MITIGATING THE EFFECTS OF EXTERNAL DEBT BURDEN IN AFRICA

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DECLARATION

I declare that this dissertation is my own unaided work. It is submitted for the degree of Doctor of Philosophy in Economics, University of the Witwatersrand, Johannesburg. It has not been submitted to this university or any other university for any other degree or examination.

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10/15/2010

DEDICATION

This work is dedicated to my father, Jethro Alusiola Muhanji, who did not live to see me fulfill his dream, my late uncle, Samuel Litswa Muhanji, who urged on me to pursue my doctorate degree and, my mother, Timina Efedha Muhanji, for her prayers, affection and support.

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I take responsibility for all errors and omissions.

ABSTRACT

This dissertation looks at how African countries can mitigate the effects of external debt burden. African countries are enmeshed in unsustainable external debts that have led to debt overhang problems, declining output, escalating current account deficits and worsening human welfare indicators. These external debt burdens are further worsened by the structural weaknesses of these economies. The World Bank and the International Monetary Fund have initiated strategies aimed at trying to arrest the escalating debt burden such as rescheduling, structural adjustment programs and the highly indebted poor countries initiative. However, African countries continue to experience difficulties in servicing external debts. The objective of this study is to find ways by which African countries can effectively manage their debt burden and possibly come up with self pre-qualification schemes that would forestall future external debt problems. The questions the study seeks to answer are: how can African countries effectively manage their current debt burden? What can African countries do to forestall the pervasive external debt accumulation in the future?

To address these questions, I develop a dynamic stochastic general equilibrium model of external debt burden for Africa. The model is estimated using the maximum likelihood method by applying the Kalman filter to the state space representation of the model. Empirical results of the model suggest that African countries need to refine their basket of imports and mainly import inputs that can be used in the production sector as opposed to importing consumption goods. Most importantly, these countries must re-think their export products and markets, and perhaps endeavor to export final goods as opposed to exporting primary commodities.

Furthermore, simulations of the model show that an expansionary monetary shock and a favourable world commodity price shock leads to an increase in external debt. On the other hand, the world interest rate shock leads to a fall in external debt. An interesting result worth highlighting is that a favourable commodity price shock leads to an increase in imported investments but the increase in imported investments does not translate into increased output. On the other hand, an unfavourable world interest rate shock leads to a fall in imported investments. Generally, these findings suggest that African countries are vulnerable to external shocks.

In pursuit of the second objective – possible ways of sourcing external debt and managing it sustainably – I find that the appropriate threshold level for debt sustainability is a ratio of external debt to gross domestic product of between 40%-60% for Africa compared to 120%-150% for Latin America. Surprisingly, East Asia has the lowest significant debt sustainability threshold of the three emerging market regions. On liquidity, which is captured by the short-term debt to reserves ratio, the threshold is 60%-80% for all the three regions. On governance, a stable political environment plays a crucial role in determining the external debt burden of African countries. An improvement in the legal system and a stable political environment leads to an increase in exports and a fall in consumption imports. These in turn reduce foreign debt. These findings suggest that African countries must pursue proper governance practices if they are to appropriately and effectively manage their external debt in ways that enhance economic progress instead of economic retardation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

"*If a despotic power incurs a debt not for the needs or in the interest of the State, but to strengthen its despotic regime, to repress the population that fights against it, etc., this debt is odious for the population of all the State. This debt is not an obligation for the nation; it is a regime's debt, a personal debt of the power that has incurred it, consequently it falls with the fall of this power*".

Alexander Sack, 1927.

1.1 Background of the Study

For over 25 years since the early 1980s, Africa's[1] external debt burden has been unmanageable. The inability of the region's countries to service their debts is not only reflected by the massive build-up of arrears, but also by the number and frequency of debt rescheduling. The attendant burden of the debt and the debt service payments are compounded by the serious structural weaknesses of African economies, such as lack of diversified export base, which makes it more difficult for the countries to adjust to changing world demand for tradable goods and changing production patterns. Further, much of Africa's accumulated debt is as a result of ill-conceived creditor supported development projects, flawed policies and strategies that originated from development co-operation agencies in exchange for cold war support, and short sighted policy decisions by African leaders. These weaknesses constrain these countries from achieving the kind of high and sustainable growth that is necessary for mitigating, if not forestalling, needless external debts and their attendant problems.

