thereof) connoted in surge in foreign reserves discourage the inflows.

All the gross inflows however respond in the same way to a positive shock in exchange rate (ER). FDIC rises by \$0.22, \$0.06 and \$0.18 in the first second and fourth year respectively following one standard deviation surge in exchange rate; PIC also respectively increases by \$0.17, \$0.07, \$0.04 and \$0.04 in the first, second, third and fourth year after the shock. In the same vein, BLC springs up by \$0.66, \$0.19, \$0.36, \$0.25 in the first second, third and fourth year after shock (table 5.5).

The response of these gross inflows to shock in ER enjoys support in literature (see Wu (2008) for a survey). Appreciation of exchange rate of a country positively affects returns on investment that accrue to a foreign investor as this investor gains from the favourable exchange rate differential[68]. Expectation of persistence in appreciation of ER may encourage the investor to allocate capital to assets in a foreign country, such that she gains when converting the returns on investment into her national currency.

5.7 Shocks to Net Capital Inflows and Macroeconomic Performance

This section presents the analytical results on the influence of shocks to net inflow of capital on behaviour of macroeconomic variables, and vice versa in the sub-Saharan Africa.

As in the case of gross inflows, the table 5.6 presents, for the first four annual periods, the impulse-response results of SVAR analyses on the impact of (i) shock to net foreign direct investment per capita (NFDIC), (ii) shocks to net portfolio inflows per capita (NPIC) and (iii) shock to net bank lending flows per capita (NBLC) on macroeconomic variables of the model: income per capita (GDPC), government

[68] Exchange rate appreciation results in fewer currency of capital-recipient country changing for a unit of currency of the foreign investor's country. Thus, the investor has more money, on converting his returns on foreign investment to his own country's currency.

Table 5.6: Shocks to Net Inflows (as Impulse) and Response of Macroeconomic Variables- Evidence from the SVAR Analyses

	RESPONSE OF MACROECONOMIC VARIABLES					
ONE S.D. SHOCK TO	**YR**	**GDPC**	**GC**	**GFCC**	**CFXC**	**ER**
NFDIC	1	1.093*** (0.09507)	0.784*** (0.06511)	-0.556*** (0.04953)	0.286*** (0.04984)	0.816*** (0.08535)
	2	1.011*** (0.09774)	1.223*** (0.07456)	0.768*** (0.09111)	-0.388*** (0.03082)	0.839*** (0.08741)
	3	1.004*** (0.09684)	1.125*** (0.07014)	0.827*** (0.07732)	0.902*** (0.05181)	0.758*** (0.07661)
	4	1.339*** (0.10444)	0.860*** (0.06064)	0.338*** (0.04110)	0.354*** (0.02370)	0.697*** (0.07315)
NPIC	1	0.326*** (0.03884)	0.489*** (0.03782)	0.251*** (0.03378)	0.475*** (0.04067)	0.532*** (0.03365)
	2	0.481*** (0.04925)	0.498*** (0.04268)	0.667*** (0.06051)	0.092*** (0.01274)	0.542*** (0.03415)
	3	0.492*** (0.05337)	0.406*** (0.03735)	0.404*** (0.04521)	0.109*** (0.01798)	0.460*** (0.02954)
	4	0.391*** (0.04910)	0.419*** (0.03626)	0.428*** (0.03247)	0.105*** (0.00971)	0.434*** (0.02853)
NBLC	1	-0.161*** (0.03227)	0.148*** (0.03194)	0.545*** (0.02593)	-0.373*** (0.03543)	-0.186*** (0.03288)
	2	-0.229*** (0.03606)	0.078*** (0.02699)	0.429*** (0.02190)	0.069*** (0.01130)	-0.184*** (0.03321)
	3	-0.195*** (0.03471)	0.031*** (0.02372)	0.162*** (0.00978)	0.235*** (0.01765)	-0.171*** (0.03233)
	4	-0.203*** (0.03472)	0.004*** (0.02221)	-0.025*** (0.01272)	0.035*** (0.00643)	-0.171*** (0.03182)

Standard errors in parenthesis

*, **, and *** *indicate statistical significance at 10%, 5% and 1% level respectively*

Source: Author's computation

spending per capita (GC), gross fixed capital formation per capita (GFCC), change in foreign reserves per capita (CFXC) and exchange rate (ER).

It is apparent from table 5.6 above that shocks to net inflows of capital bear significant implication for the economy. The impulse response results of the SVAR analyses summarised in the table establish that positive shocks to net inflows of FDI per capita (NFDIC) and net inflows of portfolio investment (NPIC) capital on output/income per capita (GDPC) is positive. One standard deviation increase in NFDIC leads to increase in GDPC by $1.1, $1.01, and $1.00 in the first, second and third year respectively; while the same magnitude of shock to NPIC result in GDPC respectively rising by $0.33, $0.48 and $0.49 in the first, second and third year. However, shocks to net inflows of bank lending flows per capita (NBLC) negatively affect the economy. GDPC respectively declines by $0.16 $0.23 and $0.20 in the first, second and third year after a shock to NBLC. The effects of shocks to these net inflows persist for many years after the initial shocks: the response functions are yet to converge to the zero (the equilibrium), even after 9th year (as shown by figures 22-24). The response of other variables to shock to the net inflows of FDI, portfolio investment and bank lending over more a period of ten years are presented in figures 36A-40A, figures 46A-50A and figures 56A-60A respectively in appendix VI.

To check the robustness of SVAR results in table 5.6, 2SLS regressions analyses are conducted and the result presented in table 8 above. There are six equations in table 5.7, two for each of NFDIC, NPIC and NBLC: equations 1, 3, and 5 explain GDPC in terms of explanatory variables (including NFDIC, NPIC and NBLC respectively) with the exception of the interaction term between measure of financial development and capital flow shocks; while equation 2, 4 and 6 explain GDPC in terms the explanatory variables including the interaction terms FDFDICS, FDPICS and FDBLCS respectively.

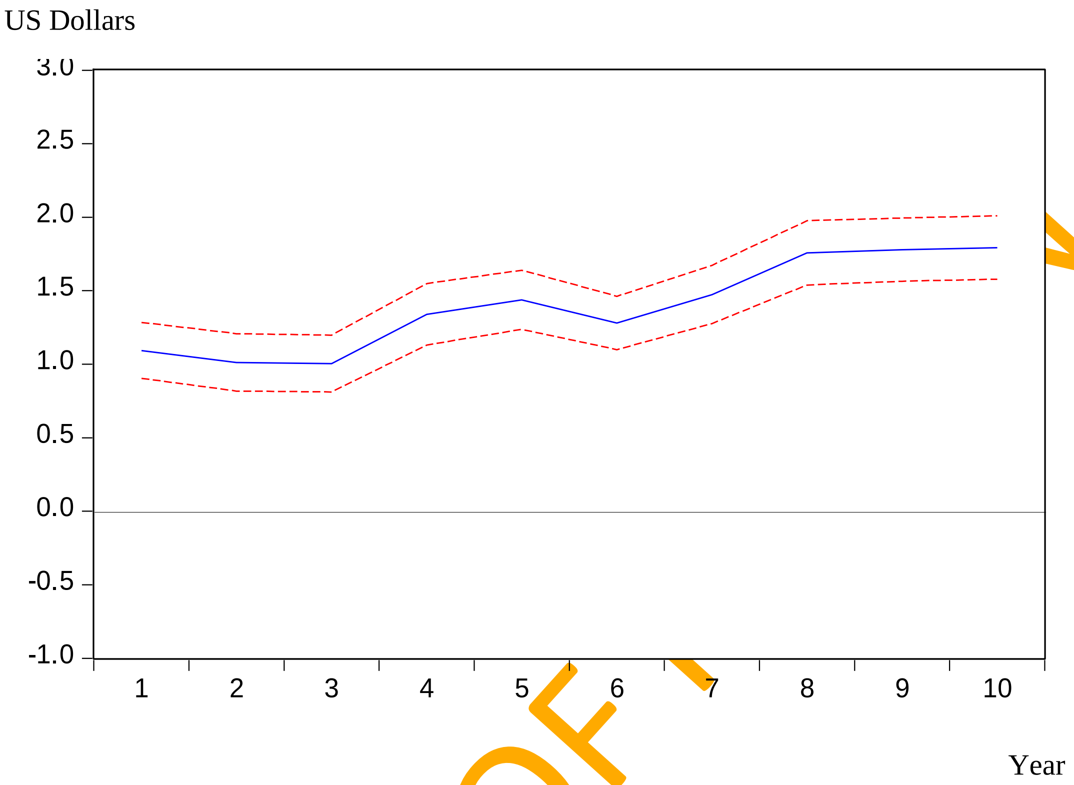

Figure 5.4: Response of GDPC to NFDIC shock

Source: Author's computation

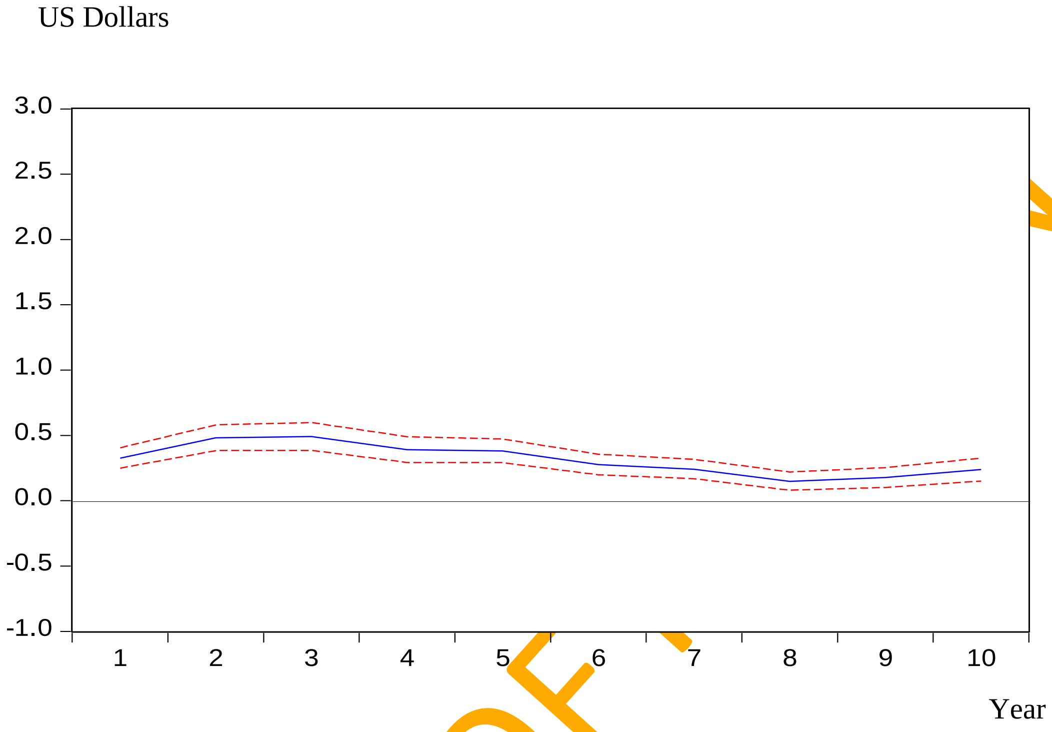

Figure 5.5: Response of GDPC to NPIC shock

Source: Author's computation

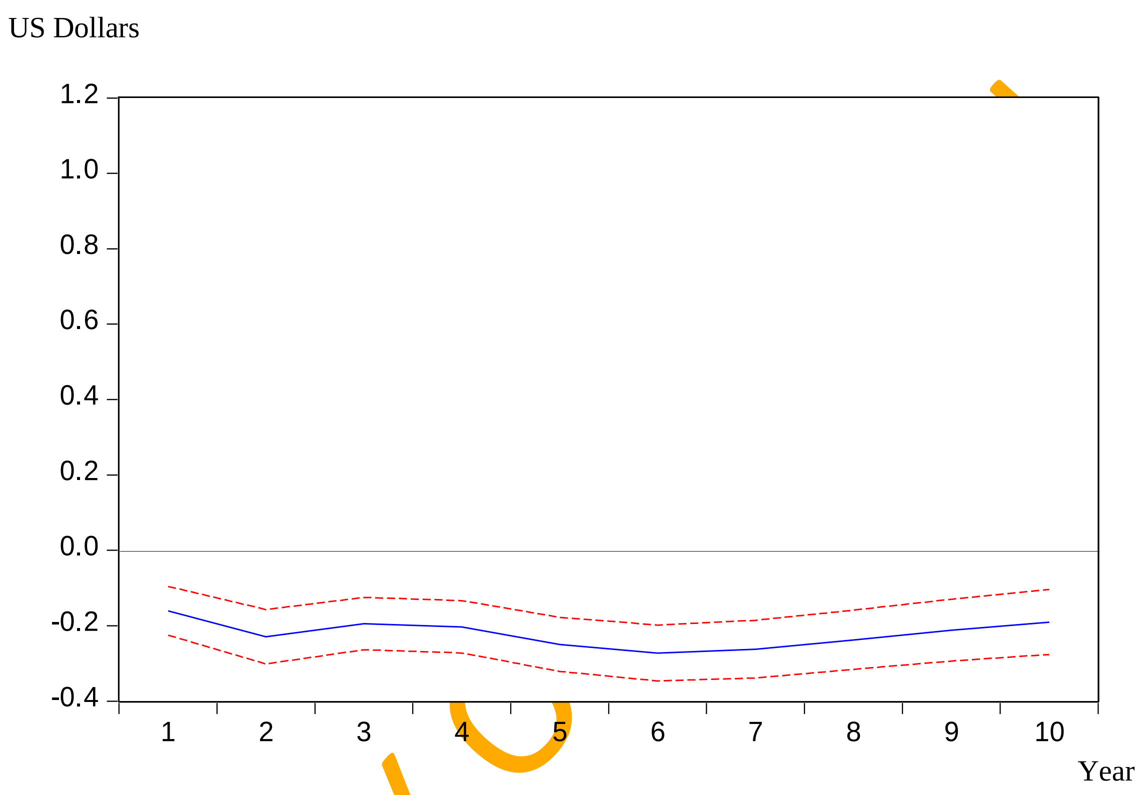

Figure 5.6: Response of GDP to NBLC shock

Source: Author’s computation

Table 5.7: Output per capita and Shocks to Net Inflows of Capital – 2SLS Results

DEPENDENT VARIABLE: *GDPC*						
	NFDIC EQUATIONS		*NPIC* EQUATIONS		*NBLC* EQUATIONS	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
NFDIC	1.245*** (0.000)	1.44*** (0.000)				
NFDICS	-0.783*** (0.000)	0.333 (0.490)				
FD	1.668 (0.379)	0.661 (0.776)	-1.68 (0.377)	-0.76 (0.725)	-4.28 (0.133)	-4.61 (0.108)
FDNFDICS		-2.024*** (0.001)				
NPIC			4.22*** (0.000)	5.617*** (0.000)		
NPICS			-4.088*** (0.000)	-6.20*** (0.000)		
FDNPICS				0.013*** (0.007)		
NBLC					-0.18 (0.698)	-0.029 (0.950)
NBLCS					0.68 (0.886)	-0.129 (0.789)
FDNBLCS						0.002 (0.782)
GC	0.097 (0.399)	0.645*** (0.000)	-0.107 (0.34)	0.137 (0.263)	0.49*** (0.001)	0.39*** (0.008)
GFCC	0.436*** (0.000)	0.564*** (0.000)	0.577*** (0.00)	0.556*** (0.000)	1.008*** (0.00)	0.98*** (0.000)
IQ	97.795* (0.096)	141.78* (0.053)	102.54* (0.089)	122.23* (0.064)	205.53** (0.016)	197.75** (0.016)
SE	0.898 (0.385)	-0.304 (0.813)	1.332 (0.209)	0.67 (0.56)	0.29 (0.851)	0.68 (0.643)
TOP	-2.68** (0.032)	-0.95 (0.530)	-2.43* (0.060)	-1.86 (0.182)	0.712 (0.669)	0.45 (0.782)
CONS	1576.4*** (0.000)	1211.36*** (0.000)	1545.98*** (0.000)	1331.6*** (0.000)	1222.9*** (0.000)	1283.9*** (0.000)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	66%	74%	64%	67%	72%	70%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

The result of the panel instrumental variable regressions, PIVR (table 5.7 above) appears to contradict the results of SVAR analyses of net inflows of capital, at first sight. While the effect of the shocks to NFDIC (NFDICS) and NPIC (NPICS) on GDPC are negative (equation 1 & 3), the combination of these effects with those of the flows themselves is, on net, positive. This net effect may have influenced SVAR results.

Back to table 5.6 to explain the behaviour of macroeconomic variables other than GDPC in response to shocks in private capital flows, the table shows that GC positively responds to all net inflows of capital. While government fiscal discipline may be sensitive to (heightened to attract) gross inflows of capital, government spending per capita is actually encouraged by balance of resources (capital) available in the country. GC rises by $1.2, $1.1 and $0.86 respectively in the first, second and third year following shock to NFDIC. Similar behaviour is also observed with one standard deviation shock to NPIC and NBLC: GC rises by $0.49, $0.41 and $0.42 in the second, third and fourth year, respectively, after shock to NPIC; and by $0.15, $0.08 and $0.03 respectively in the first, second and third year following shock to NBLC.

Net inflows of capital rub positively on investment, as predicted by theory. A positive (one standard deviation) shock to NFDIC results in GFCC rising by $0.77, $0.83 and $0.48 in the second, third and fourth year respectively. GFCC also increased by $0.66, $0.40 and $0.43 in the second, third and fourth year respectively following shock to NPIC; and by $0.43 and $0.16 second and third year following shock to NBLC (see table 7 above).

Positive shocks to net inflows of capital lead to increase in accumulation of foreign reserves, except in very few occasions. CFXC rises by $0.9 and $0.35 in the first and second year respectively after shock to NFDIC; it rises by $0.09, $0.11 and $0.11 in the second, third and fourth year respectively following shock to NPIC; and by $0.07, $0.24 and $0.04 in the second, third and fourth year respectively following shock to NBLC This, as noted earlier, is an indication of limited growth opportunities in Sub-Saharan Africa.

Exchange rate appreciation is noticed to rise with surge in NFDIC and NPIC. The rate depreciates, however, in the case of NBLC. ER appreciates by $0.84, $0.76 and $0.70 in the second, third and fourth year respectively following shock to NFDIC; and by $0.54, $0.46 and $0.43 in the second, third and fourth year respectively following shock to NPIC. It however depreciates by $0.18, $0.17 and $0.17 in the second, third and fourth year respectively following shock to NBLC.

5.7.1 Shocks to net capital inflows and economic growth

The impact of net flows on economic growth is presented in table 5.8 & table 5.9. NFDIC and PICS do not significantly retard actual growth (equations 1 & 3 of table 5.8 (a)) but significantly undermine long term (trend) growth (equations 1 & 3 of table 5.9). BLC is however injurious to both actual growth and its long term path.

The analytical findings in table 5.9 show that FDI and PIC are not actually growth-inhibitive; but their shocks are. Moreover, the net effects of net capital flows and those of their shocks are virtually nil[69]. This may explain while the economy of the sub-Saharan economy may not have achieved a growth level expected from the net inflows.

[69] The coefficients of the flows and their shocks are virtually of the same magnitude but of reverse signs. Thus, the effect of the flows and their shocks on the flows net out.

Table 5.8: Net Inflows, Shocks and Actual Economic Growth

Dependent Variable: **GRC**						
	NFDIC EQUATIONS		*NPIC EQUATIONS*		*NBLC EQUATIONS*	
	1	2	3	4	5	6
NFDIC	0.003 (0.114)	0.004* (0.070)				
NFDICS	-0.002 (0.443)	-0.009*** (0.01)				
FD	-0.023 (0.183)	-0.0245 (0.145)	-0.018 (0.273)	-0.012 (0.378)	0.008 (0.644)	-0.001 (0.951)
FDNFDICS		0.0001 (0.107)				
NPIC			0.006 (0.175)	0.005 (0.246)		
NPICS			0.003 (0.445)	-0.005 (0.365)		
FDNPICS			- -	0.00004 (0.550)		
NBLC					-0.006** (0.04)	-0.356 (0.242)
NBLCS					0.007*** (0.025)	0.0025 (0.445)
FDNBLCS					- -	0.0001*** (0.003)
GFCC	0.0002 (0.739)	-0.0001 (0.902)	0.0001 (0.860)	0.0002 (0.839)	0.0006 (0.445)	0.0007 (0.335)
INGDPC	-0.0001 (0.353)	-0.0001 (0.305)	-0.0002 (0.240)	-0.0002 (0.296)	-0.0002 (0.134)	-0.0002 (0.120)
SE	0.032*** (0.008)	0.033*** (0.006)	0.025** (0.025)	0.023** (0.040)	0.028** (0.013)	0.0281*** (0.010)
IQ	-0.464 (0.475)	-0.451 (0.486)	-0.443 (0.508)	-0.44 (0.520)	0.005 (0.994)	0.067801 (0.914)
TOP	0.005 (0.601)	0.003 (0.774)	0.008 (0.322)	0.008 (0.337)	0.013* (0.076)	0.0138* (0.070)
CONS	0.265 (0.756)	0.447 (0.602)	0.0130 (0.878)	0.72 (0.936)	-0.273 (0.737)	-0.091 (0.910)
R_o^2	3.7%	4.4%	5%	5%	4%	8%
$p(\chi^2)$	0.0925	0.0633	0.0354	0.0740	0.0370	0.0017

p-values of the z test in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.9: Net Inflows, Shocks and Long-term (Trend) Economic Growth

Dependent Variable: M GRC						
	NFDIC EQUATIONS		*NPIC EQUATIONS*		*NBLC EQUATIONS*	
	1	2	3	4	5	6
NFDIC	0.0035*** (0.000)	0.004*** (0.000)				
NFDICS	-0.0039*** (0.001)	-0.005*** (0.006)				
FD	-0.004 (0.533)	-0.008 (0.186)	-0.077 (0.188)	-0.0090 (0.142)	0.012 (0.052)	0.012 (0.055)
FDNFDICS		0.00002 (0.432)				
NPIC			0.007*** (0.000)	0.007*** (0.000)		
NPICS			-0.007*** (0.000)	-0.0058*** (0.002)		
FDNPICS			- -	-0.00002 (0.231)		
NBLC					-0.006*** (0.000)	-0.056*** (0.000)
NBLCS					0.005*** (0.000)	0.0055*** (0.000)
FDNBLCS					- -	-0.0000 (0.909)
GFCC	-0.0006* (0.074)	-0.0007** (0.045)	-0.0004 (0.197)	-0.0004 (0.173)	0.0001 (0.590)	0.0002 (0.563)
INGDPC	-0.00008 (0.235)	-0.0001 (0.106)	-0.0002*** (0.005)	-0.00015*** (0.007)	-0.0002*** (0.000)	-0.0002*** (0.000)
SE	0.021*** (0.000)	0.024*** (0.000)	0.020*** (0.000)	0.019*** (0.000)	0.268*** (0.000)	0.027*** (0.000)
IQ	-0.79*** (0.001)	-0.71*** (0.002)	-0.07*** (0.001)	-0.72*** (0.001)	-0.09 (0.676)	-0.096 (0.674)
TOP	-0.0075* (0.096)	-0.006 (0.140)	0.001 (0.693)	0.00049 (0.878)	0.008*** (0.003)	0.0075*** (0.003)
CONS	0.878** (0.021)	0.831** (0.019)	0.409 (0.182)	0.494 (0.119)	0.085 (0.758)	0.082 (0.766)
R_o^2	11.6%	14%	18.9%	18.8%	19.45%	19.41
$p(\chi^2)$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

p-values of the z test in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

5.7.2 Macroeconomic shocks as determinants of net capital inflows

How do net inflows respond to macroeconomic shocks? Table 5.10 below shows that one standard deviation shock to GDPC caused NFDIC to increase by \$0.18, \$0.15 and \$0.39 in the second, third and fourth post-shock years respectively; the shock also led NPIC to increase by \$1.2, \$1.11 and \$0.52 in the second, third and fourth post-shock year respectively. On the other hand, NBLC declined by \$0.22 and \$0.17 in the second and third year respectively following the shock.