The severity of this problem can be seen from the large size of the current debt relative to income, and the attendant high debt service payments. From an estimated total of $6 billion at the end of 1970, the external debt of African countries rose to US$84.9 billion in 1981 and then rose further by 318 percent to US$270.3 billion in 2004. During the same period, the nominal value of exports declined from US$49.3 billion in 1980 to US$25.9 billion in 1986 and stagnated at an average of US$27 billion due to falling commodity prices. Stagnant exports increased the pressure to borrow abroad and that weakened the economic base for servicing the debt. Debt as a percentage of GDP rose by 525 percent from 14.5 percent in 1971 to 76.2 percent in 1994 and declined marginally to 51.1 percent in 2004. In fact, Africa's external debt as a proportion of GDP is the highest in the world. Debt to export ratio rose from 82.6 percent in 1980 to 279.2 percent in 1994 but declined

[1] In this study, Africa represents the southern region of the African Continent, which the Washington institutions call Sub-Saharan Africa (SSA).

to 176 percent in 2003. In the early 1990s, Africa's debt to export ratio was higher than that of any region except Latin America and the Caribbean. However, between 1993 and 2002, Africa's debt to export ratio became the highest among developing regions of the World. These ratios point to a worrying Africa's absolute inability to service its external debt.

The debt service payment of the African region rose from under US$1 billion in 1970 to over US$10 billion in 1980, representing about 25 percent of export earnings; and it moderately increased to 28.7 billion in 2006. The high debt service payment meant that a significant proportion of earned hard currencies are consumed by debt, thereby limiting the countries' ability to import necessary intermediate products. The debt service also gobbles up a considerable share of the budget in many countries and consequently imposes significant constraints on domestic investment (Osei, 1995).

The average net transfers for 1997 and 1998, for example, was US$10 billion, an amount spent by African governments entirely on servicing debt which was equivalent to more than 5 percent of the region's GDP (World Bank, 1999). This amount represented more than the sub-continent's combined expenditure on primary health care and basic education for those two years. These relatively huge transfers from the world's poorest region to the richest region are slowly but inexorably consigning most of these countries to a future of deepening poverty and helplessness. In fact, the African continent is the only developing region of the world where human welfare indicators are worsening, with the proportion of people living below the poverty line increasing.

Excessive stock of external debt has retarded economic growth, and hampered the socioeconomic development of African countries. In many African countries, debt servicing in the face of inadequate foreign exchange earnings lead to severe import strangulation, which holds back export growth, thus perpetuating vital inputs import shortages (Iyoha, 1999). Falling investment combined with shortages of essential imported inputs results in declining real output. Declining output and escalating current account deficits lead to increasing debt accumulation and rising debt servicing obligation.

1.2 Motivation for this Study

Between 1975 and 1985, African countries embarked on rescheduling as a conventional method of debt management. However, rescheduling compounded the debt problem as debtors had to pay a

lot more in interest (for example via recapitalization) than they had originally contracted. The World Bank and International Monetary Fund (IMF) came up with Structural Adjustment Programs (SAPs) that were supposed to rescue debtor countries by essentially making their budgetary thrust contractionary. Instead, SAPs literally squeezed out every possible penny from ailing African economies in order to pay for bilateral and multilateral debts. In a belated and seemingly reluctant attempt to address the pervasive stifling effects of debt burden on most of the developing world, creditor countries came up with the Highly Indebted Poor Countries (HIPC) initiative in 1996 as a debt management scheme. Its design was to write off the debts of heavily indebted countries.

However, the major challenge of the HIPC initiative turned out to be its voluntary nature, which led to low participation by bilateral creditors. There is also no legal basis requiring creditors to participate and provide debt relief on terms comparable to those granted by credibly committed creditors. Despite the efforts made to reduce Africa's debt, the African countries continue to experience difficulties in managing the servicing of their relatively high stocks of external debt. This study seeks to find ways by which African countries can effectively manage their debt burden and possibly come up with self pre-qualification schemes that would forestall future debt burdens.

Key questions

1. How can African countries effectively manage their current debt burden?
2. What can African countries do to forestall the occurrence of such high external debt accumulation in the future?

1.3 Goals of the Study

1. Present an overview of the current debt problems among African countries.
2. Derive a macroeconomic model of external debt, fit empirical data to it, and assess the impulse responses of pertinent variables in the model.
3. Come up with possible prequalification schemes for better debt sourcing and management.

1.4 Key Findings and Innovations of the Study

African countries have a tendency of being characterized by unsustainable external debts. Despite efforts made by the World Bank and IMF through the HIPC initiative to cancel external debts of

low income countries, lending to these countries remain as high as before. This study therefore provides concrete measures of debt management gains that are possible were African countries to adopt best practices in debt relevant macroeconomic management and governance infrastructure provision from other regions of emerging market economies. To the best of my knowledge, there are no clearly computed thresholds for debt sustainability for African countries. While computing the thresholds, I used Latin American and East Asian countries as benchmarks. What came out is that different regions have their own threshold levels of sustainable external debts. Specifically, African countries' external debt to gross domestic product should range between 40%-60% whilst the short-term-debt to international reserves ratio should range between 60%-80%.

Additionally, I computed the equivalent effect of a change in institutional and policy variables *vis-à-vis* exports and consumption imports. In computing the equivalent effects, I followed Asiedu (2006) who computed similar effects on foreign direct investments. I found that if African countries pursue export promotion policies similar to those of East Asian countries, they would boost their exports and thus reduce their foreign debts.

Another key contribution to the literature is that I derive a dynamic stochastic general equilibrium model for African countries. It is a microeconomic-based macroeconomic model and even though it shares some of the basic features of the small open economy models, it differs in two aspects. First, I include foreign debt in my model. Second, in simulating the model, I first solve the 11 dimensional model using Matlab and then I use the roots of the matrix quadratic equation to compute impulse responses unlike other studies that use the vector autoregressive method to compute impulse responses. The key finding from the model is that exports reduce debt accumulation whilst consumption imports increase debt accumulation. The simulations show that an expansionary monetary shock and a favourable world commodity price shock lead to an increase in external debt. On the other hand, an increase in world interest rates leads to a fall in external debt.

1.5 Limitations of the Study

In chapter three where I develop the model, I balance external debt as an arbitrage condition between exports and imports. I did not include transfers and fiscal policy into the equation whereas government spending and capital outflows play a major role on external debt accumulation

especially for African countries. The main focus of the study is on external debt and not public debt and consequently, the study does not take into account the budgetary implications of debt.

There is also limitation on the availability of data on capital stocks for all sampled countries with the exception of South Africa. Hence, I computed those countries' capital stocks using King and Levine (1994) and Limam and Miller's (2004) perpetual inventory method.

1.6 Outline of the Study

In order to answer the aforementioned questions and achieve the goals of the study, the next chapter presents a review of debt crises effects on African countries and the consequences of these crises on their economies. The effectiveness and/or ineffectiveness of SAPs and other debt management initiatives such as HIPC, Paris club and rescheduling are reviewed.

Chapter three derives a macroeconomic model of external debt's potential burden. The model has similar features of real business cycle (RBC) models such as first, firms and households optimize explicit objective functions subject to the resource and revenue constraints that they face. Second, all agents have rational expectations and there is continuous market clearing. Third, actual cycles are generated by providing a propagation mechanism for shocks. In addition to these features, I model the evolution of foreign debt. In my model, foreign debt balances into an arbitrage condition between exports and imports. Another plausible assumption included in my model is that monetary authorities pursue money growth as their monetary policy following McCallum (1994) but money supply is driven by inflation gap and output gap following Taylor (1993). The policy of money growth is in line with the actual practices of monetary authorities in this economy. If the economy is not growing, this money growth policy weakens the external value of its currency and increases the burden of servicing external debt.

The model derived in this chapter is an eleven-dimensional model and it is estimated for 11 African countries. To solve the linear version of the model, I make use of Uhlig's (1999) method of undetermined coefficients. I subsequently run simulations of 50 time periods to assess the model's impulse responses of important economic variables to debt-related macroeconomic shocks.

Chapter four derives possible national strategic schemes for better debt sourcing and management. In this chapter, I compute debt sustainability and liquidity thresholds for external debt using a panel data of 11 African countries. I use middle income Latin American and East Asian countries as benchmarks in establishing Africa's debt sustainability and liquidity levels. I also analyze the role that governance plays in external debt accumulation and thus, implied potential effective external debt policy. Finally, chapter five concludes the study.