The flow behaviour of NFDIC and NPIC in response to a positive shock in GDPC agrees with the neoclassical prediction that capital flows, on net, to economies with higher productivity (Gourinchas and Jeanne, 2013). This finding enjoys support in literature: Saatcioglu and Korap (2008) find that a positive shock to domestic stock returns significantly attract net capital flows. This domestic stock return is, according to Devereux and Sutherland (2011), proportional to domestic output.

The foregoing explanation is corroborated by the response of the net inflows to government spending. NFDIC and NPIC declined following shocks to GC. Shock to GC caused NFDIC to decline by \$0.15, \$0.16 and \$0.02 in the second, third and fourth post-shock year respectively; and while NPIC also fell respectively by \$0.26, \$0.13 and \$0.36 in the second, third and fourth year following shock. On the other hand, NBLC respectively rose by \$0.20, \$0.59 and \$0.16 in the second, third and fourth post-shock year. The behaviour of these net flows can also be understood in the light of the explanation offered for the behaviour of their gross counterparts.

NFDIC positively responds to a positive shock in GFCC: it rises by \$0.52, \$0.32 and \$0.47 in the second, third and fourth year respectively after the shock. This may be due to the fact that, FDI flows in, on net, to take advantage of rise in profitability of investment, connoted by a positive shock to GFCC.

Table 5.10: Macroeconomic shocks as Determinants of Net Inflows– the Impulse-Response Result

	ONE S.D. SHOCK TO MACROECONOMIC VARIABLES					
RESPONSE OF	*YR*	*GDPC*	*GC*	*GFCC*	*CFXC*	*ER*
NFDIC	1	0.245***	-0.361***	0.571***	0.000000	0.234***
		(0.05549)	(0.06439)	(0.06066)	(0.00000)	(0.06504)
	2	0.186***	-0.152***	0.521***	0.321***	0.139***
		(0.03750)	(0.04671)	(0.03817)	(0.00056)	(0.04444)
	3	0.148***	-0.161016	0.323***	0.197***	-0.049**
		(0.01307)	(0.01872)	(0.01753)	(0.00069)	(0.01912)
	4	0.385***	-0.020***	0.472***	-0.137***	0.311***
		(0.05889)	(0.07179)	(0.06084)	(0.00079)	(0.06905)
NPIC	1	0.792***	-0.313***	-0.106***	0.000000	-0.615***
		(0.04041)	(0.03341)	(0.03606)	(0.00000)	(0.03665)
	2	1.204***	-0.263***	0.095***	-0.552***	-0.134***
		(0.04984)	(0.02148)	(0.01354)	(0.00054)	(0.04122)
	3	1.111***	-0.125***	-0.182***	-0.294***	-0.459***
		(0.04530)	(0.03362)	(0.03333)	(0.00094)	(0.04133)
	4	0.523***	-0.360***	-0.100***	-0.217***	0.221***
		(0.03365)	(0.01596)	(0.00945)	(0.00124)	(0.02345)
NBLC	1	-0.186***	0.311***	-0.680***	0.000000	-0.285***
		(0.02736)	(0.02816)	(0.02915)	(0.00000)	(0.02745)
	2	-0.224***	0.204***	0.129***	-0.091***	-0.169***
		(0.00963)	(0.01137)	(0.01819)	(0.00038)	(0.01132)
	3	-0.174***	0.591***	-0.092***	-0.339***	-0.070***
		(0.01657)	(0.01686)	(0.03262)	(0.00048)	(0.02013)
	4	0.010**	0.163***	-0.250***	-0.092***	0.144***
		(0.00500)	(0.00680)	(0.01503)	(0.00039)	(0.00753)

*Standard errors in parenthesis *, **, and *** indicate statistical significance at 10%, 5% and 1% level respectively*

Source: Author's computation

On the other hand, NPIC and NBLC decline with surge in GFCC. NPIC falls by \$0.18, \$0.11in the third and fourth year respectively after the shock; NBLC also declines by \$0.13 \$0.09 and \$0.25 in the second, third and fourth year respectively after the shock. The negative response of NPIC and NBLC may be explained in terms of their short-term nature. Surge in GFCC may indicate proliferation of longer term investment which may crowd out short-term investment that both portfolio investment and bank lending pursue.

Just as in the case of FDIC, NFDIC is driven by investment-security-concern effect: NFDIC rises when the there is a positive surge in accumulation of foreign reserves, CFXC, (the collateral). On the other hand, NPIC and NBLC respond negatively to positive shocks in CFXC; thus the return-chasing effect dominates (as in the case of PIC and NBLC, explained above).

NPIC and NBLC fall when there is a positive shock to ER. Appreciation encourages outflows, thus depressing net inflows. NFDIC does not respond negatively to appreciation of ER (except in the third year) as outflows of FDI may not be sparked by the appreciation, given the long-term nature of the flows.

5.8 The Effect of capital flows and their shocks on output and economic growth – evidence from sub-sample analyses

The foregoing discussions in this chapter rest on the results of analysis of data on the sample of countries under study. The coefficients of the panel-data equations are so interpreted as describing the economic situations in the sub-Saharan Africa, assuming all the countries are homogenous. The implication of this is that the coefficients of the equations can be generalised; that is, they describe the economic situations in each country of the sample. The assumption of coefficient homogeneity may, however, be wrong if economic situations in each country are statistically heterogeneous. According to Lin (2007), imposing the assumption of coefficient homogeneity if the true parameters are not the same across the countries will bias estimation and inference.

That the countries of the sample belong to different income and regional categories connotes heterogeneity in economic situations in the countries; hence, this study does not expect or assume that the coefficients of the equations from sample analysis describe the economic situation in each country. To know the extent to which the results of sample analysis can be generalised, we conduct analyses of subsamples and compare the result with that of the whole sample. To the extent that the coefficients of subsample equations (in at least two of the three subsamples considered) have the same signs as those of the sample equations, and are as statistically significant as those of the samples, the results of the sample equations can be generalised to be robust to sample size.

5.8.1 Evidence from Upper Middle Income Countries (UMIC)

The analyses of the effect of capital flows and their shocks on output and economic growth in UMI subsample of six countries including Botswana, Gabon, Mauritius, Namibia, Seychelles, and South Africa, as earlier done in the whole sample, reveal that the effect of capital flows and their shocks on economic output per capita (GDPC) in upper middle income countries are similar to that of the whole sample representing the sub-Saharan Africa (see table 5.11 above).

Foreign direct investment per capita (FDIC) and portfolio investment per capita (PIC) have the same positive impact on GDPC, and are as significant at conventional level, in UMIC as in SSA while shocks to foreign direct investment per capita (FDICS) and shocks to portfolio investment per capita (PICS) have conventionally statistically significant negative effect on GDPC in UMIC, as they do in SSA. On the other hands, bank lending per capita BLC has statistically significant negative impact on GDPC in UMIC as in SSA while its shock (BLCS) has positive effect on GDPC in UMIC as in SSA.

Table 5.11: Output Per Capita and Shocks to Gross Inflows of Capital – Evidence from UMIC

DEPENDENT VARIABLE: *GDPC*						
	***FDIC* EQUATIONS**		***PIC* EQUATIONS**		***BLC* EQUATIONS**	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
FDIC	4.28*** (0.000)	4.08*** (0.000)				
FDICS	-3.71*** (0.000)	-2.67*** (0.000)				
FD	-11.26*** (0.005)	-11.67** (0.049)	-27.99** (0.000)	-28.01** (0.000)	18.47*** (0.001)	19.15*** (0.304)
FDFDICS		-0.016 (0.376)				
PIC			13.38*** (0.000)	13.39*** (0.000)		
PICS			-13.36*** (0.000)	-13.31*** (0.000)		
FDPICS				-0.001 (0.954)		
BLC					-12.76*** (0.000)	-12.98*** (0.000)
BLCS					12.93*** (0.000)	13.24*** (0.000)
FDBLCS						-0.003 (0.714)
GC	1.817*** (0.000)	1.895*** (0.000)	-0.69** (0.047)	-0.69* (0.051)	1.409*** (0.000)	1.382*** (0.000)
GFCC	1.111*** (0.000)	1.172*** (0.000)	1.59*** (0.00)	1.59*** (0.00)	1.23*** (0.000)	1.22*** (0.000)
IQ	-1694* (0.080)	-1723* (0.080)	-528.1 (0.107)	-527.42 (0.107)	-231.8 (0.514)	-224.6 (0.530)
SE	-4.54 (0.192)	-4.54 (0.396)	-3.77* (0.251)	-3.77* (0.251)	-15.58*** (0.000)	-15.76*** (0.000)
TOP	-28.51*** (0.000)	-28.51*** (0.000)	-11.00*** (0.000)	-11.02*** (0.000)	-5.802* (0.069)	-5.712* (0.076)
CONS	4001*** (0.000)	4001*** (0.000)	2803*** (0.000)	2807*** (0.000)	2399*** (0.000)	2404*** (0.000)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	82%	82%	83%	83%	82%	82%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Other variables in the equations (1 to 6) behave in similar way in UMIC as they do in SSA. Government spending per capita (GC) has positive effects in UMIC as in SSA, though statistically significant at conventional level in former as against the latter. Gross fixed capital formation per capita, or investment per capita (GFCC) impact positively on GDPC at conventional statistically significant level in UMIC as in SSA. Trade openness (TOP) has negative and statistically significant effect in both UMIC and SSA while institutional quality (IQ) and school enrolment, SE, (a proxy for human capital development) have negative impact in UMIC[70] as against the SSA where their effects are positive. While the effect of IQ and SE is expected to be positive, as it is in SSA, their negative effect in subsample reflect the fact that low level of IQ and SE may be inimical to GDPC.

The effects of net capital flow variables and their shocks on GDPC in UMIC (presented in table 5.12 below) are similar to those of gross capital variables and their shocks (as presented in table 5.11 above; and so are effects of other variables.

One important point to notice is that the coefficients of the equations are larger in UMIC, compared to those of SSA. These merely reflect that UMIC are individually economically above the average SSA country.

[70] The effect is statistically significant in some equation and not in some other equations

Table 5.12: Output per capita and Shocks to Net Inflows of Capital – Evidence from UMIC

DEPENDENT VARIABLE: *GDPC*						
	NFDIC EQUATIONS		*NPIC* EQUATIONS		*NBLC* EQUATIONS	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
NFDIC	4.12*** (0.000)	3.97*** (0.000)				
NFDICS	-3.65*** (0.000)	-2.92** (0.022)				
FD	-12.60*** (0.001)	-12.81** (0.001)	-12.56** (0.004)	-11.83** (0.007)	15.79** (0.013)	14.52** (0.025)
FDNFDICS		-0.011 (0.507)				
NPIC			5.574*** (0.000)	5.353*** (0.000)		
NPICS			-5.390*** (0.000)	-6.025*** (0.000)		
FDNPICS				0.0151 (0.013)		
NBLC					-6.280*** (0.000)	-6.231*** (0.000)
NBLCS					-6.376*** (0.000)	-6.252*** (0.000)
FDNBLCS						-0.002 (0.543)
GC	1.701*** (0.000)	1.759*** (0.000)	-2.173*** (0.047)	-2.225*** (0.000)	1.482*** (0.000)	1.532*** (0.000)
GFCC	1.085*** (0.000)	1.131*** (0.000)	1.782*** (0.000)	1.782*** (0.000)	1.113*** (0.000)	1.126*** (0.000)
IQ	-1718*** (0.080)	-1740*** (0.080)	-1284*** (0.000)	-1288*** (0.000)	-179.3 (0.663)	-195.6 (0.634)
SE	-3.629 (0.289)	-3.339 (0.329)	-10.14*** (0.008)	-9.994*** (0.009)	-16.31*** (0.000)	-15.98*** (0.000)
TOP	-27.86*** (0.000)	-27.50*** (0.000)	-18.57*** (0.000)	-18.56*** (0.000)	6.259* (0.087)	6.467* (0.077)
CONS	3985*** (0.000)	3893*** (0.000)	2374*** (0.000)	2328*** (0.000)	2640*** (0.000)	2633*** (0.000)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	82%	82%	77%	78%	77%	77%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.13: Gross Inflows of Capital and Long Term Economic Growth - Evidence from UMIC

Dependent Variable: MGRC						
	FDIC		PIC		BLC	
	1	2	3	4	5	6
FDIC	0.0047*** (0.000)	0.0051*** (0.000)				
FDICS	-0.0051*** (0.001)	-0.0094*** (0.001)				
FD	-0.0083 (0.163)	-0.0078 (0.260)	-0.0218*** (0.000)	-0.217*** (0.000)	0.0206*** (0.000)	0.0203*** (0.000)
FDFDICS	-	0.0001*** (0.004)				
PIC			0.0099*** (0.000)	0.010*** (0.000)		
PICS			-0.0097*** (0.000)	-0.0086*** (0.000)		
FDPICS			-	0.000 (0.390)		
BLC					-0.0125*** (0.000)	-0.0124*** (0.000)
BLCS					0.0126*** (0.000)	0.0125*** (0.000)
FDBLCS						0.000 (0.839)
INGDPC	-0.0002*** (0.000)	-0.0003*** (0.000)	-0.0002*** (0.000)	-0.003*** (0.000)	-0.0003*** (0.000)	-0.0003*** (0.000)
SE	0.0144*** (0.000)	0.0137*** (0.006)	0.0137*** (0.004)	-0.0139*** (0.001)	0.0039 (0.273)	0.039*** (0.274)
IQ	-0.3856 (0.488)	-0.2.954 (0.596)	1.319*** (0.002)	1.266*** (0.004)	1.720*** (0.000)	1.726*** (0.000)
TOP	-0.0332*** (0.000)	-0.0393*** (0.000)	0.0132** (0.017)	0.0149** (0.012)	0.007*** (0.003)	0.010** (0.027)
CONS	4.144 (0.000)	4.835 (0.000)	2.575*** (0.000)	2.770 (0.000)	0.0104** (0.025)	2.490*** (0.000)
R_o^2	29%	31%	43%	43%	49%	49.5%
$p(\chi^2)$	0.0000	0.0000	0.000	0.000	0.000	0.00

*p-values of the z test in parenthesis; while *, ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author’s computation

Similarly, the effects of the FDIC and PIC capital flow variables on the long term (trend) economic growth (MGRC) are positive and statistically significant in UMIC as they are in SSA; while their shocks have statistically significant negative impact on economic growth in both UMIC and SSA (table 5.13 above). On the other hands, BLC and its Shock, BLCS, have positive and negative effect respectively on MGRC and their impacts are statistically significant at conventional levels.

Initial per capita income (INGDPC) has negative impact of MGRC in UMIC as in SSA, though the effect is statistically significant in the former. This agrees with the prediction of growth convergence literature (See Barro, 1996, 2003 for a survey). IQ and TOP exert negative impact on MGRC in UMIC as in SSA, though the effects of TOP is statistically significant in the former, as against the statistical insignificance of both IQ and TOP in SSA. On the other hand, SE has a positive and statistically significant effect on MGRC in UMIC as it does in SSA. Again, the effects of these variables in many of the equations, both in UMIC and SSA cases, are similar.

The effects of net capital flows variables on MGRC (presented in table 5.14 above), as well as those of other variables of the equations in the table, are similar to those of gross variables and other variables in table 5.13.

Table 5.14: Net Inflows, Shocks and Long-term Economic Growth – Evidence from UMIC

Dependent Variable: M GRC						
	1	2	3	4	5	6
NFDIC	0.0043*** (0.000)	0.0046*** (0.000)				
NFDICS	-0.0048*** (0.000)	-0.0087*** (0.000)				
FD	-0.010* (0.084)	-0.0089 (0.260)	-0.0082*** (0.115)	-0.0094*** (0.000)	0.0187*** (0.003)	0.0168*** (0.008)
FDNFDICS	-	0.0001*** (0.004)				
NPIC			0.0069*** (0.000)	0.0071*** (0.000)		
NPICS			-0.0066*** (0.000)	-0.0054*** (0.000)		
FDNPICS			-	0.0000 (0.128)		
NBLC					-0.0061*** (0.000)	-0.0062*** (0.000)
NBLCS					0.0062*** (0.000)	0.0061*** (0.000)
FDNBLCS						0.000 (0.214)
INGDPC	-0.0003*** (0.000)	-0.0003*** (0.000)	-0.0002*** (0.008)	-0.0002*** (0.005)	-0.0003*** (0.000)	-0.0003*** (0.000)
SE	0.0156*** (0.001)	0.0152*** (0.002)	0.0030 (0.452)	-0.0033 (0.407)	0.0032 (0.420)	0.0031*** (0.425)
IQ	-0.336 (0.537)	-0.2644 (0.626)	1.319*** (0.002)	1.298*** (0.004)	1.715*** (0.000)	1.759*** (0.000)
TOP	-0.0332*** (0.000)	-0.0377*** (0.000)	-0.0116** (0.036)	-0.0123** (0.025)	0.0127** (0.016)	0.0122** (0.020)
CONS	4.051 (0.000)	4.650 (0.000)	1.942*** (0.000)	2.085*** (0.002)	2.919** (0.016)	2.891*** (0.000)
R_o^2	29%	33%	37%	38%	41%	41%
$p(\chi^2)$	0.0000	0.0000	0.000	0.000	0.000	0.00

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author’s computation

5.8.2 Evidence from Lower Middle Income Countries (LMIC)

The analyses of the effect of capital flows and their shocks on output and economic growth in LMIC subsample of five countries including Cameroun, Cote d'Ivoire, Nigeria, Swaziland and Togo are presented in this subsection. The findings of the analyses presented in table 5.15 below shows that FDIC and PIC have significant positive effect on GDPC while FDICS and PICS have statistically significant negative effects on GDPC in LMIC, as they do in SSA (see table 5.2 above). On the other hands, BLC exerts a negative impact on GDPC at conventional statistically significant level while its shock, BLCS, exerts a positive impact on GDPC. The influence of BLC and BLCS on GDPC in LMIC, like in the cases of FDIC, FDICS, PIC and PICS, in terms of sign of their coefficients is similar to their impact on GDPC in SSA (as presented in table 5.2 above). However, the effects of these capita flow variables and their shocks are more tremendous in terms of magnitude of coefficients.

Table 5.15: Output per capita and Shocks to Gross Inflows of Capital – Evidence from LMIC

DEPENDENT VARIABLE: ***GDPC***						
	FDIC **EQUATIONS**		***PIC*** **EQUATIONS**		***BLC*** **EQUATIONS**	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
FDIC	6.126* (0.063)	5.857* (0.082)				
FDICS	-3.854* (0.090)	-1.223 (0..759)				
FD	-7.572** (0.029)	-7.359** (0.032)	-0.538 (0.901)	-0.569 (0.900)	-10.09* (0.064)	-9.027 (0.125)
FDFDICS		-0.139 (0.335)				
PIC			-259.5*** (0.000)	-261.8*** (0.000)		
PICS			262.7*** (0.000)	252.0*** (0.000)		
FDPICS				0.639 (0.328)		
BLC					-87.55** (0.015)	-92.73** (0.000)
BLCS					91.10** (0.013)	77.13* (0.082)
FDBLCS						-1.040 (0.417) (0.714
GC	0.089 (0.433)	0.114 (0.341)	0.226** (0.042)	0.225** (0.044)	0.242 (0.109)	0.225 (0.158)
GFCC	0.089*** (0.004)	0.911*** (0.003)	0.672*** (0.009)	0.650** (0.013)	1.167*** (0.000)	1.167*** (0.000)
IQ	-19.51 (0.648)	-17.23 (0.685)	12.25 (0.813)	9.405 (0.857)	-54.14 (0.472)	-66.19 (0.408)
SE	-4.776*** (0.001)	-4.919*** (0.001)	-1.991 (0.243)	-2.111 (0.220)	-2.071 (0.299)	-2.122 (0.311)
TOP	3.971*** (0.000)	4.017*** (0.000)	8.316*** (0.000)	8.274*** (0.000)	8.238*** (0.000)	8.315*** (0.000)
CONS	298.0*** (0.000)	291.4*** (0.000)	216.9** (0.019)	205.4** (0.029)	-87.22 (0.661)	-120.0 (0.564)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	79%	80%	73%	73%	58%	56%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

GC has positive effect on GDPC in LMIC subsample and the effect is statistically significant in many of the equations, just as it does in SSA (table 5.2 above). In a similar vein, GFCC effect on GDPC is positive and statistically significant in all the equations, also as in SSA.

Unlike their effects in SSA, IQ and SE have negative effects in LMIC (table 16 above), while TOP has positive effect in LMIC compared to its positive effect in SSA (table 5.2 above). Moreover, the models explain the behaviour of GDPC in terms of the explanatory variables with overall R-square higher than 75% in FDIC and PIC equations (1-4), more than 55% in BLC equations (5-6) and the χ^2 being statistically significant in all the equations.