CHAPTER TWO: THE REVIEW OF DEBT CRISES EFFECTS ON AFRICAN COUNTRIES

2.1 Definition of Debt Crises and their History

The inception of the debt crisis refers to a period in the early 1980s when countries in emerging market economies reached a point where their foreign debt exceeded their earning power and they were not able to service their debt. Un-payable debt is a term used to describe when the interest cost on external debt exceeds the amount that the country produces (earns), thus preventing the repayment of the debt.

Between 1968 and 1973, the World Bank played a major role in the indebtedness of emerging market economies. It urged on these countries of "the South" to borrow massively to finance the modernization of their export 'apparatus' and to draw them more tightly into the world market. These loans constituted the multilateral part of the external debt equation. When the world economy went into a recession during the 1970s and early 1980s, and oil prices skyrocketed, it created a breaking point for most developing countries. Importantly, much of the current levels of debt were amassed following the 1973 oil crisis when the members of Organization of Petroleum Exporting Countries (OPEC) pushed the price of oil up, making the oil-producing Arab nations very wealthy.

The OPEC members decided to deposit their oil earnings in western banks, which in turn 'recycled' a major portion of the deposits as loans to emerging market economies (Boyce, 1992). The banks lent large amounts of money to developing countries without much attention to where the money would be spent or whether countries would be capable of repaying the amount. While some of this money went towards improving the standards of living for some in these countries, most of the loans never reached the poor of these countries. Instead, it either went towards purchasing of armaments, private bank accounts of dictators, repression of their own people, civil wars or towards inappropriate large scale development projects; many of which proved to be of little value.

The 1973 oil price shock also triggered a worldwide inflation and pushed industrial economies deeper into a recession. The decision to fight inflation by using contractionary monetary policies in the rich industrial economies led to an increase in real interest rates. The resultant slow-down in

growth dampened the demand for commodity imports from Africa. Prices for exportable commodities (largely primary in nature) from Africa weakened while prices of imports (rich countries' exports, then reflecting high cost of energy inputs) for African countries increased, and consequently worsened the terms of trade for the African region.

The debt crisis began in August 1982, when the international markets became aware that Mexico would not be able to repay its loans. Faced with the possibility of losing their investments, lender countries proposed a variety of structural adjustment programs to fundamentally reorient emerging economies. Most called for drastic reduction in public welfare spending, focusing economic output towards direct export and resource extraction, providing attractive investment concessions to multinational investors, increasing the fluidity of investment flows and generally enhancing the rights of foreign investors. In response to the crisis, most developing countries abandoned "wholesale" the import substitution industrialization models for their economies and adopted export oriented industrialization strategy encouraged by the IMF.

According to Ayittey (1999) and Boyce (1992), Africa's debt crisis originated from three basic missteps. First, many of the loans were simply consumed and therefore did not generate the returns needed to repay the loans. Consumption loans were borrowed to finance recurrent expenditures such as paying civil servants' salaries, import of consumer goods and purchase of arms and ammunition. Use of the loans did not produce any foreign exchange earnings. Second, the loans were invested in projects that turned out to be hopelessly unproductive. Africa has more than 3000 state enterprises, majority of them being "white elephants". These enterprises, set up with foreign loans, were supposed to earn or save the foreign exchange needed to service the loan. Instead, they racked up loses upon loses, used up additional foreign exchange and compounded the debt crisis. Third, many foreign loans were contracted under dubious and corrupt circumstances. In 1990, Nigeria discovered that US$4.5 billion of its debt was fraudulent and spurious. While the country sank in debt, its former military rulers amassed huge personal fortunes estimated at US$13 billion (Ayittey, 1999). In 1995, Ghana's debt stood at US$5.5 billion with a population of 17 million. To finance its industrialization drive, the country borrowed heavily from abroad under a supplier credit[2] scheme. Under this arrangement, Ghana bought obsolete equipments at inflated

[2] In a supplier credit arrangement, a fast-talking equipment peddler would sell to Ghana equipment over a period of time, generally 4-6years. The peddler then would obtain credit from private banks, and have it guaranteed by his own country's governmental

prices. For example, it bought three expensive Illyushin jets from the Soviet Union which turned out to be old jets that had been repainted.