Similar behaviour to that of the gross flows discussed above is exhibited by net capital inflows in the LMIC. The effects of the net capital flows variables and their shocks on GDPC in LMIC is also a magnified version of such effects in the SSA. Table 5.16 below shows that net foreign direct investment inflows per capita (NFDIC) and net portfolio investment inflows per capita (NPIC) have positive and statistically significant effect on GDPC while their respective shocks, NFDICS and NPICS exert negative and statistically significant effect on GDPC. On the other hands, NBLC has a negative impact on GDPC while its shock, NBLCS, exerts a positive impact on GDPC. The effect of NBLC and NBLCS on GDPC in LMIC are not however significant at the conventional level, just as in SSA (table 5.7 above).

GC and GFCC have positive impact on GDPC in the equations but the effects are statistically significant in some equations while not in some others. These are replica of their effect on GDPC in the equations of net capital flows variables (NFDIC, PIC and BLC) under SSA sample (see table 5.7 above).

However, the effect of IQ, SE and TOP are negative in many of the equations in table 5.16 below, as against their mostly positive effects when analysing SSA sample (see table 5.7 above).

Table 5.16: Output per capita and Shocks to Net Inflows of Capital – Evidence from LMIC

DEPENDENT VARIABLE: *GDPC*						
	***NFDIC* EQUATIONS**		***NPIC* EQUATIONS**		***NBLC* EQUATIONS**	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
NFDIC	6.883** (0.033)	6.560** (0.044)				
NFDICS	-4.529** (0.000)	-1.303 (0.745)				
FD	-7.456** (0.049)	-7.239* (0.052)	-0.772 (0.869)	-2.358 (0.560)	-8.477*** (0.007)	-7.999 (0.279)
FDNFDICS		-0.170 (0.285)				
NPIC			-119.4*** (0.000)	-107.5*** (0.000)		
NPICS			115.2*** (0.000)	98.15*** (0.000)		
FDNPICS				0.521*** (0.000)		
NBLC					-1.887 (0.816)	-1.535 (0.906)
NBLCS					3.499 (0.662)	3.485 (0.672)
FDNBLCS						
GC	0.046 (0.719)	0.0482 (0.542)	0.275** (0.018)	0.196** (0.044)	0.142 (0.127)	0.138 (0.248)
GFCC	1.085*** (0.719)	0.602*** (0.157)	0.226 (0.463)	0.288 (0.254)	1.341*** (0.000)	1.344*** (0.000)
IQ	-12.76 (0.785)	-10.94 (0.813)	-103.5* (0.072)	-104.1** (0.029)	8.954 (0.823)	6.781 (0.891)
SE	-5.491*** (0.001)	-5.590*** (0.001)	-3.034** (0.048)	-2.955** (0.020)	3.224*** (0.004)	-3.301* (0.063)
TOP	-4.130*** (0.000)	-4.154*** (0.000)	5.461*** (0.000)	4.963*** (0.000)	5.464*** (0.000)	5.475*** (0.000)
CONS	302.9*** (0.000)	296.0*** (0.000)	351.1*** (0.000)	304.7*** (0.000)	234.9** (0.045)	225.9** (0.011)
$p(\chi^2)$	0.000	0.000	0.000	0.000	0.000	0.000
R_o^2	72%	76%	72%	80%	82%	82%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.17: Gross Inflows of Capital and Long Term Economic Growth – Evidence from LMIC

Dependent Variable: MGRC						
	FDIC		PIC		BLC	
	1	2	3	4	5	6
FDIC	0.077** (0.032)	0.075** (0.034)				
FDICS	-0.049** (0.048)	-0.060 (0.118)				
FD	0.109*** (0.006)	0.108*** (0.007)	0.033 (0.453)	0.014 (0.766)	0.085*** (0.011)	0.080** (0.023)
FDFDICS	-	0.002 (0.673)				
PIC			1.794*** (0.002)	1.892*** (0.001)		
PICS			-1.795*** (0.000)	-1.677*** (0.004)		
FDPICS			-	-0.011 (0.117)		
BLC					0.289 (0.226)	0.325 (0.174)
BLCS					-0.282 (0.247)	0.216 (0.426)
FDBLCS						0.006 (0.465)
INGDPC	-0.002*** (0.002)	-0.002*** (0.002)	-0.0002 (0.595)	-0.0004 (0.447)	-0.001* (0.057)	-0.0006* (0.076)
SE	0.016 (0.521)	0.013 (0.482)	0.005 (0.785)	0.002 (0.918)	0.035*** (0.003)	0.036*** (0.003)
IQ	-0.291 (0.576)	-0.293 (0.575)	-0.862 (0.118)	-0.846 (0.128)	0.423 (0.366)	0.378 (0.425)
TOP	0.201* (0.058)	0.204* (0.062)	-0.021 (0.226)	-0.023 (0.189)	0.006 (0.693)	0.004 (0.775)
CONS	2.526*** (0.005)	2.497*** (0.006)	-1.102 (0.272)	-0.833 (0.418)	0.752 (0.570)	0.517 (0.700)
R_o^2	25%	25%	18%	19%	38%	38%
$p(\chi^2)$	0.0000	0.0000	0.000	0.000	0.000	0.00

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.18: Net Inflows, Shocks and Long-Term Economic Growth – Evidence from LMIC

Dependent Variable: MGRC						
	***NFDIC* EQUATIONS**		***NPIC* EQUATIONS**		***NBLC* EQUATIONS**	
	1	2	3	4	5	6
NFDIC	0.063** (0.023)	0.062** (0.025)				
NFDICS	-0.041** (0.038)	-0.043 (0.195)				
FD	0.101*** (0.010)	0.101*** (0.010)	0.072* (0.078)	0.067 (0.151)	0.093** (0.012)	0.151* (0.061)
FDNFDICS	-	0.0001 (0.927)				
NPIC			0.233 (0.419)	0.237 (0.449)		
NPICS			-0.224 (0.423)	-0.237 (0.443)		
FDNPICS				-0.0005 (0.761)		
NBLC					0.092 (0.324)	0.133 (0.348)
NBLCS					0.078 (0.398)	0.080*** (0.390)
FDNBLCS						
INGDPC	-0.001*** (0.010)	-0.002*** (0.002)	-0.0003 (0.659)	-0.0002 (0.790)	-0.001*** (0.007)	-0.001*** (0.006)
SE	0.010 (0.571)	0.010 (0.568)	0.039*** (0.002)	0.039*** (0.002)	0.033*** (0.009)	0.022 (0.312)
IQ	-0.457 (0.370)	-0.457 (0.372)	-0.493 (0.328)	-0.492 (0.328)	-0.513 (0.285)	-0.723 (0.176)
TOP	-0.025** (0.026)	-0.025** (0.027)	-0.011 (0.476)	-0.009 (0.569)	0.008 (0.690)	0.010 (0.543)
CONS	-2.58*** (0.005)	-2.58*** (0.005)	1.96** (0.027)	1.891** (0.042)	-1.35 (0.320)	-2.48** (0.016)
R_o^2	24%	24%	27%	27%	29%	32%
$p(\chi^2)$	0.0000	0.0000	0.000	0.000	0.000	0.000

p-values of the z test in parenthesis., ** and *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

On their impact on the long term (trend) economic growth of LMIC, gross and net capital flows variables, as well as many other variables, exert similar influence on MGRC as they do under SSA (see table 5.18 above).

5.8.3 Evidence from Lower Income Countries (LIC)

The analyses of the effect of capital flows and their shocks on output and economic growth in LIC subsample of three countries including Benin, Kenya and Niger show that the impacts of capital flow variables and their shock on output and economic growth in LIC are different from those other subsamples and the SSA sample. FDIC, PIC and BLC have negative albeit statistically insignificant effect on GDPC while their shocks have positive though insignificant effect on GDPC. Other variables of the equations are also statistically insignificant (table 5.19 below).

Similarly, net inflows of foreign direct investment (NFDIC) and net inflows of portfolio investment (NPIC) have negative but statistically insignificant effect on GDPC. Net inflows of bank lending (NBLC) and its shock (NBLCS) have positive but insignificant effect on GDPC. Other variables of the net inflows equations 1-6 of table 5.20 below also have insignificant effect.

With respect to their impact on the long term (trend) growth rate in LIC, PIC and PICS have positive and negative statistically significant effect on MGRC respectively, just like in SSA and other subsamples. BLC and BLCS also have positive and negative statistically significant effect on GDPC respectively, but these results do not match with the impacts of BLC and BLCS in SSA and other subsamples (Table 5.21). However, net inflows of capital follow the same pattern as their gross counterpart in impacting on MGRC (see table 5.22 below).

Table 5.19: Output per Capita and Shocks to Gross Inflows of Capital – Evidence from LIC

DEPENDENT VARIABLE: *GDPC*						
	***FDIC* EQUATIONS**		***PIC* EQUATIONS**		***BLC* EQUATIONS**	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
FDIC	-20.9 (0.292)	-22.6 (0.295)				
FDICS	16.4* (0.279)	23.14* (0.329)				
FD	12.5 (0.139)	12.8 (0.107)	10.19 (0.104)	10.19 (0.106)	44.88 (0.488)	165.3 (0.855)
FDFDICS						
PIC			-259.6 (0.216)	-270.7 (0.223)		
PICS			260.00 (0.216)	260.00 (0.255)		
FDPICS				0.941 (0.860)		
BLC					-728.2 (0.559)	-2699 (0.861)
BLCS					719.8 (0.561)	1983. (0.861)
FDBLCS						49.94 (0.863)
GC	-3.65 (0.365)	-3.93 (0.355)	-4.061 (0.306)	-4.177 (0.306)	-17.98 (0.109)	-77.39 (0.859)
GFCC	1.204 (0.624)	1.344 (0.598)	1.269 (0.560)	1.309 (0.553)	1.555 (0.746)	2.107 (0.904)
IQ	213.4 (0.103)	212.0 (0.169)	227.6 (0.115)	224.9 (0.115)	78.72 (0.806)	854.2 (0.886)
SE	1.640 (0.784)	1.858 (0.762)	4.222 (0.480)	4.341 (0.474)	26.87 (0.555)	113.0 (0.877)
TOP	-5.886 (0.404)	-6.281 (0.398)	-0.958 (0.807)	-0.844 (0.833)	-3.536 (0.728)	-8.79 (0.877)
CONS	666.5* (0.064)	689.3 (0.101)	468** (0.027)	468** (0.028)	91.54 (0.853)	-852.7 (0.899)
$p(\chi^2)$	0.630	0.742	0.483	0.594	0.99	1.00
R^2	5%	5%	17%	17%	2.4%	1.4%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.20: Output per Capita and Shocks to Net Inflows of Capital – Evidence from LIC

DEPENDENT VARIABLE: *GDPC*						
	***NFDIC* EQUATIONS**		***NPIC* EQUATIONS**		***NBLC* EQUATIONS**	
Independent variables	**1**	**2**	**3**	**4**	**5**	**6**
NFDIC	-20.8 (0.299)	-22.07 (0.303)				
NFDICS	15.92 (0.288)	29.55 (0.343)				
FD	12.87 (0.104)	13.08 (0.109)	11.22* (0.082)	11.91* (0.073)	11.23* (0.084)	11.28* (0.079)
FDNFDICS		-0.184 (0.748)				
NPIC			-83.71 (0.207)	-93.87 (0.177)		
NPICS			81.95 (0.229)	64.83 (0.417)		
FDNPICS				1.270 (0.651)		
NBLC					43.43 (0.228)	41.15 (0.773)
NBLCS					36.71 (0.340)	36.51 (0.399)
FDNBLCS						-0.111 (0.981)
GC	-3.69 (0.363)	-3.91 (0.358)	-3.293 (0.351)	-3.576 (0.320)	-4.35 (0.269)	-4.33 (0.310)
GFCC	1.176 (0.627)	1.293 (0.598)	1.074 (0.616)	1.135 (0.599)	1.814 (0.443)	1.797 (0.498)
IQ	211.6 (0.161)	210.0 (0.170)	215.8 (0.125)	218.01 (0.124)	253.9* (0.095)	253.95* (0.098)
SE	1.547 (0.795)	1.687 (0.781)	2.828 (0.620)	2.837 (0.621)	4.560 (0.477)	4.514 (0.4584)
TOP	6.368 (0.393)	-6.697 (0.391)	-0.507 (0.897)	-0.518 (0.895)	-1.329 (0.728)	-1.355 (0.743)
CONS	694.8 (0.103)	714.1 (0.110)	411** (0.027)	417.9** (0.026)	413.6** (0.028)	415.3** (0.027)
$p(\chi^2)$	0.633	0.743	0.492	0.575	0.502	0.502
R_o^2	6%	5%	15%	15%	11%	11%

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.21: Gross Inflows of Capital and Long Term Economic Growth – Evidence from LIC

Dependent Variable: MGRC						
	FDIC		PIC		BLC	
	1	2	3	4	5	6
FDIC	0.145 (0.344)	0.269 (0.100)				
FDICS	-0.105 (0.326)	-0.213 (0.115)				
FD	-0.035 (0.238)	-0.034 (0.218)	-0.022* (0.097)	-0.022* (0.083)	-0.068** (0.011)	-0.069*** (0.000)
FDFDICS	-	0.002 (0.546)				
PIC			2.00*** (0.000)	2.01*** (0.000)		
PICS			-2.05*** (0.000)	-1.695*** (0.003)		
FDPICS			-	-0.015 (0.172)		
BLC					0.929** (0.013)	0.846*** (0.009)
BLCS					-0.901** (0.017)	-0.671** (0.032)
FDBLCS						0.011 (0.290)
INGDPC	-0.001 (0.351)	-0.002*** (0.715)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
SE	-0.014 (0.441)	0.025 (0.326)	-0.003 (0.812)	-0.003 (0.918)	0.014 (0.429)	0.015 (0.397)
IQ	-0.380 (0.581)	-1.640*** (0.009)	-1.909*** (0.000)	-1.863*** (0.000)	-1.799*** (0.000)	-1.731*** (0.000)
TOP	0.031 (0.324)	0.071 (0.173)	-0.000 (0.999)	-0.003 (0.682)	-0.004 (0.686)	-0.006 (0.586)
CONS	-0.860 (0.800)	4.528 (0.278)	-0.145 (0.843)	0.106 (0.887)	2.426*** (0.000)	2.581*** (0.000)
R_o^2	30%	27%	70%	71%	48%	52%
$p(\chi^2)$	0.0000	0.0014	0.000	0.000	0.000	0.000

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

Table 5.22: Net Inflows, Shocks and Long-Term (Trend) Economic Growth – Evidence from LIC

Dependent Variable: MGRC						
	NFDIC EQUATIONS		*NPIC* EQUATIONS		*NBLC* EQUATIONS	
	1	2	3	4	5	6
NFDIC	0.160 (0.402)	0.0247* (0.087)				
NFDICS	-0.113 (0.388)	-0.192 (0.100)				
FD	-0.034 (0.311)	-0.039 (0.131)	-0.031** (0.013)	-0.0367*** (0.005)	-0.026* (0.091)	-0.028 (0.199)
FDNFDICS	-	0.001 (0.564)				
NPIC			0.789*** (0.000)	0.772*** (0.000)		
NPICS			-0.773*** (0.001)	-0.558** (0.034)		
FDNPICS				-0.009 (0.119)		
NBLC					0.373*** (0.003)	0.740** (0.052)
NBLCS					-0.376*** (0.006)	-0.295* (0.083)
FDNBLCS						-0.024 (0.106)
INGDPC	-0.0005 (0.443)	-0.0003 (0.564)	-0.0005** (0.012)	-0.0006*** (0.004)	-0.0005** (0.031)	-0.001** (0.011)
SE	-0.014 (0.444)	0.026 (0.303)	0.008 (0.465)	0.009 (0.421)	-0.013 (0.391)	-0.028 (0.259)
IQ	0.448 (0.529)	-1.658*** (0.006)	-1.740*** (0.000)	-1.768*** (0.000)	-1.925*** (0.000)	-1.555*** (0.003)
TOP	0.036 (0.373)	-0.025 (0.303)	-0.0005 (0.948)	-0.002 (0.815)	0.001 (0.910)	0.009 (0.464)
CONS	-1.336 (0.761)	-4.320*** (0.268)	0.284 (0.723)	0.023 (0.978)	0.131 (0.878)	1.300 (0.197)
R_o^2	28%	29%	70%	71%	59%	45%
$p(\chi^2)$	0.0000	0.0006	0.000	0.000	0.000	0.000

p-values of the z test in parenthesis., ** & *** indicate 10%, 5% and 1% level of statistical significance.*

Source: Author's computation

5.9 Summary of empirical results

This chapter investigated the impacts of three different types of private capital flows, namely FDI, portfolio investment and bank lending, as well as their shocks on economic performance viz-a-viz output (GDP) and economic growth of the Sub-Saharan African region using data on fourteen countries that make up the SSA sample.

Following satisfactory results from various diagnostic tests, the influence of shocks to capital flows on macroeconomic variables such as output per capita (GDPC), government spending per capita (GC) investment spending of gross fixed capital formation per capita (GFCC), foreign reserve per capita (CFXC) and exchange rate (ER) were examined using the structural vector autoregression (SVAR) model. The impact of shocks to macroeconomic variables as determinants of capital flows is also examined within the same model. The results of SVAR findings, especially that of the impact of shocks to capital flows on output and economic growth is extensively robustness-checked using a panel instrumental variable regression (PIVR) technique. The robustness of PIVR findings is in turn examined for sensitivity to sample-size variation as a means to concluding if the coefficients in equations for the whole SSA sample is reflective of sub-sample economic groupings such as UMIC, LMIC and LIC, on the basis of which the sample results can be generalised as descriptive of economic situation in each of the SSA countries, at least those in the sample.

The SVAR analyses establish that shocks to gross inflows of private capital (with exception of FDI) negatively affect output but positively influence other macroeconomic variables like government expenditure, investment spending, foreign exchange reserve accumulation and exchange rate. The negative impact of shocks to gross inflows of private capital other than FDI on output agrees with literature: Converse (2012) documents that volatility of portfolio investment flows negatively output. In addition, that portfolio flows are more volatile than FDI (Ferreira and Laux, 2008; Becker and Noone, 2009) may explain why the former has negative effect and the latter does not. Also, international bank lending flows, as a wholesale funding source for domestic banks, has been noted to be more volatile than the retail (dometic) funding sources (Aisen and Franken, 2010). This may explain the negative effect of bank lending flows. The SVAR analyses further show that shocks to net inflows of FDIC and PIC do not harm GDPC while shock to net inflows of BLC does.

On the other hand, PIVR analyses identify shocks to gross and net inflows of the FDI and portfolio investment flows as baneful to both output and economic growth while the flows themselves positively affect the economy. Bank lending flows, however, have direct negative impact on the economy. These results of the PIVR analyses on the SSA samples hold in UMIC and LMIC subsamples but are not replicated in LIC. While FDI and portfolio investment flows have positive effect (with their shocks having negative effects) on the economies of SSA, UMIC and LMIC, all the flows (FDI, portfolio investment flows and bank lending) negatively affect the economy of LIC, though not to a statistically significant level.

Moreover, SVAR analyses show that gross inflows of portfolio investment and bank lending are procyclical: PIC significantly rise with positive shocks to output while BLC does not significantly decline with positive shock to output. On the other hand, gross inflows of FDI appear to be countercyclical: FDIC significantly decline with a positive shock to output. Net inflows of FDI and portfolio flows are procyclical, rising with positive shocks to output. Though the gross inflows of FDI appear countercyclical, flowing less to the economy in terms of unusual boom (positive shock), decline in gross outflows may have been smaller than decline in gross inflows in periods of economic boom: this results in NFDIC rising with positive shocks to output. Also, declines in NBLC in response to a positive shock in output indicates that though gross inflows of bank lending rises with positive shocks in output, gross outflows rise faster with positive output shocks.

It is evident from the foregoing that private capital flows with the exception of bank lending positively affect the economy, but their shocks negatively do. On the other hand, bank lending flows are inimical to the economy of SSA countries.

CHAPTER SIX

SUMMARY OF MAJOR FINDINGS, IMPLICATIONS AND CONCLUSIONS

6.1 Introduction

One of the main reasons identified for low economic growth and development of the sub-Saharan African region is inadequacy of financial resources. Thus, inflows of foreign capital have been suggested as the solution to the problem.

While capital has indeed been flowing to the SSA region in various forms and quantities for several decades, the region has not broken away from the shackles of poverty and underdevelopment. This problem of underdevelopment confronting developing countries known to have been receiving foreign capital has triggered several studies in inquiry.

Literature is divided on the roles private foreign capital has played on the economic growth of developing countries. A popular stance in literature is that the role of capital flows on a recipient's economic performance is conditional upon flows-extrinsic factors such as the recipient's economic and structural features. Limited attention has however been paid to the influence of capital flow shocks on capital flow-economic growth nexus. This study is probably the first to consider role of flow-intrinsic attributes (shocks) of the selected private capital flows (FDI, portfolio investment and bank lending) on the nexus as a means to explaining why the SSA region has not witnessed significant economic progress in spite of substantial inflows of foreign private capital.

In summary, this dissertation investigates two major issues. First, it examines the relationship between capital flows and shocks to domestic macroeconomic variables. This is a contribution to literature on determinants of capital flows and description of their flow behaviour. Second, it analyses the impact of shocks to capital flows on economic output and growth. The study thus also contributes to literature on growth.

6.2 Domestic macroeconomic shocks as determinants of capital flows in SSA

Several factors have been identified as determinants of capital flows to developing countries. These factors have oft been categorised into pull and push factors. While most push factors are foreign[71] and exogenous to the capital recipients, pull factors are domestic and endogenous. Resting on literature for identification and selection of established capital flows determinants as a departure point; this study contributes to literature by identifying domestic shocks as significant determinants of capital flows to Sub-Saharan Africa.

This study establishes that shocks to domestic macroeconomic variables affect flows of major private capital flows to the SSA region: FDI, portfolio flows and bank lending. Positive shock to output stimulates increase in gross and net inflows of portfolio investment flows and bank lending flows; it discourages gross FDI inflows however. The economic implication is that gross flows of portfolio investment and bank lending capital are procyclical and gross FDI flows are rather countercyclical.

Positive shocks to government spending discourage FDI and portfolio investment flows; whereas, the shocks encourage bank lending flows. Also, positive shocks to gross capital formation stimulate inflows of FDI and portfolio capital. This is not true for gross inflows of bank lending capital. In the case of net inflows, only net FDI inflows are stimulated by gross capital formation while the rest are not, indicating once again that FDI is responsive to long term performance of the economy which the rising (surges in) gross fixed capital formation connotes.

Positive shocks to foreign reserves stimulate gross inflows of FDI in SSA. This is not surprising as the long term nature of the FDI necessitates safety concerns by investors. On the other hand, positive shocks/surges in foreign reserves discourage gross inflows of portfolio investment and bank lending capital as such surges indicate to international investors that investment opportunities[72] in the SSA are in decline. Net inflows are similarly affected by foreign reserves shocks.

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[71] These factors are foreign in nature as they relate to either countries other than the capital recipients or international market environment lying outside the control of the capital flows recipient.
[72] The idea is akin to accumulation of cash or liquid assets by big corporations with declining investment or growth opportunities, which often subject them to take-over struggles.

The gross inflows of all the foreign private capital are positively influenced by positive shocks in exchange rate. Positive shocks to exchange rate indicate depreciation[73] and this increases the purchasing power of the foreign funds; hence, international investors are encouraged to invest capital in the SSA. The contrary holds for net inflows. This may be due to the fact that depreciation in exchange rate reduces repatriated profit when converted to the foreign investors' home currency. This may trigger mass gross outflows and net inflows may thus be negatively determined by exchange rate shocks.

6.3 Shocks to the private capital flows and economic performance of the SSA

The arguments for increased flows of private capital to developing countries in general, and SSA in particular, are rooted in the expected benefits of such flows to the recipient countries. Contrary to this theoretical expectation, the economic performance of the SSA region has not significantly improved in spite of tremendous inflows of private capital. One explanation for this phenomenon is the effects of capital flow shocks on GDP and its growth rate.

While gross and net inflows of FDI and portfolio investment exert positive effect on economic output and growth in SSA, shocks to these flows reduced GDP and its growth. Besides, gross and net inflows of bank lending capital negatively affect the economy.

In summary, shocks to private capital flows have detrimental effects on the economy, and these have been undermining any positive impacts the flows may have on the economy.

6.4 Conclusions

The expeditions of this thesis have been focussed on achieving the stated objectives for the study. The summary of findings in the last two sections indicates that those objectives have been achieved. Abstracting from this summary, this section neatly summarises the whole of the study in the conclusions presented below.

[73] With rise/surge in the exchange rate, more local currency exchanges for the same unit of dollar. The price of dollar rises and the value of the local currency falls/depreciates.

Most private capital flows (FDI and portfolio investment flows) contribute positively to the economy of SSA region, as hypothesized in theory, shocks to these flows are detrimental to the region as they undermine economic output and growth. However, some capital flows (bank lending flows) directly affect the economy. The net impact[74] of these flows on economic output and growth is virtually nil. This probably explains why the GDP of the regions relative to that of the world has not risen above the 1980's level despite rising inflow of these capital funds to the region.

It is worth of note that capital flows, on the other hand, are influenced by shocks to domestic macroeconomic variables[75]. This offers opportunity for SSA countries to manage the flows into their economies. In addition to this, the SSA may manage these flows through use of their financial markets. Though the financial sector currently has not fully mitigated the negative impact of shocks to these flows it has a great deal of potential to do so; it thus needs to be overhauled. Prior to full development of the sector, the region may recourse to other capital flows management techniques such as exchange rate policy, foreign exchange reserves policy; prudential policies and capital controls to manage shocks to these flows. The appropriateness of these techniques in terms of achieving the desired benefit may however needs to be determined before their application.

6.5 Policy recommendations

Capital flows have been identified to be beneficial to recipients, at least theoretically. There has also been empirical evidence of their benefits, not only to recipients but also to investors; though most of the benefits are conditional. In this light, it is in the interest of a developing country to attract foreign capital.

Portfolio capital and bank lending capital are attracted to an SSA country in times of boom. Positive shocks to output are found to be a determinant of these flows. Thus, expansionary policies that shove up the GDP may be an instrument for attracting these flows.

[74] The net impact refers to difference between the positive impact of the flows themselves and the negative impact of their shocks.

[75] The influence of the domestic shocks on capital flows have been discussed in the findings.

Gross inflows of FDI are however countercyclical, indicating that they are attracted to the economy not necessarily in times of boom or output shocks. The net inflows, on the other hand, positively respond to positive output shock. This indicates that less of FDI grossly flows out in times of boom, connoting that FDI stay within the economy during impressive economic performance. On this basis, progressive and stable performance of the economy is vital for increasing the retention rate of FDI inflows to the economy.

Gross and net inflows of FDI and portfolio investment are discouraged by sharp increase in government expenditures. To encourage these inflows, the government needs to reduce fiscal deficits.

Significant rise in gross fixed capital formation has been found to be an instrumental determinant of gross inflows of FDI and portfolio investment. Thus, government policies that stimulate formation of fixed capital are essential at encouraging these flows. One such policy is an expansionary monetary policy which often entails reduction of interest rate. Decline in interest rate[76] reduces cost of capital and increases profitability of investment; hence investment rises.

Shocks to private capital flows have been shown to be detrimental to output and growth in the long run, while the flows themselves positively enhance economic performance of recipient countries. Thus, to maximise the benefit of the flows, the shocks to the flows must be managed. One way of managing the shocks is improving the effectiveness of the financial sector. This sector has been identified in literature as the condition that determines whether or not capital flows play a positive role in the economy. This study finds out that the sector only has the potential for managing shocks to private capital flows and minimising their negative effects in the SSA, but has not been significantly playing the role. Hence, it is advised that this sector be improved to realise its potential for this role. Once done, the full benefits of private capital flows would be realised.

[76] Decline in interest rate may discourage inflows in the short run and has been identified as one of policy to contain capital flows surges. However, the impact of this policy on investment growth may stimulate inflows in long run.

6.6 Recommendations for further research

This study identifies shocks to capital flows, an intrinsic property of the flows, as a major determinant of the impact of the flows on the economy of SSA[77]. Several policy strategies have been suggested in literature for managing the shocks: macroeconomic policies such as exchange rate policy, foreign exchange reserves policy; prudential policies; and capital controls. For successful management of these shocks, there is need to appraise the effectiveness and efficiency[78] of these management techniques, either the individually applied or jointly implemented.

This task lies beyond the scope of this study for many reasons. First, it is not enlisted among the primary objectives stated ab initio, for reasons subsequently presented. Second, the task is an aspect that requires not only a great deal of time and financial resources beyond those currently available for this thesis, but also much more data than currently obtainable. In this light, the appraisal of effectiveness and efficiency of techniques for managing capital flows shocks is a feasible expedition in the future, when the constraints are relaxed.

[77] The study thus contributes to literature on determinants of the impact of capital flows on the economy which has mostly focussed on flow-extrinsic conditions such as domestic factors such as threshold developmental level of the financial sector, as well as global factors such as global risk perception, liquidity, etc

[78] A capital flow management technique or policy is effective if it achieves their intended aim and not easily circumvented; and it is efficient if it minimises distortions and scope for non-transparent or arbitrary enforcement (Ostry et al, 2011)

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APPENDICES

Appendix I

Capital Flows and Macroeconomic Performance of SSA: A Snapshot

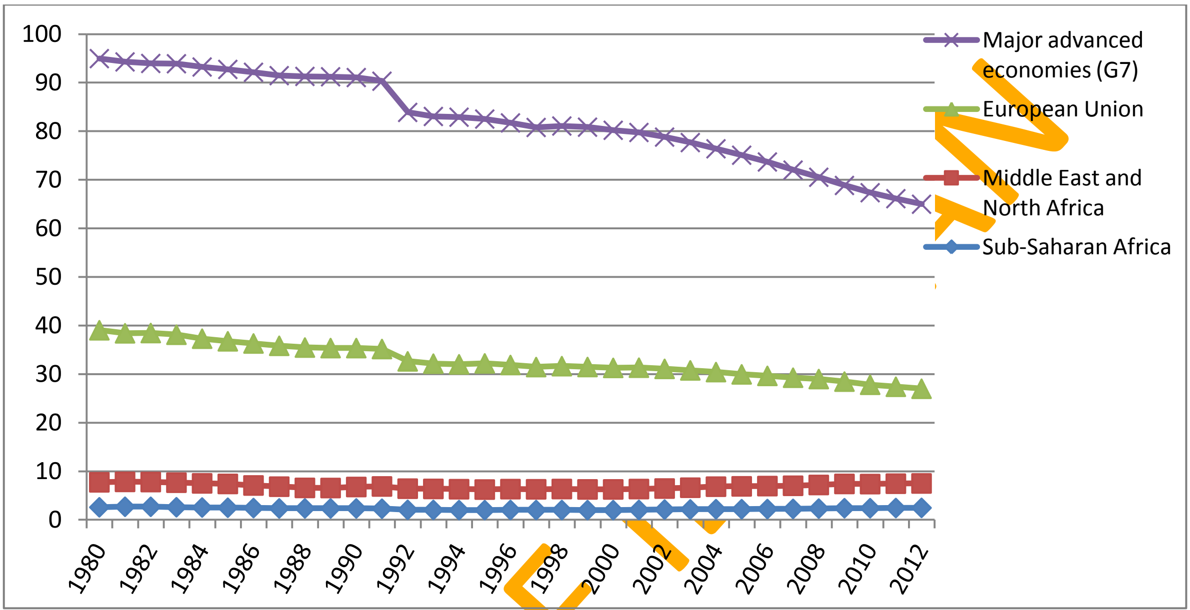


Figure 1A: Gross domestic product based on purchasing-power-parity (PPP) as % share of world total

Source: International Monetary Fund's World Economic Outlook (2013) Database

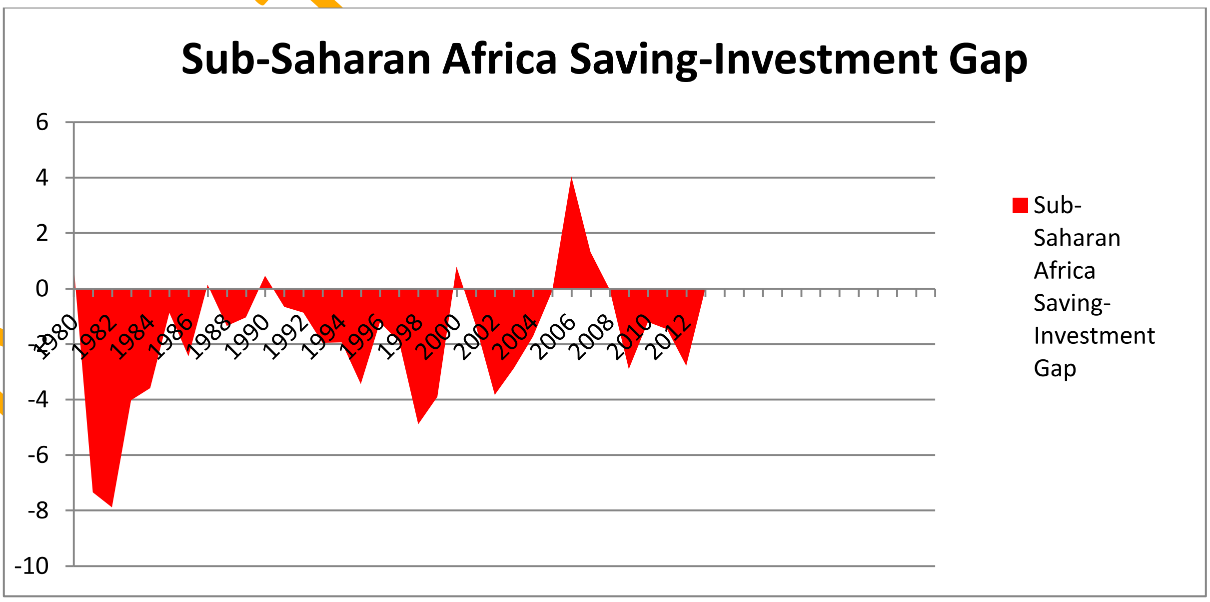


Figure 2A: Saving-Investment Gap in SSA

Source: International Monetary Fund's World Economic Outlook (2013) Database

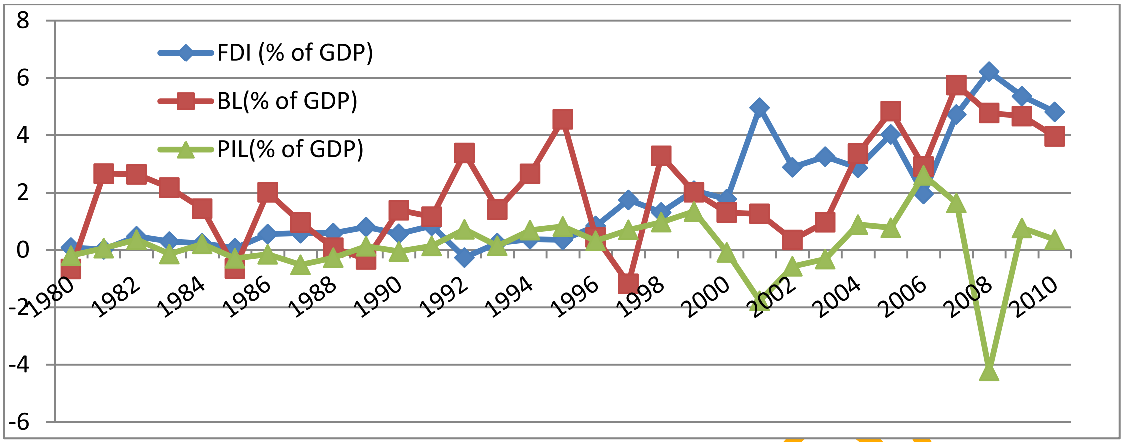


Figure 3A: Foreign direct investment, portfolio investment and bank lending (proxied by other financial flows) to SSA region as % of her GDP

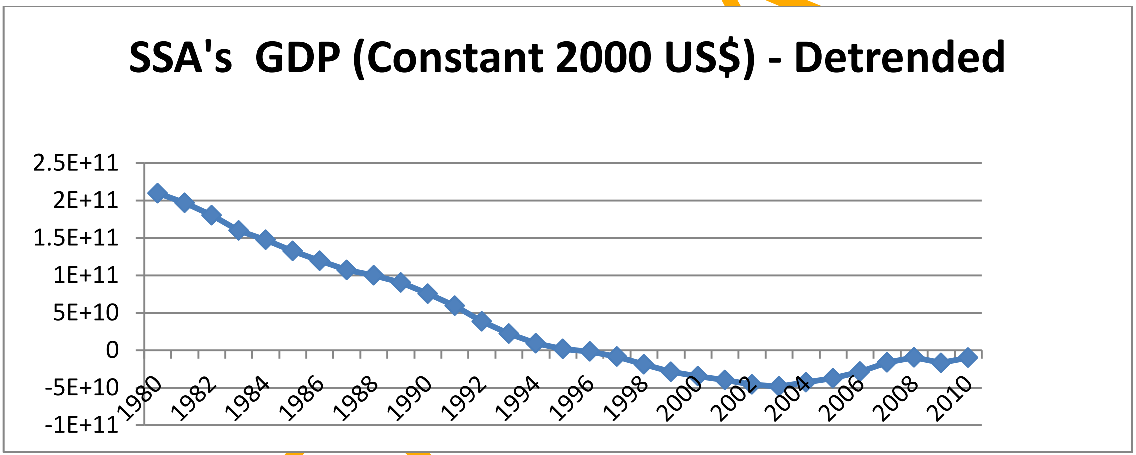


Figure 4A: SSA Real GDP controlled for trend effect ($GDP_t - \theta t$)

θ =trend parameter; t=time variable (year)

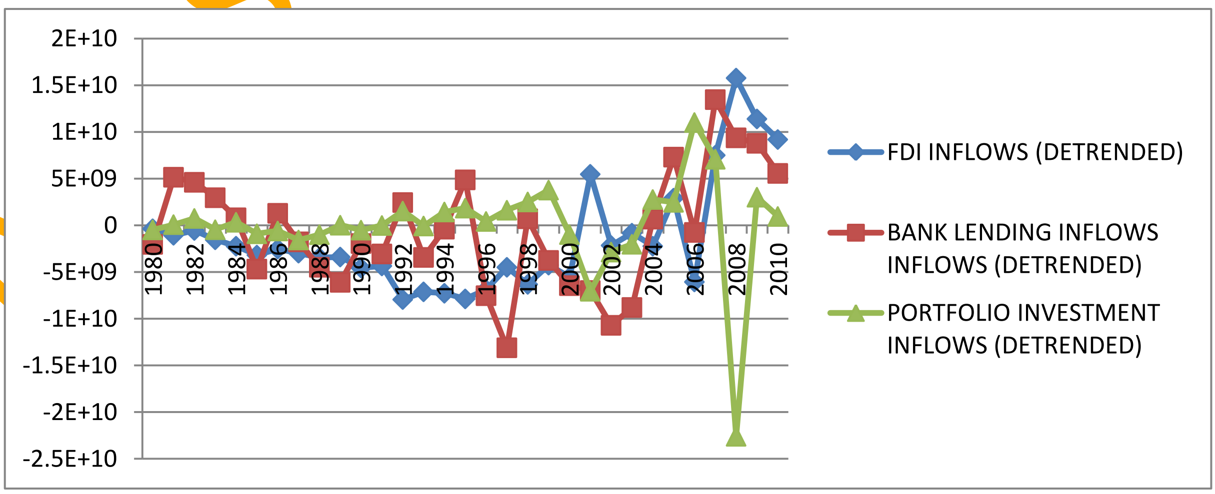


Figure 5A: Foreign direct investment, portfolio investment and bank lending to SSA region as % of the region's GDP (controlled for trend effect)

Source (figure 3A-5A): International Monetary Fund's World Economic Outlook (2013) Database

Appendix II

<u>Classifications of Sampled Countries</u>

Table 1A: *Mineral Rich Vs Non-Resource Rich*

Mineral Rich		**Non-resource rich**	
Oil	Non- Oil	Coastal	Landlocked
Cameroun	Botswana	Kenya	Niger
Gabon	Cote D'voire	Seychelles	Swaziland
Nigeria		South Africa	
		Mauritius,	
		Togo	
		Namibia	
		Benin	

Source: IMF (2010): Regional economic outlook – Sub-Saharan Africa

Table 2A: *Grouping on Income Level*

Low Income	**Low Middle**	**Upper Middle**
Benin	Cameroun	Botswana
Kenya	Cote D'voire	Gabon
Niger	Nigeria	Mauritius
	Swaziland	Namibia
	Togo	Seychelles
		South Africa

Source: World Bank (2012): Financial Structure Data Set

Appendix III:

Diagnostic Analysis Results

Table 3A: Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
FDILC	overall	89.53	286.48	-447.88	2933.06	N = 294
	between		219.52	-29.6	840.75	n = 14
	within		192.8	-624.32	2181.84	T = 21
PILC	overall	32.53	253.55	-160.25	3563.1	N = 294
	between		84.67	-0.12	304.59	n = 14
	within		240.02	-300.17	3291.04	T = 21
BLLC	overall	23.48	223.12	-204.15	3145.67	N = 294
	between		69.88	-3.98	262.33	n = 14
	within		212.68	-442.99	2906.83	T = 21
	between		3.29	8.22	20.29	n = 14
	within		42.49	-32.64	183.62	T = 21
YC	overall	1759.6	1988.54	134.2	8661.41	N = 294
	between		2025.1	274.63	7037.72	n = 14
	within		364.92	143.47	4134.23	T = 21
GC	overall	381.17	481.9	0	2220.34	N = 294
	between		464.59	26.49	1721.83	n = 14
	within		176.39	-1340.66	1833.41	T = 21
GFCC	overall	449.3	555.36	0	3015.54	N = 294
	between		503.9	13.56	1546.35	n = 14
	within		268.04	-1097.06	1918.49	T = 21
CFXC	overall	39.08	176.5	-849.06	1315.98	N = 294
	between		48.1	1.73	148.98	n = 14
	within		170.28	-958.96	1206.08	T = 21
ER	overall	203.25	243.68	1.86	733.04	N = 294
	between		237.38	4.5	507.33	n = 14
	within		82.94	-39.38	428.96	T = 21
FD	overall	26.24	22.26	0	100.95	N = 294
	between		19.92	8.43	68.65	n = 14
	within		11.21	-42.41	61.82	T = 21
IQ	overall	-0.22	0.55	-1.46	0.88	N = 294
	between		0.45	-0.84	0.5	n = 14
	within		0.33	-0.96	0.62	T = 21
TOP	overall	82.64	42.46	0	256.36	N = 294
	between		39.94	30.15	157.81	n = 14
	within		17.79	-32.18	181.18	T = 21
TOT	overall	102.75	29.24	21.3	221.91	N = 294
	between		18.05	70.24	137.8	n = 14
	within		23.48	40.32	213.07	T = 21
FFDILC	overall	2850.612	5697.19	-1154.51	26907.35	N = 294
	between		219.52	2099.40	2969.74	n = 14
	within		5693.25	-403.29	26861.86	T = 21
FPILC	overall	1274.158	1101.45	-3694.39	3867.93	N = 294
	between		84.67	1002.10	1306.81	n = 14
	within		1098.42	-3422.33	3843.40	T = 21

Table 3A: Descriptive Statistics (contd.)

Variable		Mean	Std. Dev.	Min	Max	Observations
FBLLC	overall	2509.282	3525.52	-3118.98	13163.40	N = 294
	between		69.88	2270.44	2536.74	n = 14
	within		3524.88	-2880.13	13143.64	T = 21
FNFDILC	overall	5266.374	9799.87	-1090.31	45967.04	N = 294
	between		243.85	4432.48	5386.57	n = 14
	within		9797.05	-256.41	45925.89	T = 21
FNBLLC	overall	4860.313	7626.77	-6135.25	28651.13	N = 294
	between		136.24	4395.10	4915.84	n = 14
	within		7625.64	-5670.04	29116.35	T = 21
FNPILC	overall	2925.31	3698.30	-9698.21	12476.84	N = 294
	between		95.79	2686.35	2987.34	n = 14
	within		3697.14	-9459.24	12427.82	T = 21
FYC	overall	41214.39	29617.58	-1451.15	95412.19	N = 294
	between		2025.10	35936.27	42699.35	n = 14
	within		29553.00	3826.97	93999.45	T = 21
FGC	overall	3485.801	1356.47	-566.05	6067.72	N = 294
	between		464.59	2145.14	3840.47	n = 14
	within		1280.19	-771.37	5756.30	T = 21
FGFCC	overall	3612.727	1178.27	-1064.59	5656.76	N = 294
	between		503.90	2515.67	4048.47	n = 14
	within		1073.19	32.46	5315.97	T = 21
FCFXC	overall	5334.606	43038.94	-51023.58	143572.00	N = 294
	between		48.10	5224.71	5371.97	n = 14
	within		43038.92	-50922.14	143582.10	T = 21
BLLCS	overall	0.0321091	212.01	-384.86	2876.39	N = 294
	between		0.66	-1.47	1.49	n = 14
	within		212.01	-384.94	2876.31	T = 21
FDBLLCS	overall	-585.6731	10398.19	-34238.04	153136.30	N = 294
	between		2362.60	-8787.74	270.44	n = 14
	within		10145.02	-26035.97	161338.40	T = 21
FDILCS	overall	-0.1557913	141.38	-875.32	1418.55	N = 294
	between		2.71	-4.66	6.57	n = 14
	within		141.35	-875.05	1418.82	T = 21
FDFDILCS	overall	-44.99057	8360.09	-46726.71	85635.89	N = 294
	between		411.51	-1280.88	707.15	n = 14
	within		8350.65	-45490.83	86871.78	T = 21
PILCS	overall	-0.0371798	239.19	-371.99	3242.62	N = 294
	between		0.16	-0.54	0.12	n = 14
	within		239.19	-372.11	3242.49	T = 21
FDPILCS	overall	-63.03237	14895.81	-30409.90	173099.20	N = 294
	between		239.57	-888.68	67.17	n = 14
	within		14894.01	-29584.25	173924.80	T = 21
NBLLCS	overall	1.595192	421.28	-782.92	5543.40	N = 294
	between		2.17	-1.88	6.20	n = 14
	within		421.28	-779.44	5546.88	T = 21

Table 3A: Descriptive Statistics (contd.)

Variable		**Mean**	**Std. Dev.**	**Min**	**Max**	**Observations**
FDNBLLCS	overall	1997.41	22265.68	-61354.76	368782.90	N = 294
	between		5000.72	-55.45	18641.52	n = 14
	within		21736.15	-77998.87	352138.80	T = 21
NPILCS	overall	0.0002006	253.11	-617.85	3251.07	N = 294
	between		0.36	-0.86	0.53	n = 14
	within		253.11	-617.33	3251.59	T = 21
FDNPILCS	overall	-1130.952	21551.94	-67237.59	322926.90	N = 294
	between		4472.98	-16665.26	326.66	n = 14
	within		21115.03	-51703.28	338461.20	T = 21
NFDILCS	overall	-0.2367962	142.57	-825.14	1422.07	N = 294
	between		3.50	-5.51	7.10	n = 14
	within		142.53	-824.92	1422.29	T = 21
FDNFDILCS	overall	-47.98902	8357.14	-44048.29	85848.74	N = 294
	between		418.57	-1282.57	768.09	n = 14
	within		8347.37	-42813.70	87083.33	T = 21
GRC	overall	1.023085	4.91	-25.44	41.14	N = 294
	between		1.37	-0.76	3.36	n = 14
	within		4.73	-27.78	38.80	T = 21
INYC	overall	1854.009	2347.71	180.08	8661.41	N = 294
	between		2432.18	180.08	8661.41	n = 14
	within		0.00	1854.01	1854.01	T = 21
IQ	overall	-0.217816	0.55	-1.46	0.88	N = 294
	between		0.45	-0.84	0.50	n = 14
	within		0.33	-0.96	0.62	T = 21
MGRC	overall	1.023085	1.81	-7.98	5.99	N = 294
	between		1.37	-0.76	3.36	n = 14
	within		1.23	-6.44	3.65	T = 21
SE	overall	23.90034	30.53	0.00	95.70	N = 294
	between		24.93	0.00	62.29	n = 14
	within		18.79	-38.39	57.59	T = 21
TOP	overall	82.63519	42.46	0.00	256.36	N = 294
	between		39.94	30.15	157.81	n = 14
	within		17.79	-32.18	181.18	T = 21
ER	overall	203.2504	243.68	1.86	733.04	N = 294
	between		237.38	4.50	507.33	n = 14
	within		82.94	-39.38	428.96	T = 21
TOT	overall	102.7472	29.24	21.30	221.91	N = 294
	between		18.05	70.24	137.80	n = 14
	within		23.48	40.32	213.07	T = 21
FD	overall	26.23917	22.26	0.00	100.95	N = 294
	between		19.92	8.43	68.65	n = 14
	within		11.21	-42.41	61.82	T = 21

Table 4A: Unit Root Test Results

Variables	Level LLC	1st diff. LLC	Level IPS	1st diff. IPS	Level ADF	1st diff. ADF	Level PP	1st diff. PP
BLC	-4.00***	-12.30***	-6.34***	-14.30***	96.46***	213.2***	238.8***	1449.8***
BLCS	-5.32***	-12.99***	-5.88***	-13.38***	91.37***	197.6***	165.9***	1112.3***
CFXC	-3.29***	-9.46***	-4.61***	-11.69***	70.42***	169.3***	137.4	1143.6***
ER	-2.65***	-8.17***	-1.63*	-6.69***	37.10	96.05***	35.57	123.26***
FD	-0.14	-7.40***	-2.06**	-5.12***	63.06***	101.0***	35.36	102.22***
FDIC	0.26	-3.03***	-0.55	-9.30***	33.33	134.0***	74.55***	775.7***
FDICS	-1.95**	-5.57***	-6.78***	-15.28***	99.36***	225.3***	357.6***	2205.2***
GC	3.34	-2.83***	4.03	-3.20***	22.10	73.72***	72.29***	397.70***
GFCC	-0.25	-5.53***	0.66	-6.32***	21.48	94.00***	22.36	215.3***
GRC	-3.95***	-9.21***	-5.29***	-10.64***	77.7***	154.8***	122.8***	1195.7***
IQ	-2.30**	-7.69***	-0.39	-6.17***	24.29	89.11***	23.15	174.6***
MGRC	-21.2***	-10.82***	-20.78***	-8.50***	441.4***	127.1***	33.78	13.29
NBLC	-0.95	-12.2***	-4.16***	-16.68***	73.68***	267.9***	178.20***	1751.0***
NBLCS	-2.15	-13.05***	-3.00***	-14.10***	59.3***	224.2***	99.04***	661.6***
NFDIC	1.59	-3.04***	-0.18	-8.31***	30.13	119.8***	67.53***	600.6***
NFDICS	-2.02**	-6.21***	-5.77***	-14.55***	84.89***	214.4***	274.2***	2046.9***
NPIC	-1.63*	-2.40***	-4.23***	-8.67***	66.91***	125.3***	110.4***	449.9***
NPICS	-1.66**	-2.75***	-4.39***	-8.98***	69.11***	129.5***	128.8***	549.4***
PIC	-4.56***	-5.07***	-4.48***	-9.13***	77.42***	139.3***	131.3***	1411.1***
PICS	-4.54***	-4.38***	-4.71***	-9.14***	78.22***	138.3***	137.0**	1434.8***
SE	-0.12	-5.59***	-2.08**	-6.22***	39.60***	75.63***	37.10**	165.2***
TOP	-0.25	-2.43***	-1.01	-4.63***	33.71	80.97***	30.02	158.6***
TOT	0.83	-7.21***	0.77	-6.58***	25.68	97.07***	30.83	204.3***
GDPC	20.99	57.3	1.59	-6.16***	32.60	89.76***	292.0***	658.8***

LC = Levin, Lin & Chu t stat; IPC= Im, Pesaran and Shin W-stat

ADF= Augmented Dickey-Fuller stat; PP=Phillip-Peron stat

Table 5A: Johansen-Fisher Cointegration Results (SVAR Models)

Variables	No of Cointegrating Equations	No trend in data				Linear trend in data			
		No (intercept trend)		Intercept (no trend)		Intercept (no trend)		Intercept and trend	
		Stat.* Trace test	Stat.* Max -eigen test	Stat.* Trace test	Stat.* Max -eigen test	Stat.* Trace test	Stat.* max-eigen test	Stat.* Trace test	Stat.* max-eigen test
FDILC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT FDILC*	None	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 1	12.48	30.90*	13.86	13.86	13.86	13.86	13.86	13.86
	At most 2	4.159	133***	11.09	47***	12.48	30.90*	12.48	275***
	At most 3	0.000	184***	1.386	167***	8.318	82***	11.09	47***
	At most 4	184***	184***	0.000	184***	0.000	184***	2.773	2110***
	At most 5	223***	154***	263***	2634***	184***	184***	0.000	184***
	At most 6	108***	91***	179***	132***	152***	114***	2634***	184***
	At most 7	48****	48***	80***	80***	86***	86***	83***	83***
BLLC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT BLLC*	None	13.86	13.86	13.86	13.9	13.86	13.86	13.86	13.86
	At most 1	11.09	47***	12.48	30.90*	13.86	13.86	13.86	13.86
	At most 2	5.545	116***	9.70	65***	12.48	30.90*	13.86	13.86
	At most 3	1.386	167***	1.386	167***	5.545	116***	5.545	116.1**
	At most 4	184***	184***	0.000	184***	0.000	184***	2.773	2110***
	At most 5	196***	136***	2634**	2634***	184***	184***	0.000	184.2**
	At most 6	95***	90***	187***	135***	145***	94***	2634***	184.2**
	At most 7	28.82*	28.82*	88***	87***	106***	106***	5.55***	96.51**
PIC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT PILC*	None	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 1	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 2	11.09	47.93***	11.09	47.93***	13.86	13.86	13.86	13.86
	At most 3	1.386	167.2***	2.773	150.1***	5.545	116.1***	6.931	99.03**
	At most 4	184.2**	184.2***	0.000	184.2***	0.000	184.2***	0.000	2634***
	At most 5	198.7**	134.6***	2634**	2634.***	184.2***	184.2***	0.000	184.2**
	At most 6	109.4**	86.23***	168***	115.4***	139.3***	109.8***	2634***	184.2**
	At most 7	57.87**	57.87***	85.9***	85.93***	70.24***	70.24***	91.7***	91.71**
NBLLC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT NBLLC*	None	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 1	13.86	13.86	13.86	13.86	12.48	30.90*	13.86	13.86
	At most 2	8.318	82.00***	12.48	30.90*	11.09	47.93***	12.48	275.9**
	At most 3	1.386	167.2***	2.773	150.1***	6.931	99.03***	6.931	99.03**
	At most 4	184.2***	184.2***	0.000	184.2***	0.000	184.2***	2.773	2110.**
	At most 5	210.2***	162.9***	2634**	2634***	184.2***	184.2***	0.000	184.2**
	At most 6	94.84***	86.96***	198***	136.0***	146.7***	110.1***	2634***.	184.2**
	At most 7	33.53**	33.53**	99.4***	99.43***	79.08***	79.08***	104.8***	104.8**

Table 5A: Johansen-Fisher Cointegration Results - SVAR Models- (contd.)

Variables	No of Cointegrating Equations	No trend in data				Linear trend in data			
		No (intercept trend)		Intercept (no trend)		Intercept (no trend)		Intercept and trend	
		Stat.* Trace test	Stat.* Max -eigen test	Stat.* Trace test	Stat.* Max -eigen test	Stat.* Trace test	Stat.* max-eigen test	Stat.* Trace test	Stat.* max-eigen test
NFDILC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT NFDILC*	None	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 1	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 2	5.545	116.1***	11.09	47.93***	13.86	13.86	13.86	13.86
	At most 3	0.000	184.2***	1.386	167.2***	5.545	116.1***	12.48	30.90*
	At most 4	184.2***	184.2***	0.000	184.2***	0.000	184.2***	2.773	2110.**
	At most 5	214.0***	154.5***	2634**	2634.***	184.2***	184.2***	1.386	167.2**
	At most 6	99.79***	85.86***	181***	138.9***	141.4***	119.8***	2634.***	184.2**
	At most 7	44.81***	44.81***	77.2***	77.20***	67.99***	67.99***	105.5***	105.5**
NPIC GDPC GC GFCC CFXC ER GDPC* GC* GFCC* CFXC* FD IQ TOP TOT NPILC*	None	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 1	13.86	13.86	13.86	13.86	13.86	13.86	13.86	13.86
	At most 2	9.704	64.97**	11.09	47.93***	9.704	64.97***	13.86	13.86
	At most 3	0.000	184.2***	5.545	116.1***	4.159	133.1***	4.159	133.1**
	At most 4	184.2***	184.2***	0.000	184.2***	0.000	184.2***	1.386	2372.**
	At most 5	202.5***	129.3***	2634**	2634.***	184.2***	184.2***	0.000	184.2**
	At most 6	126.7***	100.1***	188***	134.3***	150.1***	120.8***	2634***	184.2**
	At most 7	65.19***	65.19***	89.8***	89.82***	75.86***	75.86***	125.8**	125.8**

Table 6A: Kao Cointegration Results

Structural Vector Auto-Regressive Models				
Variables	ADF	PROB	NULL HYPOTHESIS	STATUS
FDILC YC GC GFCC CFXC ER FFDILC FYC FGC FGFCC FCFXC FD IQ TOP TOT	-2.058**	0.0198	No cointegration	Cointegrated
PIC YC GC GFCC CFXC ER FPILC FYC FGC FGFCC FCFXC FD IQ TOP TOT	2.587***	0.0048	No cointegration	Cointegrated
BLLC YC GC GFCC CFXC ER FBLLC FYC FGC FGFCC FCFXC FD IQ TOP TOT	2.107**	0.0176	No cointegration	Cointegrated
NFDILC YC GC GFCC CFXC ER FNFDILC FYC FGC FGFCC FCFXC FD IQ TOP TOT	2.033**	0.0210	No cointegration	Cointegrated
NPIC YC GC GFCC CFXC ER FNPILC FYC FGC FGFCC FCFXC FD IQ TOP TOT	2.546***	0.0054	No cointegration	Cointegrated
NBLLC YC GC GFCC CFXC ER FNBLLC FYC FGC FGFCC FCFXC FD IQ TOP TOT	2.016**	0.0219	No cointegration	Cointegrated

Table 6A: Kao Cointegration Results (Contd.)

Panel Instrumental Variable Regression Models				
Variables	ADF	PROB	NULL HYPOTHESIS	STATUS
YC GC GFCC FD IQ TOP FDILC FDILCS SE	3.226***	0.0006	No cointegration	Cointegrated
YC FDIC FDILCS GC GFCC IQ SE TOP FD FDFDILCS	5.539***	0.0000	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD PIC PILCS	2.402***	0.0082	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD PIC PILCS FDPILCS	2.669***	0.0038	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD BLC BLLCS	3.014***	0.0013	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD BLC BLLCS FDBLLCS	3.149***	0.0008	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP FDIC FDILCS SE	-3.025***	0.0012	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP FDIC FDILCS FD FDILCS SE	3.889***	0.0001	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP BLC BLLCS SE	-4.810***	0.0000	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP BLC BLLCS FDBLLCS SE	-5.486***	0.0000	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP PIC PILCS SE	-4.651***	0.0000	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP PIC PILCS FDPILCS SE	-4.297***	0.0000	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP FDIC FDILCS SE	-3.233***	0.0006	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP FDILCS FDIC FDS SE	-3.259***	0.0006	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP PIC PILCS SE	-3.375***	0.0004	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP PIC PILCS FDPILCS SE	-3.312***	0.0005	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP BLC BLLCS SE	-3.801***	0.0001	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP BLC BLLCS FDBLLCS SE	-3.745***	0.0001	No cointegration	Cointegrated
YC GC GFCC FD IQ TOP NFDIC NFDILCS SE	3.586	0.0002	No cointegration	Cointegrated
YC GC GFCC FD IQ TOP NFDIC NFDILCS FDNFDILCS SE	2.543	0.0055	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD NPIC NPILCS	2.430***	0.0076	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD NPIC NPILCS FDNPILCS	2.327***	0.0100	No cointegration	Cointegrated
YC GC GFCC IQ SE TOP FD NBLC NBLLCS	2.904***	0.0018	No cointegration	Cointegrated
GC GFCC YC IQ SE TOP FD NBLC NBLLCS FDNBLLCS	2.976***	0.0015	No cointegration	Cointegrated
GRC GC GFCC IQ SE TOP FD NPIC NPILCS	2.562***	0.0052	No cointegration	Cointegrated
GRC GC GFCC IQ SE TOP FD NPIC NPILCS FDNPILCS	2.367***	0.0090	No cointegration	Cointegrated
GRC GC GFCC IQ SE TOP FD NBLC NBLLCS	3.632***	0.0001	No cointegration	Cointegrated
GRC GC GFCC IQ SE TOP FD NBLC NBLLCS FDNBLLCS	3.291***	0.0005	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP NFDIC NFDILCS SE	-3.187***	0.0008	No cointegration	Cointegrated
GRC GC GFCC FD IQ TOP NFDILCS NFDIC FDNFDILCS SE	3.173***	0.2647	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP NFDIC NFDILCS SE	-3.161	0.0008	No cointegration	Cointegrated
MGRC GC GFCC FD IQ TOP NFDIC NFDILCS FDNFDILCS SE	-3.249	0.0006	No cointegration	Cointegrated
MGRC GC GFCC IQ SE TOP FD NPIC NPILCS FDNPILCS	2.137**	0.0163	No cointegration	Cointegrated
MGRC GC GFCC IQ SE TOP FD NBLC NBLLCS	3.347***	0.0004	No cointegration	Cointegrated
MGRC GC GFCC IQ SE TOP FD NBLC NBLLCS FDNBLLCS	3.038***	0.0012	No cointegration	Cointegrated

Appendix IV

Lag Length Criteria Test Results

VAR Lag Order Selection Criteria
Endogenous variables: GDPC GC GFCC CFXC ER FDIC
Exogenous variables: FFDIC FGDPC FGC FGFCC FD TOT IQ TOP FCFXC
Date: 05/12/13 Time: 13:06
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7750.542	NA	7.12e+29	85.76419	86.71483	86.14957
1	-6672.413	1978.544	7.58e+24	74.31223	75.89663	74.95452
2	-6565.523	189.1130	3.49e+24	73.53322	75.75138	74.43243
3	-6418.065	251.1655	1.03e+24	72.30840	75.16032	73.46453
4	-6349.022	113.0476	7.26e+23	71.94530	75.43098	73.35834
5	-6233.493	181.5459	3.08e+23	71.07135	75.19079	72.74131
6	-6085.186	223.2748	9.17e+22	69.83721	74.59041	71.76409
7	-5977.261	155.3654*	4.28e+22*	69.04682*	74.43378*	71.23061*
8	-5942.364	47.93544	4.51e+22	69.05894	75.07966	71.49965

* 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

VAR Lag Order Selection Criteria
Endogenous variables: PIC GDPC GC GFCC CFXC ER
Exogenous variables: FGDPC FGC FGFCC FD TOT IQ TOP FPIC
Date: 05/12/13 Time: 13:13
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7806.789	NA	1.24e+30	86.31636	87.16137	86.65892
1	-6815.216	1830.595	3.41e+25	75.81557	77.29434	76.41504
2	-6611.755	362.2059	5.43e+24	73.97533	76.08786	74.83172
3	-6517.836	161.0048	2.89e+24	73.33885	76.08514*	74.45216
4	-6436.244	134.4918	1.77e+24	72.83785	76.21790	74.20807
5	-6363.811	114.6189	1.20e+24	72.43749	76.45130	74.06463
6	-6286.401	117.3908	7.80e+23	71.98243	76.63000	73.86649
7	-6166.145	174.4377	3.18e+23	71.05654	76.33787	73.19751*
8	-6107.973	80.54548*	2.59e+23*	70.81289*	76.72798	73.21078

* 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

VAR Lag Order Selection Criteria
Endogenous variables: BLC GDPC GC GFCC CFXC ER
Exogenous variables: C FBLL FGDPC FGC FGFCC FD TOT IQ TOP
Date: 05/12/13 Time: 13:25
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7599.980	NA	1.36e+29	84.10967	85.06031	84.49505
1	-6801.538	1465.272	3.13e+25	75.73119	77.31559	76.37348
2	-6716.430	150.5760	1.83e+25	75.19154	77.40970	76.09075
3	-6559.699	266.9592	4.90e+24	73.86483	76.71675*	75.02095
4	-6468.986	148.5312	2.71e+24	73.26358	76.74926	74.67662
5	-6389.312	125.2015	1.71e+24	72.78365	76.90309	74.45361
6	-6313.376	114.3210	1.13e+24	72.34479	77.09799	74.27167
7	-6192.190	174.4554	4.55e+23	71.40868	76.79563	73.59247*
8	-6148.249	60.35723*	4.33e+23*	71.32142*	77.34214	73.76213

* 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

VAR Lag Order Selection Criteria
Endogenous variables: NFDIC GDPC GC GFCC CFXC ER
Exogenous variables: FNFDIC FGDPC FGC FGFCC FD TOT IQ TOP
Date: 05/12/13 Time: 14:28
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7755.779	NA	7.06e+29	85.75582	86.60083	86.09837
1	-6680.052	1985.958	7.71e+24	74.33024	75.80901	74.92971
2	-6576.740	183.9178	3.69e+24	73.59055	75.70308	74.44694
3	-6428.309	254.4535	1.08e+24	72.35504	75.10133	73.46835
4	-6363.646	106.5869	7.97e+23	72.04007	75.42012	73.41029
5	-6264.511	156.8738	4.04e+23	71.34627	75.36008	72.97341
6	-6124.395	212.4828	1.32e+23	70.20215	74.84972	72.08620
7	-6014.069	160.0336	5.98e+22	69.38537	74.66670*	71.52635*
8	-5971.935	58.33991*	5.80e+22*	69.31796*	75.23305	71.71585

* 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

VAR Lag Order Selection Criteria
Endogenous variables: NPIC GDPC GC GFCC CFXC ER
Exogenous variables: FNPIC FGDPC FGC FGFCC FD TOT IQ TOP
Date: 05/12/13 Time: 14:32
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7820.457	NA	1.44e+30	86.46656	87.31157	86.80912
1	-6825.767	1836.350	3.82e+25	75.93151	77.41028	76.53098
2	-6639.168	332.1880	7.33e+24	74.27657	76.38910*	75.13296
3	-6554.816	144.6029	4.34e+24	73.74523	76.49152	74.85854
4	-6486.491	112.6234	3.07e+24	73.39001	76.77006	74.76024
5	-6410.205	120.7164	2.00e+24	72.94731	76.96112	74.57445
6	-6336.563	111.6772	1.35e+24	72.53366	77.18123	74.41771
7	-6218.887	170.6939	5.68e+23	71.63613	76.91746	73.77710*
8	-6162.353	78.27839*	4.70e+23*	71.41047*	77.32556	73.80836

* 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

VAR Lag Order Selection Criteria
Endogenous variables: NBLC GDPC GC GFCC CFXC ER
Exogenous variables: FNBLC FGDPC FGC FGFCC FD TOT IQ TOP
Date: 05/12/13 Time: 14:40
Sample: 1990 2010
Included observations: 182

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7907.462	NA	3.74e+30	87.42266	88.26768	87.76522
1	-6932.101	1800.668	1.23e+26	77.10001	78.57878	77.69948
2	-6840.904	162.3507	6.73e+25	76.49345	78.60598	77.34984
3	-6704.558	233.7362	2.25e+25	75.39074	78.13704*	76.50405
4	-6634.513	115.4580	1.56e+25	75.01663	78.39668	76.38685
5	-6553.055	128.9005	9.63e+24	74.51709	78.53090	76.14423
6	-6475.391	117.7760	6.22e+24	74.05924	78.70681	75.94330
7	-6345.758	188.0396	2.29e+24	73.03031	78.31164	75.17128*
8	-6297.639	66.62619*	2.08e+24*	72.89713*	78.81222	75.29502

* 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

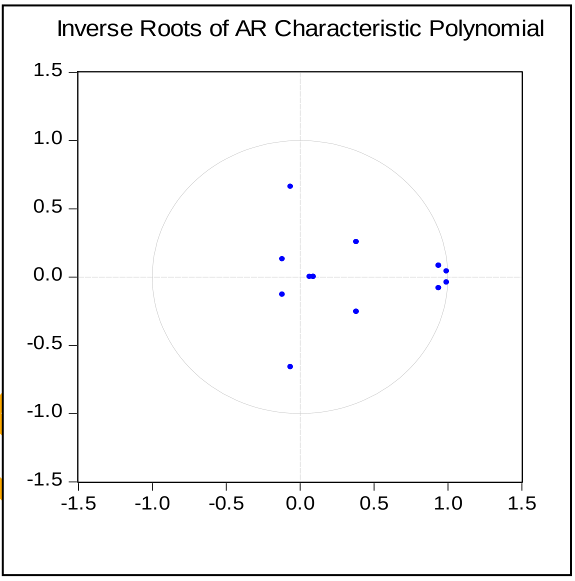
Appendix V

Stability Test Results

Roots of Characteristic Polynomial
Endogenous variables: FDIC GDPC GC GFCC CFXC ER
Exogenous variables: FFDIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 2
Date: 05/12/13 Time: 14:10

Root	Modulus
0.992760 - 0.039716i	0.993554
0.992760 + 0.039716i	0.993554
0.939135 - 0.082487i	0.942751
0.939135 + 0.082487i	0.942751
-0.061910 - 0.659950i	0.662848
-0.061910 + 0.659950i	0.662848
0.382269 - 0.255361i	0.459716
0.382269 + 0.255361i	0.459716
-0.117397 - 0.129148i	0.174531
-0.117397 + 0.129148i	0.174531
0.091547	0.091547
0.066492	0.066492

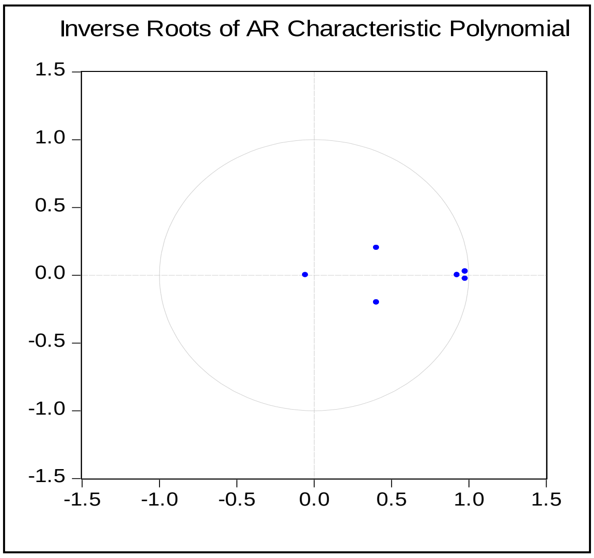
No root lies outside the unit circle.
VAR satisfies the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: PIC GDPC GC GFCC CFXC ER
Exogenous variables: FPIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 1
Date: 05/12/13 Time: 14:13

Root	Modulus
0.977843 - 0.026855i	0.978212
0.977843 + 0.026855i	0.978212
0.926208	0.926208
0.403727 - 0.200648i	0.450838
0.403727 + 0.200648i	0.450838
-0.055514	0.055514

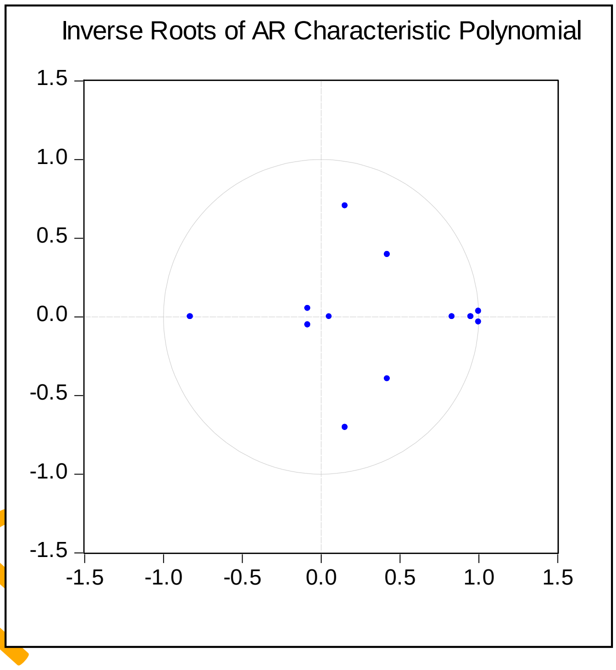
No root lies outside the unit circle.
VAR satisfies the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: PIC GDPC GC GFCC CFXC ER
Exogenous variables: FPIC FGDPC FGC FGFCC FD
TOT IQ TOP
Lag specification: 1 2
Date: 05/12/13   Time: 14:11

Root	Modulus
1.001399 - 0.035034i	1.002011
1.001399 + 0.035034i	1.002011
0.951730	0.951730
0.832636	0.832636
-0.827959	0.827959
0.154450 - 0.703803i	0.720551
0.154450 + 0.703803i	0.720551
0.421166 - 0.395603i	0.577826
0.421166 + 0.395603i	0.577826
-0.082592 - 0.051235i	0.097193
-0.082592 + 0.051235i	0.097193
0.054080	0.054080

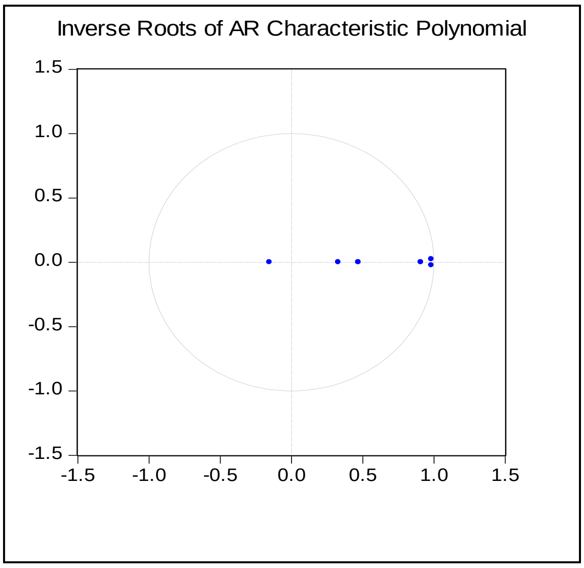
Warning: At least one root outside the unit circle.
VAR does not satisfy the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: BLC GDPC GC GFCC CFXC ER
Exogenous variables: FBLC FGDPC FGC FGFCC FD
TOT IQ TOP
Lag specification: 1 1
Date: 05/12/13   Time: 14:22

Root	Modulus
0.982945 - 0.024749i	0.983257
0.982945 + 0.024749i	0.983257
0.909079	0.909079
0.470558	0.470558
0.329347	0.329347
-0.154154	0.154154

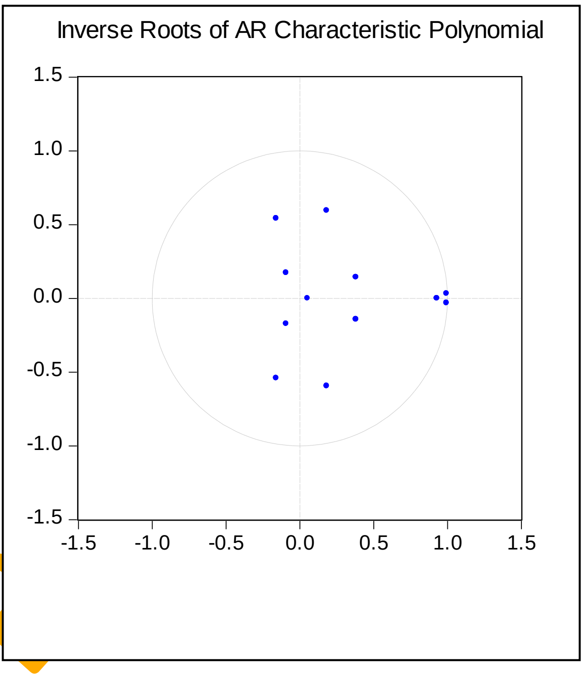
No root lies outside the unit circle.
VAR satisfies the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: BLC GDPC GC GFCC CFXC ER
Exogenous variables: FBLC FGDPC FGC FGFCC FD
TOT IQ TOP
Lag specification: 1 2
Date: 05/12/13 Time: 14:24

Root	Modulus
0.994388 - 0.032066i	0.994905
0.994388 + 0.032066i	0.994905
0.928581	0.928581
0.183535 - 0.594304i	0.621998
0.183535 + 0.594304i	0.621998
-0.158098 - 0.542103i	0.564687
-0.158098 + 0.542103i	0.564687
0.381317 - 0.141874i	0.406855
0.381317 + 0.141874i	0.406855
-0.090692 - 0.173536i	0.195805
-0.090692 + 0.173536i	0.195805
0.053623	0.053623

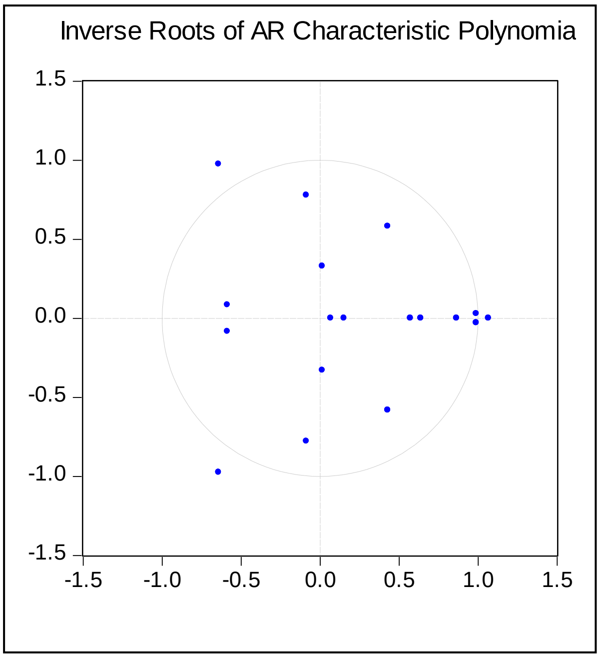
No root lies outside the unit circle.
VAR satisfies the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: BLC GDPC GC GFCC CFXC ER
Exogenous variables: FBLC FGDPC FGC FGFCC FD
TOT IQ TOP
Lag specification: 1 3
Date: 05/12/13 Time: 14:23

Root	Modulus
-0.640936 + 0.975044i	1.166838
-0.640936 - 0.975044i	1.166838
1.066866	1.066866
0.989548 - 0.028056i	0.989946
0.989548 + 0.028056i	0.989946
0.865211	0.865211
-0.085712 + 0.778946i	0.783648
-0.085712 - 0.778946i	0.783648
0.429340 - 0.580972i	0.722400
0.429340 + 0.580972i	0.722400
0.637769	0.637769
-0.586032 - 0.083346i	0.591929
-0.586032 + 0.083346i	0.591929
0.572095	0.572095
0.014761 + 0.329026i	0.329357
0.014761 - 0.329026i	0.329357
0.153384	0.153384
0.067424	0.067424

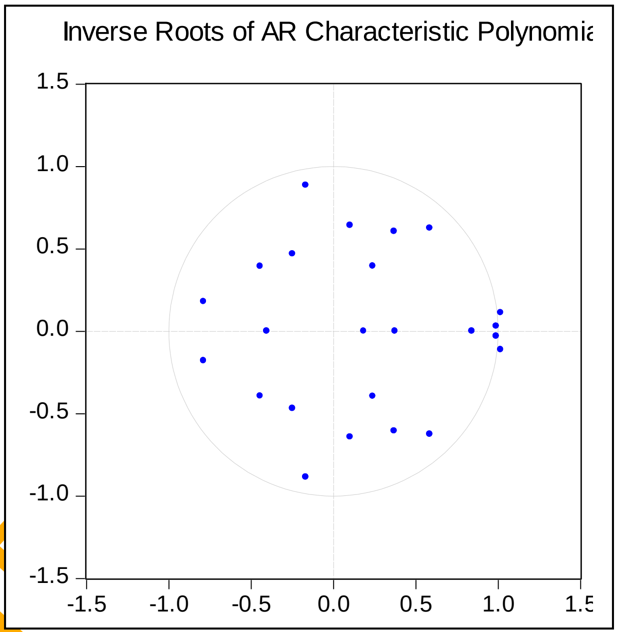
Warning: At least one root outside the unit circle.
VAR does not satisfy the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: NFDIC GDPC GC GFCC CFXC ER
Exogenous variables: FNFDIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 4
Date: 05/12/13 Time: 14:25

Root	Modulus
1.016558 + 0.111844i	1.022692
1.016558 - 0.111844i	1.022692
0.988826 - 0.029965i	0.989280
0.988826 + 0.029965i	0.989280
-0.167055 + 0.885511i	0.901131
-0.167055 - 0.885511i	0.901131
0.584963 - 0.625037i	0.856069
0.584963 + 0.625037i	0.856069
-0.444424 + 0.394003i	0.593929
-0.247784 - 0.468576i	0.530057
-0.247784 + 0.468576i	0.530057
0.241061 + 0.394950i	0.462705
0.241061 - 0.394950i	0.462705
-0.404704	0.404704
0.374542	0.374542
0.184567	0.184567

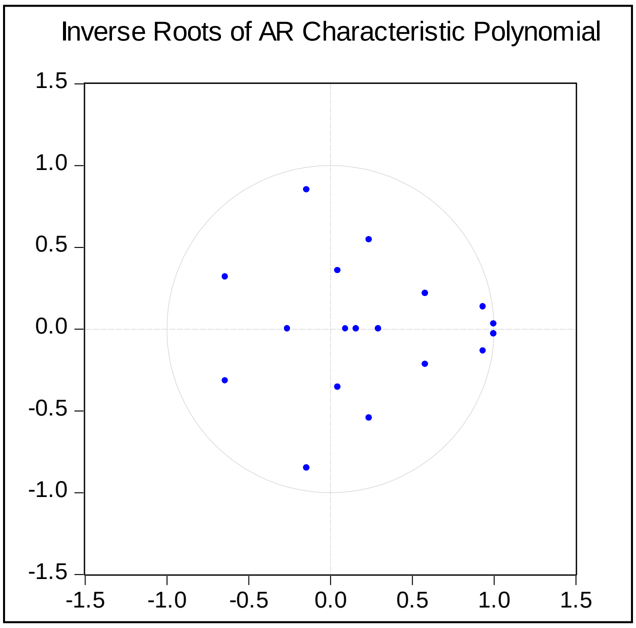
Warning: At least one root outside the unit circle.
VAR does not satisfy the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: NFDIC GDPC GC GFCC CFXC ER
Exogenous variables: FNFDIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 3
Date: 05/12/13 Time: 14:27

Root	Modulus
0.999305 - 0.029414i	0.999738
0.999305 + 0.029414i	0.999738
0.935649 - 0.135740i	0.945444
0.935649 + 0.135740i	0.945444
-0.144090 + 0.849939i	0.862066
-0.144090 - 0.849939i	0.862066
-0.641162 + 0.317488i	0.715463
-0.641162 - 0.317488i	0.715463
0.581569 - 0.217170i	0.620795
0.581569 + 0.217170i	0.620795
0.294196	0.294196
-0.260691	0.260691
0.158585	0.158585
0.094088	0.094088

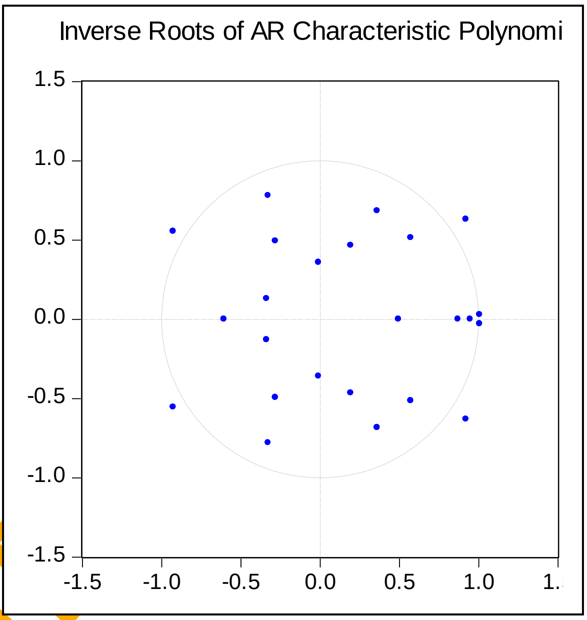
No root lies outside the unit circle.
VAR satisfies the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: NPIC GDPC GC GFCC CFXC ER
Exogenous variables: FNPIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 4
Date: 05/12/13 Time: 14:31

Root	Modulus
0.920786 + 0.630988i	1.116240
0.920786 - 0.630988i	1.116240
-0.926472 + 0.554884i	1.079929
-0.926472 - 0.554884i	1.079929
1.006274 - 0.028417i	1.006675
1.006274 + 0.028417i	1.006675
-0.605647	0.605647
-0.281544 - 0.493226i	0.567925
-0.281544 + 0.493226i	0.567925
0.194373 + 0.465243i	0.504214
0.194373 - 0.465243i	0.504214
0.495521	0.495521
-0.337107 - 0.129098i	0.360982
-0.337107 + 0.129098i	0.360982
-0.008995 + 0.358927i	0.359039
-0.008995 - 0.358927i	0.359039

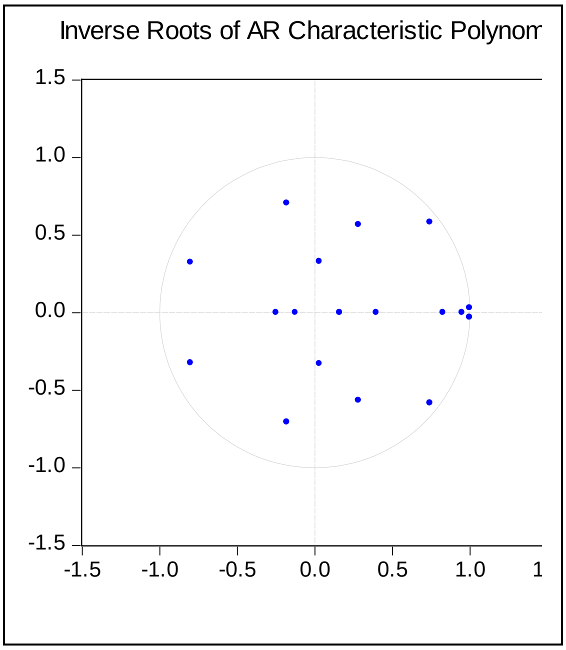
Warning: At least one root outside the unit circle.
VAR does not satisfy the stability condition.



Roots of Characteristic Polynomial
Endogenous variables: NPIC GDPC GC GFCC CFXC ER
Exogenous variables: FNPIC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 3
Date: 05/12/13 Time: 14:31

Root	Modulus
0.998036 + 0.030371i	0.998498
0.998036 - 0.030371i	0.998498
0.948888	0.948888
0.741601 + 0.583086i	0.943378
0.741601 - 0.583086i	0.943378
-0.800047 + 0.323737i	0.863065
-0.800047 - 0.323737i	0.863065
0.826509	0.826509
-0.180393 - 0.705062i	0.727774
-0.180393 + 0.705062i	0.727774
0.280741 - 0.565970i	0.631773
0.280741 + 0.565970i	0.631773
0.397045	0.397045
0.029933 + 0.330137i	0.331492
0.029933 - 0.330137i	0.331492
-0.249258	0.249258
0.160698	0.160698
-0.125114	0.125114

No root lies outside the unit circle.

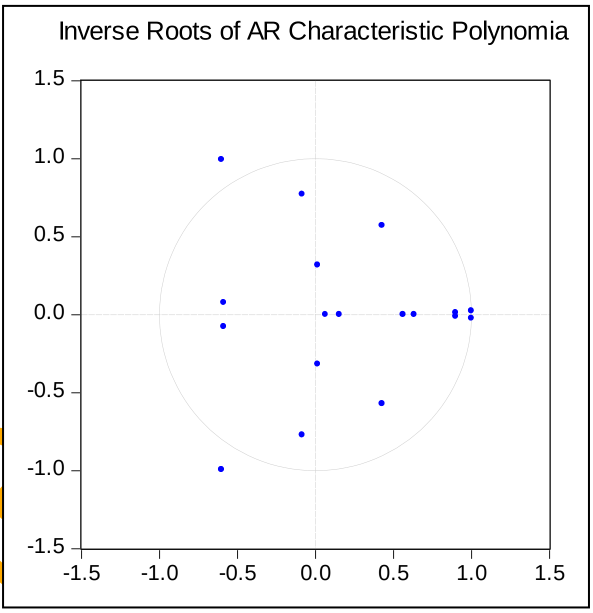


VAR satisfies the stability condition.

Roots of Characteristic Polynomial
Endogenous variables: NBLC GDPC GC GFCC CFXC ER
Exogenous variables: FNBLC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 3
Date: 05/12/13 Time: 14:38

Root	Modulus
-0.600986 + 0.992779i	1.160515
-0.600986 - 0.992779i	1.160515
1.001091 + 0.024192i	1.001383
1.001091 - 0.024192i	1.001383
0.900429 + 0.012295i	0.900513
0.900429 - 0.012295i	0.900513
-0.084751 - 0.770687i	0.775333
-0.084751 + 0.770687i	0.775333
0.427930 - 0.571318i	0.713812
0.427930 + 0.571318i	0.713812
0.634132	0.634132
-0.587216 - 0.076352i	0.592159
-0.587216 + 0.076352i	0.592159
0.561993	0.561993
0.014845 + 0.318306i	0.318652
0.014845 - 0.318306i	0.318652
0.154563	0.154563
0.065770	0.065770

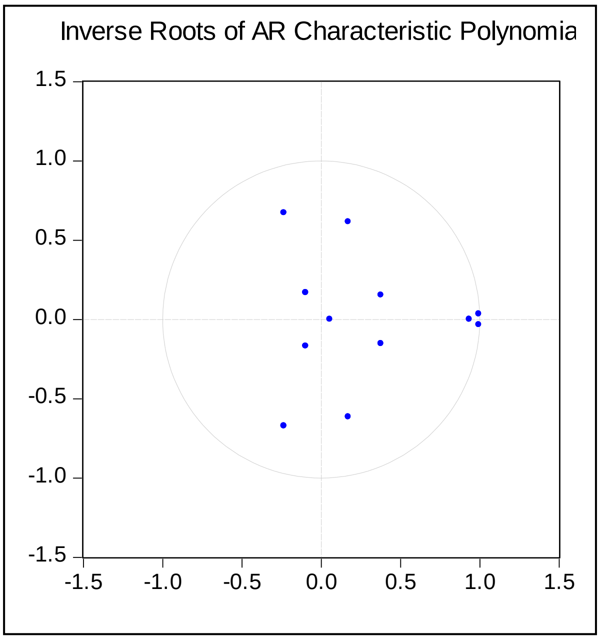
Warning: At least one root outside the unit circle.



Roots of Characteristic Polynomial
Endogenous variables: NBLC GDPC GC GFCC CFXC ER
Exogenous variables: FNBLC FGDPC FGC FGFCC FD TOT IQ TOP
Lag specification: 1 2
Date: 05/12/13 Time: 14:39

Root	Modulus
0.994669 - 0.033657i	0.995238
0.994669 + 0.033657i	0.995238
0.934215	0.934215
-0.235159 - 0.671465i	0.711453
-0.235159 + 0.671465i	0.711453
0.172454 - 0.614157i	0.637910
0.172454 + 0.614157i	0.637910
0.377719 - 0.152179i	0.407222
0.377719 + 0.152179i	0.407222
-0.097542 - 0.168635i	0.194814
-0.097542 + 0.168635i	0.194814
0.055309	0.055309

No root lies outside the unit circle.
VAR satisfies the stability condition.



Appendix VI

Impulse-Response Functions Graphs

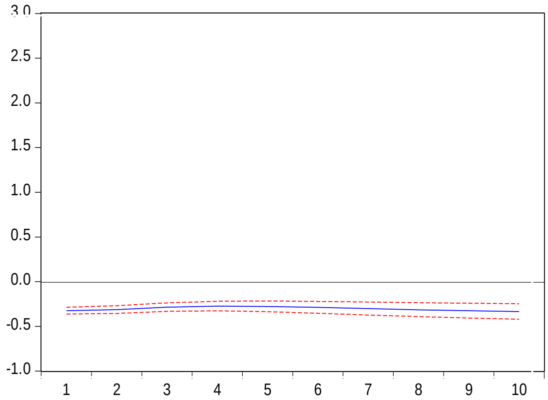


Figure 6A: Response of GDPC to shock in PIC

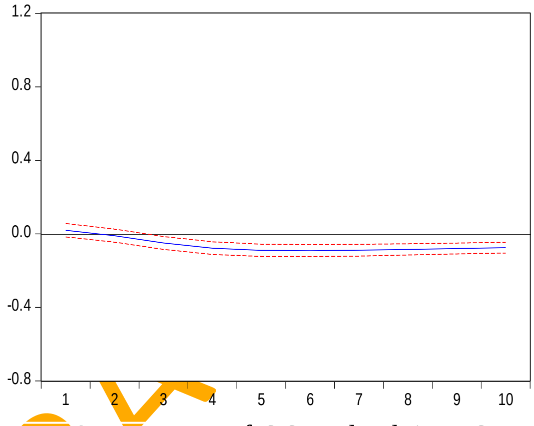


Figure 7A: Response of GC to shock in PIC

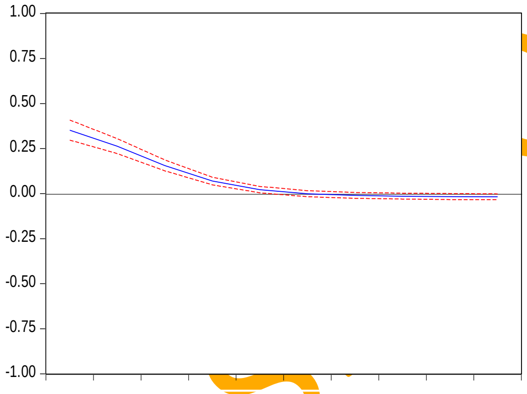


Figure 8A: Response of GFCC to shock in PIC

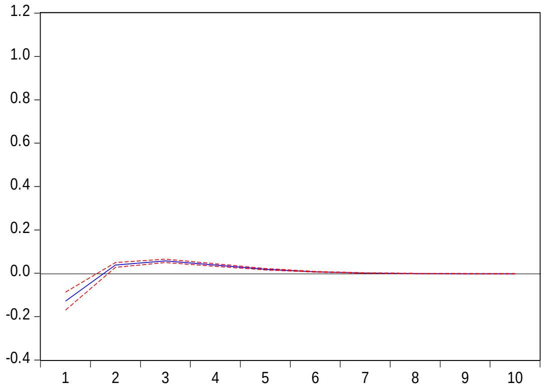


Figure 9A: Response of CFXC to shock in PIC

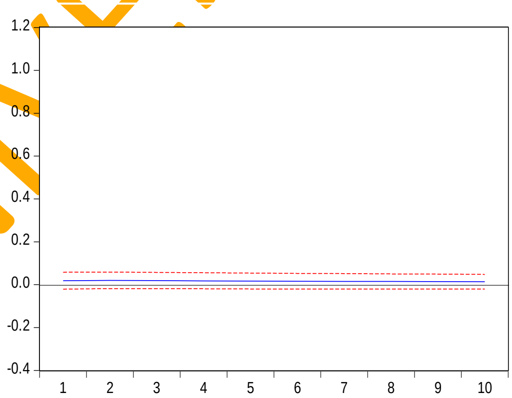


Figure 10A: Response of ER to shock in PIC

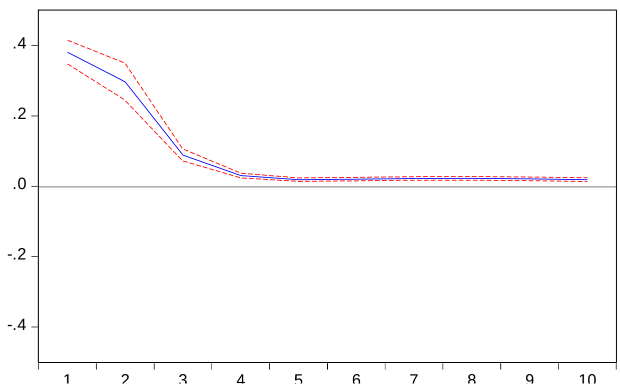


Figure 11A: Response of PIC to shock in GDPC

Sources: Author’s computation

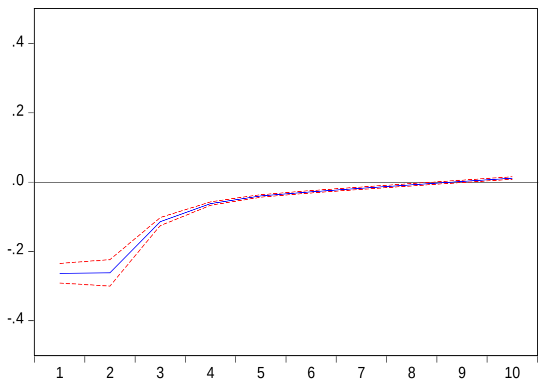


Figure 12A: Response of PIC to shock in GC

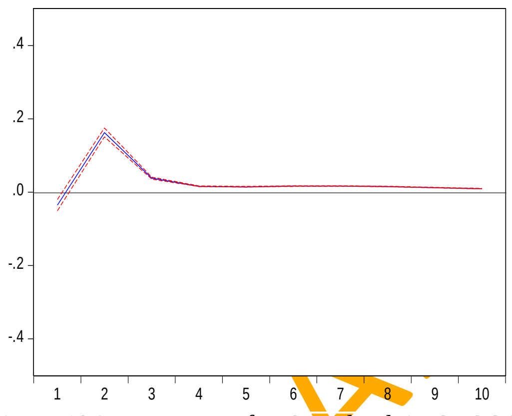


Figure 13A: Response of PIC to shock in GFCCC

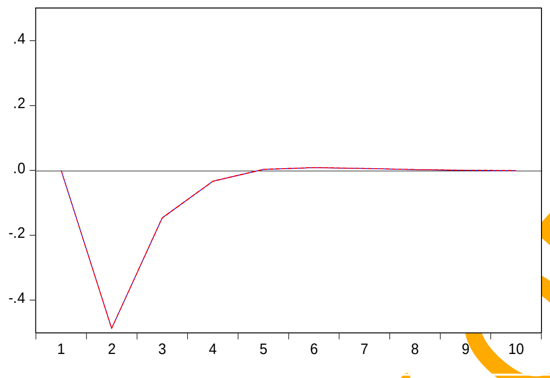


Figure 14A: Response of PIC to shock in CFXC

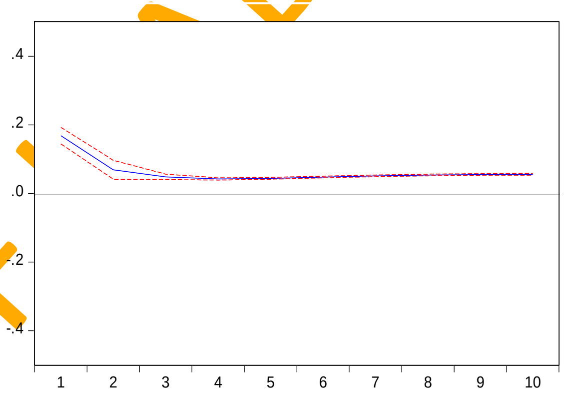


Figure 15A: Response of PIC to shock in ER

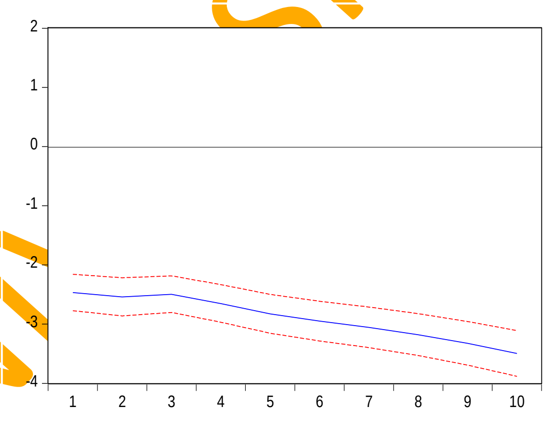


Figure 16A: Response of GDPC to shock in BLC

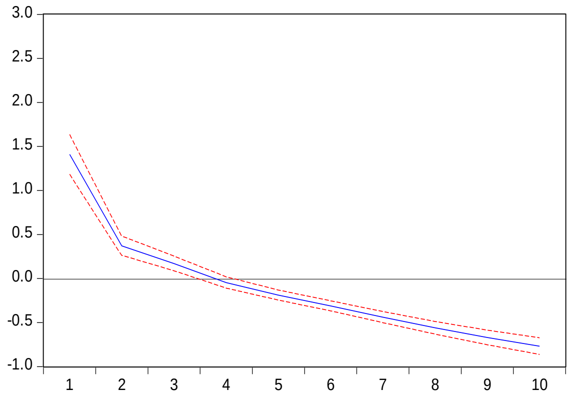


Figure 17A: Response of GC to shock in BLC

Sources: Author’s computation

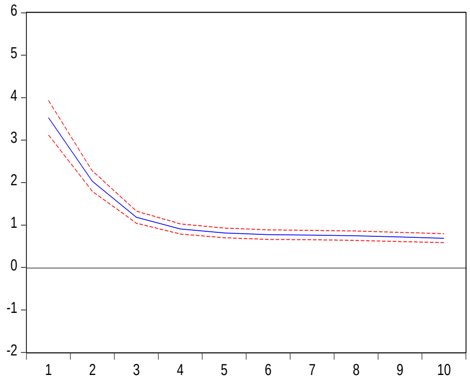


Figure 18A: Response of GFCC to shock in BLC

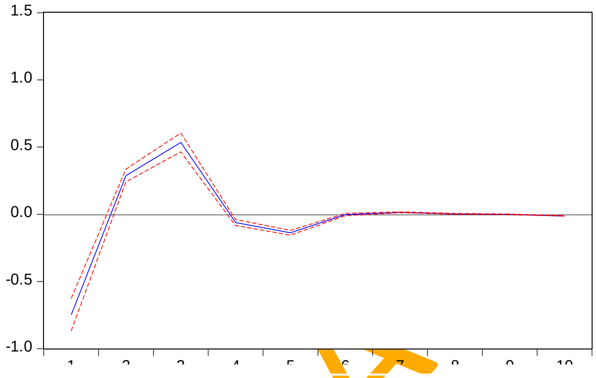


Figure 19A: Response of CFXC to shock in BLC

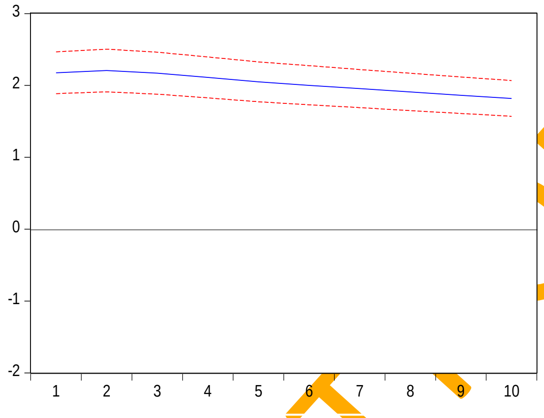


Figure 20A: Response of ER to shock in BLC

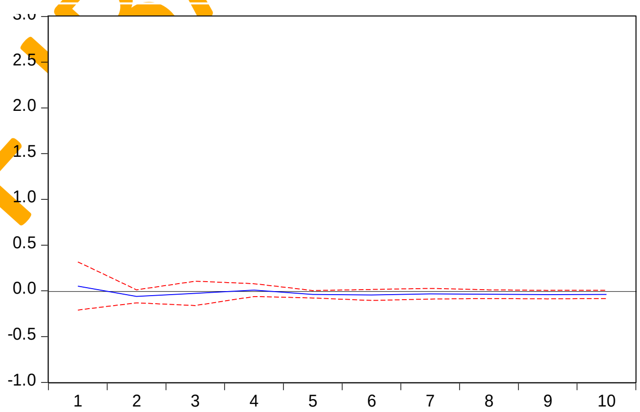


Figure 21A: Response of BLC to shock in GDPC

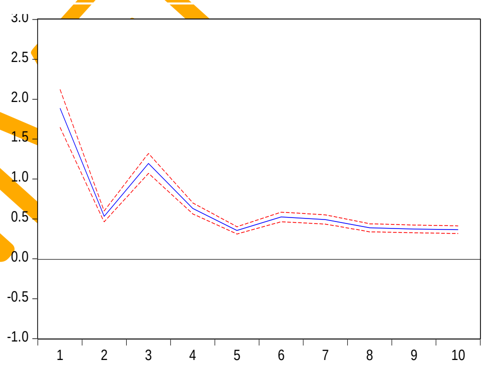


Figure 22A: Response of BLC to shock in GC

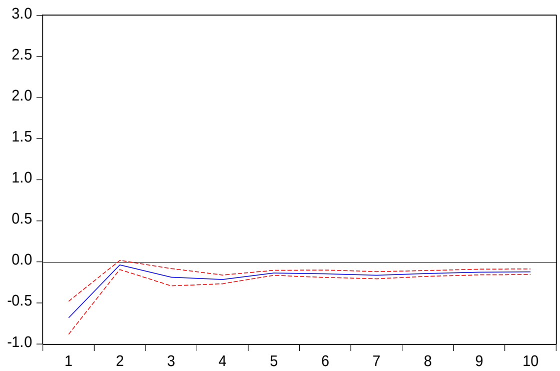


Figure 23A: Response of BLC to shock in GFCC

Sources: Author's computation

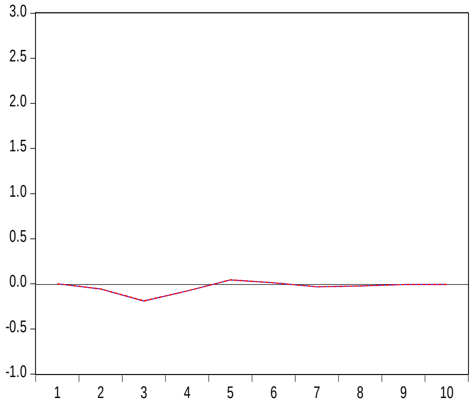


Figure 24A: Response of BLC to shock in CFXC

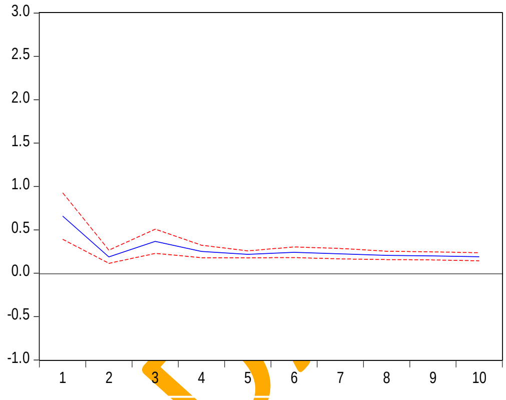


Figure 25A: Response of BLC to shock in ER

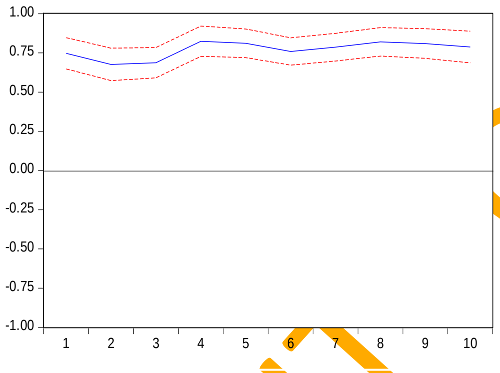


Figure 26A: Response of GDPC to shock in FDIC

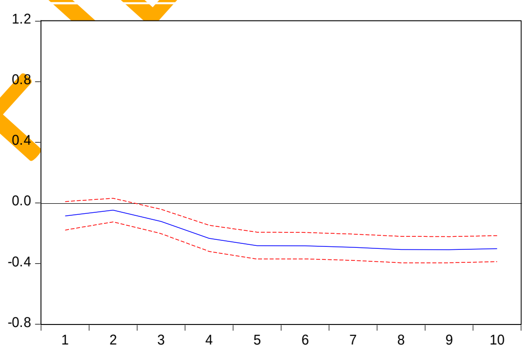


Figure 27A: Response of GC to shock in FDIC

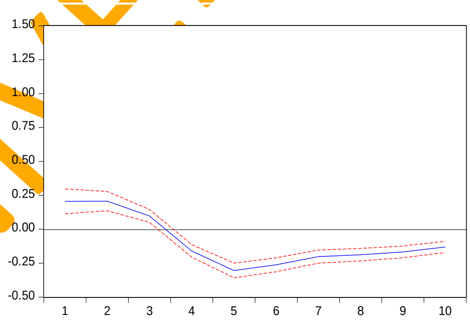


Figure 28A: Response of GFCC to shock in FDIC

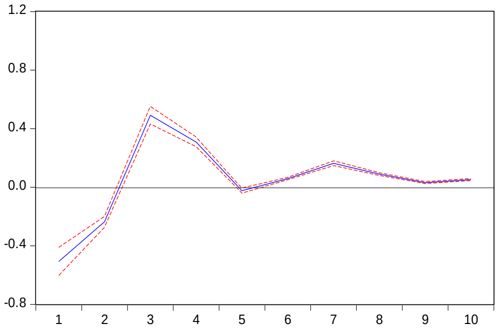


Figure 29A: Response of CFXC to shock in FDIC

Sources: Author’s computation

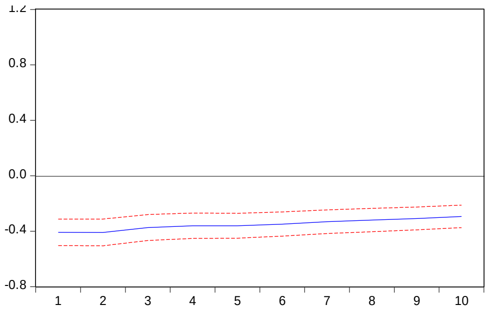


Figure 30A: Response of ER to shock in FDIC

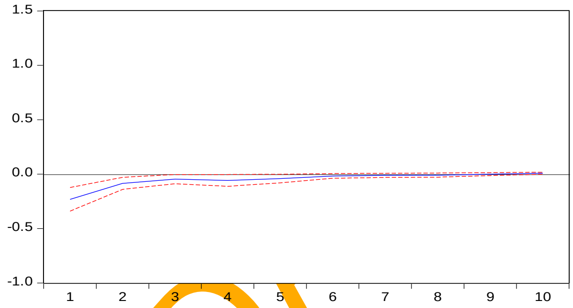


Figure 31A: Response of FDIC to shock in GDPC

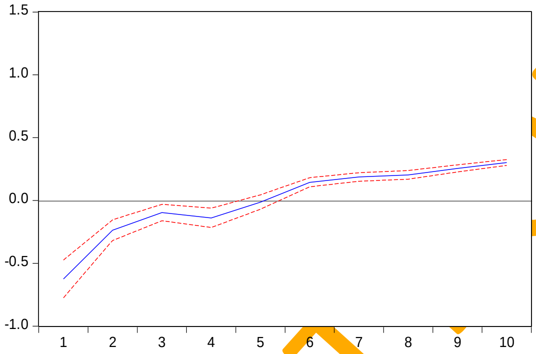


Figure 32A: Response of FDIC to shock in GC

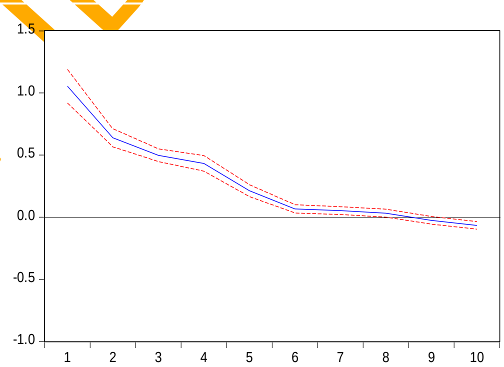


Figure 33A: Response of FDIC to shock in GFCC

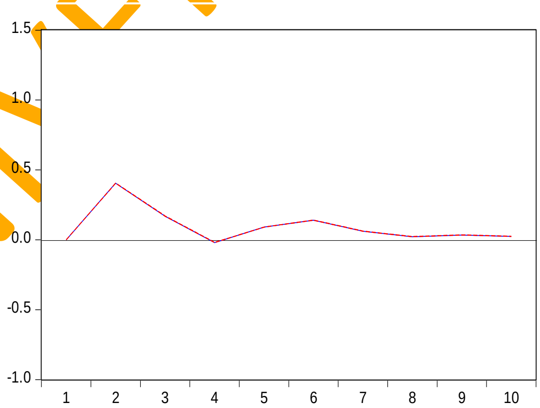


Figure 34A: Response of FDIC to shock in CFXC

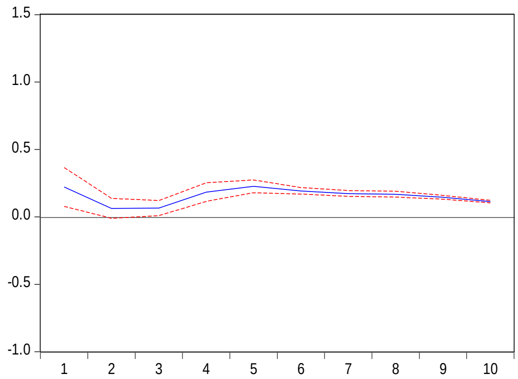


Figure 35A: Response of FDIC to shock in ER

Sources: Author's computation

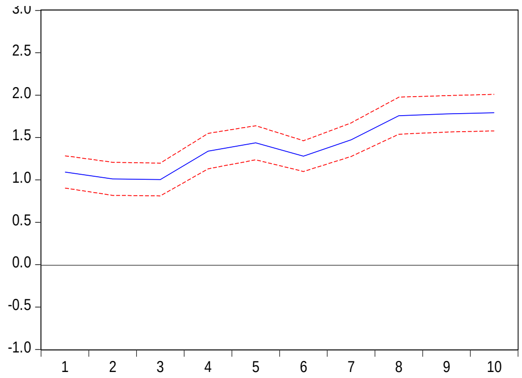


Figure 36A: Response of GDPC to shock in NFDIC

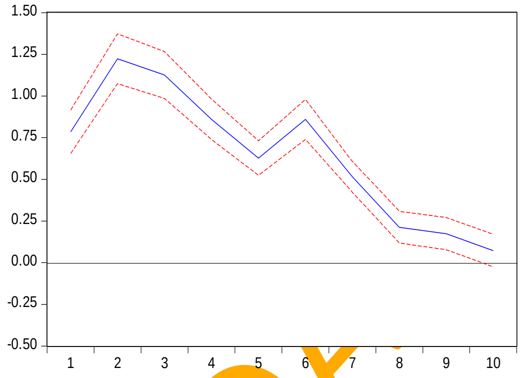


Figure 37A: Response of GC to shock in NFDIC

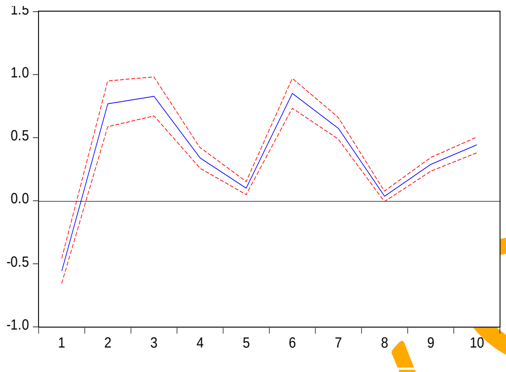


Figure 38A: Response of GFCC to shock in NFDIC

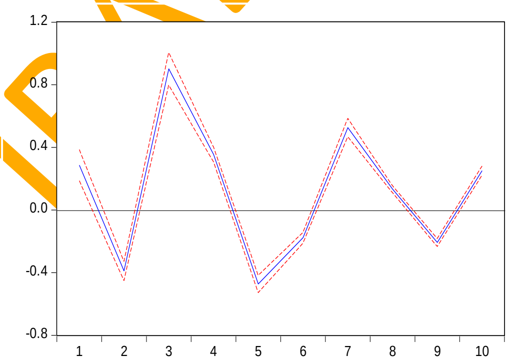


Figure 39A: Response of CFXC to shock in NFDIC

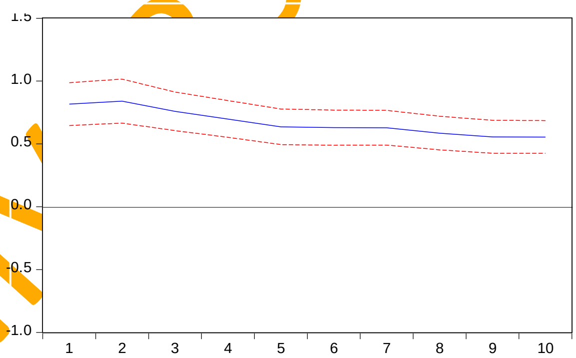


Figure 40A: Response of ER to shock in NFDIC

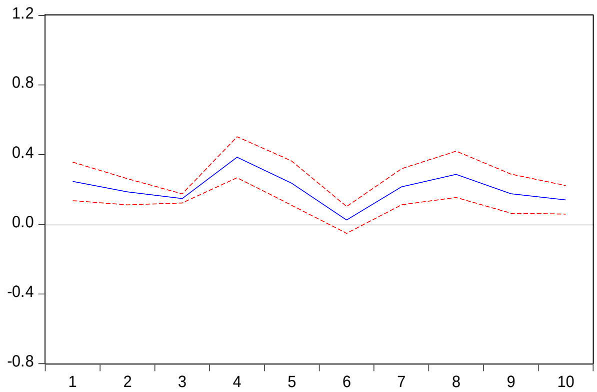


Figure 41A: Response of NFDIC to shock in GDPC

Sources: Author's computation

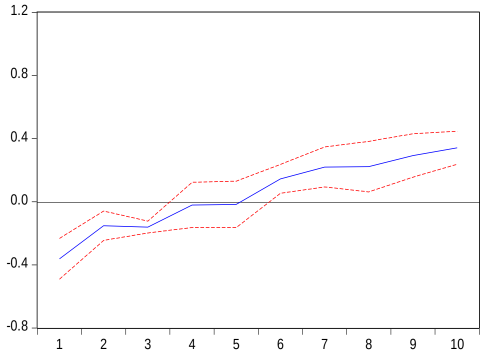


Figure 42A: Response of NFDIC to shock in GC

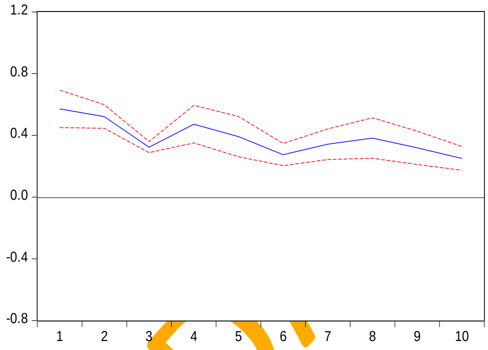


Figure 43A: Response of NFDIC to shock in GFCC

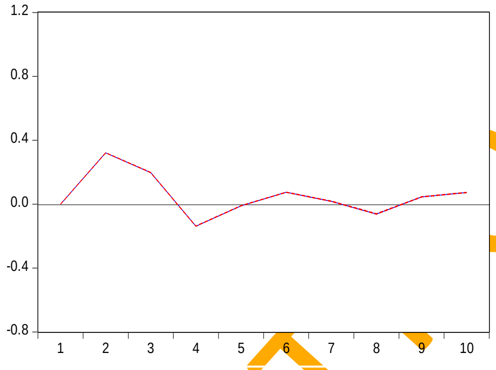


Figure 44A: Response of NFDIC to shock in CFCX

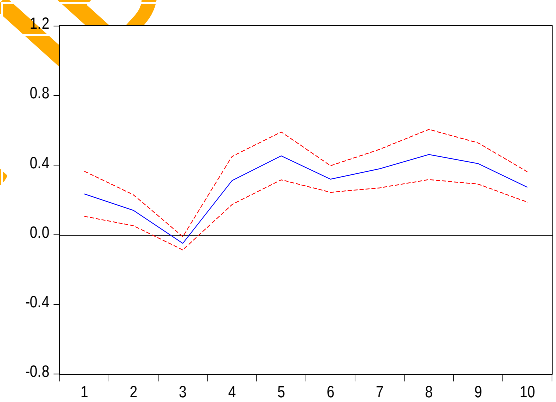


Figure 45A: Response of NFDIC to shock in ER

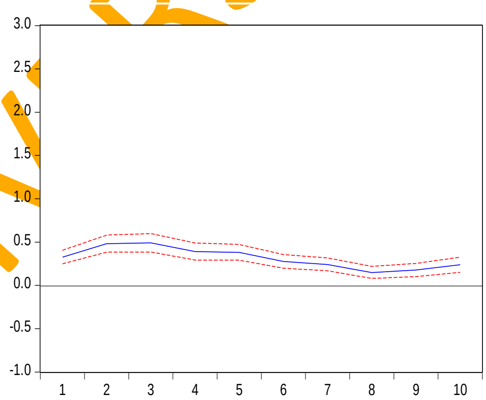


Figure 46A: Response of GDPC to shock in NPIC

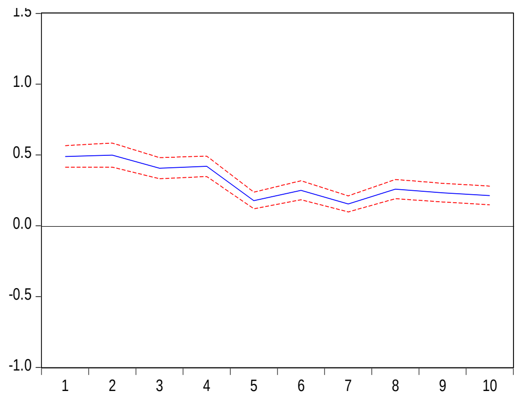


Figure 47A: Response of GC to shock in NPIC

Sources: Author's computation

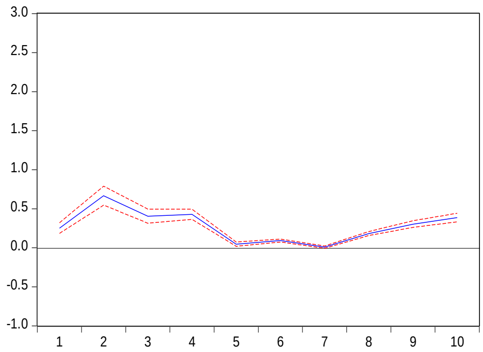


Figure 48A: Response of GFCC to shock in NPIC

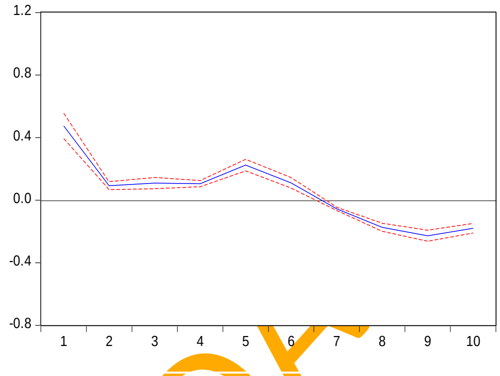


Figure 49A: Response of CFXC to shock in NPIC

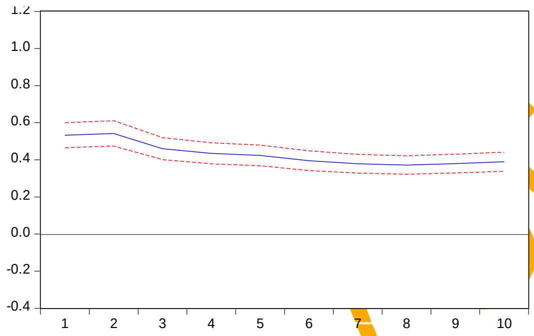


Figure 50A: Response of ER to shock in NPIC

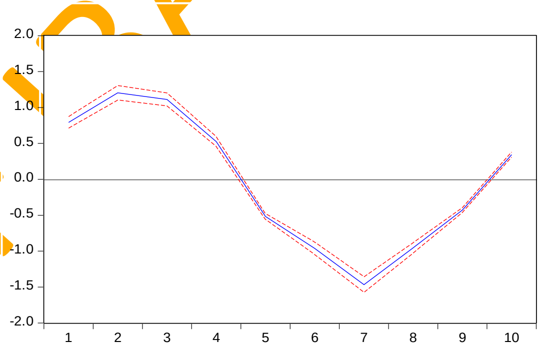


Figure 51A: Response of NPIL to shock in GDPC

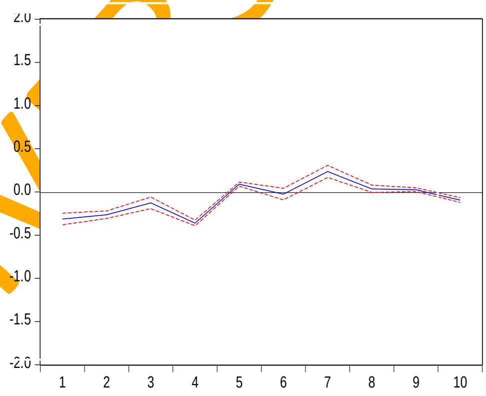


Figure 52A: Response of NPIC to shock in GC

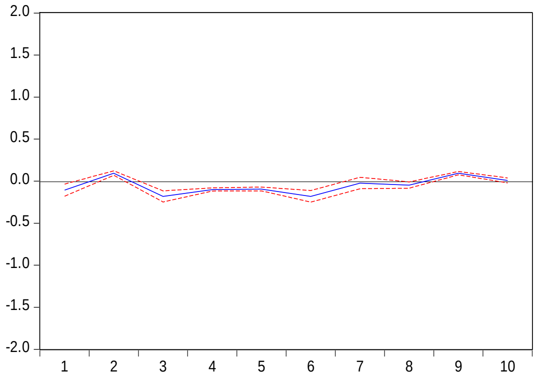


Figure 53A: Response of NPIC to shock in GFCC

Sources: Author's computation

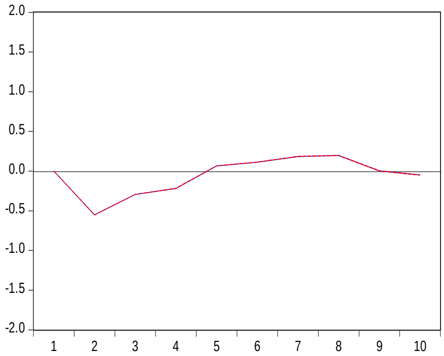


Figure 54A: Response of NPIC to shock in CFXC

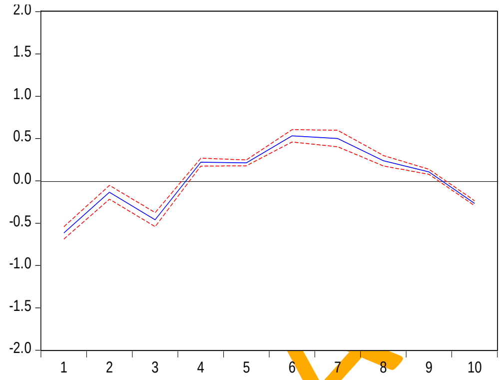


Figure 55A: Response of NPIC to shock in ER

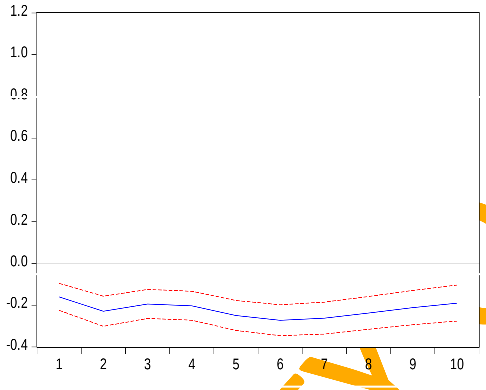


Figure 56A: Response of GDPC to shock in NBLC

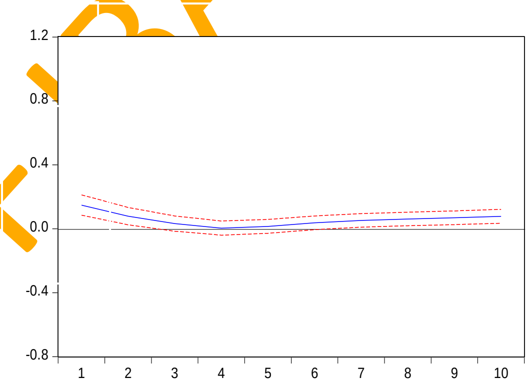


Figure 57A: Response of GC to shock in NBLC

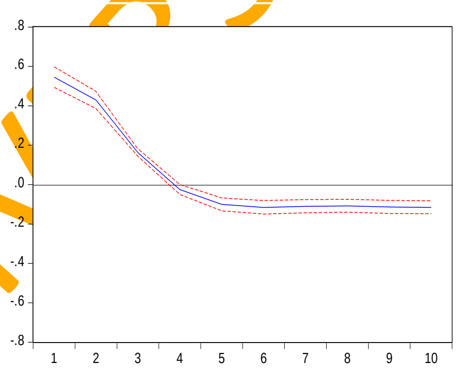


Figure 58A: Response of GFCC to shock in NBLC

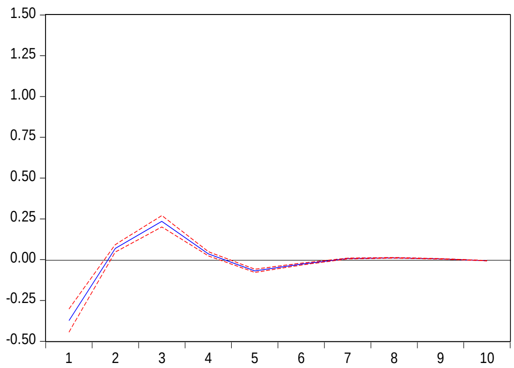


Figure 59A: Response of CFXC to shock in NBLC

Sources: Author's computation

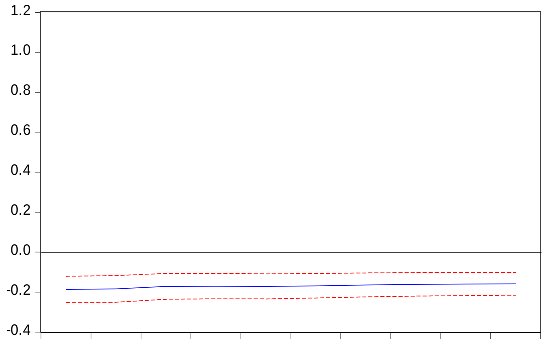


Figure 60A: Response of ER to shock in NBLC

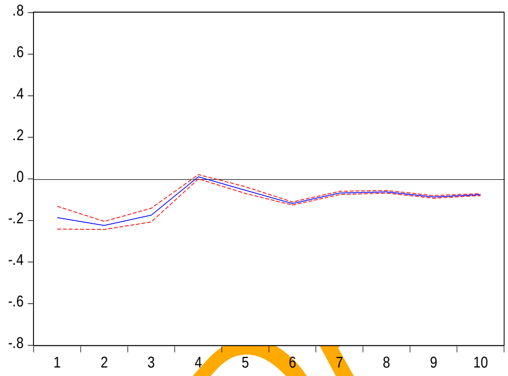


Figure 61A: Response of NBLC to shock in GDPC

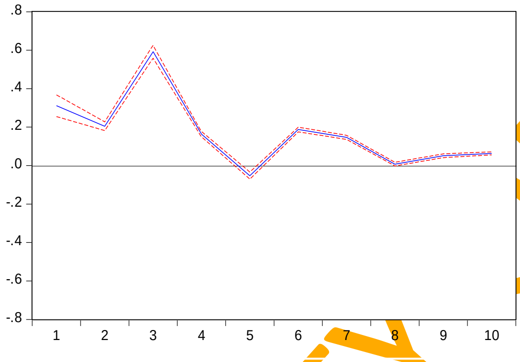


Figure 62A: Response of NBLC to shock in GC

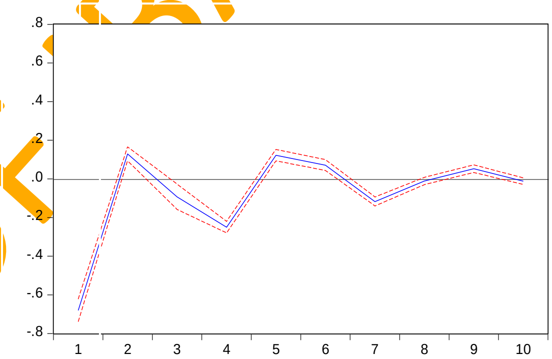


Figure 63A: Response of NBLC to shock in GFCC

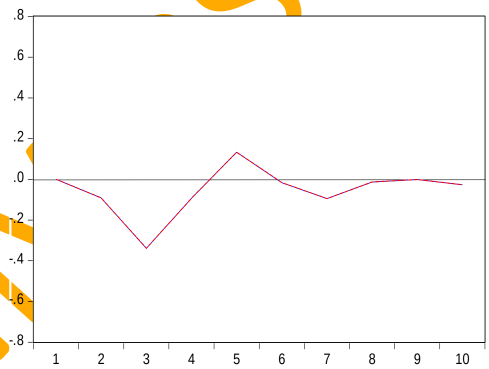


Figure 64A: Response of NBLC to shock in GC

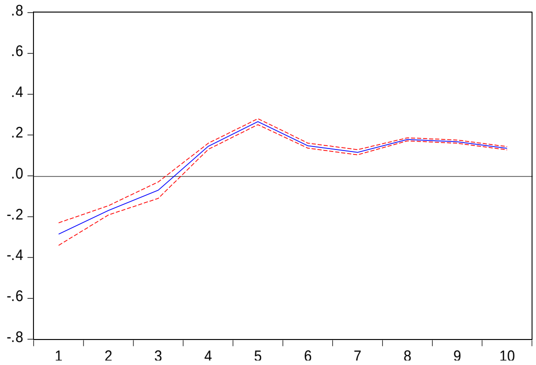


Figure 65A: Response of NBLC to shock in GFCC

Sources: Author's computation