As pointed out by Ayittey (1999), most of the funds embezzled by Africa's "Kleptocrats" were siphoned out to overseas (Western) banks. An estimated US$20 billion flees the continent annually. In Democratic Republic of Congo (formerly Zaire), Mobutu Sese Seko erected an institutional structure that allowed him rapid accumulation of wealth from foreign borrowing. His control over the central bank allowed him to transfer money directly into his personal accounts and secret budget lines. He also diverted large amounts of government funds through "special accounts" that only he and his appointees had access (Ndikumana and Boyce, 1998). While the country had a debt of US$9.6 billion in 1997, Mobutu bragged to be among the World's richest individuals. His personal fortune was estimated to be between US$10 and US$15 billion, more than enough to pay off Zaire's entire foreign debt (Ayittey, 1999).

The creditors also had their fare share in contributing to the exacerbation of Africa's external indebtedness. First, the Western governments and development agencies failed to exercise prudence in the grant of aid and loans to African governments. Much of the aid was used to finance grandiose projects of little economic value and to underwrite economically ruinous policies. For instance, in 1983, the US built silos in Senegal and placed them in locations where peasant farmers never visited. In 1980s, Canada funded a fully-automated modern bakery in Tanzania but there was no flour to bake bread. In Somalia, the Italian government funded a banana-boxing plant but the production capacity needed to make the plant break-even exceeded the country's entire output of bananas. In Northern Kenya, the Norwegian government built a fish freezing plant in the 1980s to assist the Turkana people but the Turkana do not fish, they raise goats (Ayittey, 1999). This fish freezing plant could have been more economically viable for Kenya if it was located in the Lake Victoria region. African leaders are equally culpable for permitting such edifices to be built knowing that there were no logical bases to support them. In view of the fact that African leaders permitted these edifices to be built knowing that there were no logical bases to support them, they are equally culpable in intensifying the external debt burden.

export credit insurance organization. After this arrangement, any future dealings will be between Ghana and the export credit organization, not the peddler.

Second, foreign aid allocations were often cocooned in bureaucratic red-tape and shrouded in secrecy. The programs lacked transparency and the people being helped were seldom consulted. In this way, the donors set themselves to be duped. In fact, corruption in the use of Zairian loan proceeds was widely reported in the press and official documents but creditors, particularly governments and multilateral institutions, continued to give loans to Congo (Ndikumana and Boyce, 1998). For example, the United States gave Mobutu Sese Seko nearly US$1.5 billion in various forms of aid since the time he took power in 1965 but Mobutu claimed that during the cold war he and his fellow African autocrats were fighting the Soviet Union influence and were unable to concentrate on creating viable economic and political systems. The reality is that during that time Mobutu was becoming one of the World's wealthiest individuals while the people of Zaire were being pauperized (Millet and Toussaint, 2004; Ayittey, 1999).

Third, the West knew that billions of dollars were being transferred to Swiss and other Western banks by greedy African leaders and elites instead of being used for the purported reasons for which African governments borrowed the funds. It was profitable for the banks of the "North" since the money that came back into their coffers could be loaned again to reasonable others who would service their debts. For instance, in 1988 France sent US$2.59 billion in aid to Africa but in the same year, nearly US$1.2 billion (47 percent of the total aid) was exchanged in Europe by the bank of France, some of it exported in suitcases. In 1991, US$200 billion or 90 percent of the region's GDP was shipped to foreign banks, an amount that was more than half of its total debt. In fact, Ndikumana and Boyce (2003) argue that out of every dollar that was borrowed from abroad by African countries, as much as 80 cents was channeled back abroad as capital flight. In 1980s and 1990s, about over US$98.8 billion was stashed away by Nigerians to foreign banks (Swiss, German, United Kingdom and United States).

For Africa as a whole, whereas its total external debt stood at US$178 billion in 1996, its cumulative capital flight amounted to US$193 billion, which indicates that capital flight exceeded stock of debt by US$14.5 billion (see Boyce and Ndikumana, 2001 and 2002, for details). By 2004, capital flight (US$420 billion) exceeded external debt (US$270 billion) by US$ 150 billion. Apparently, these large sums of money from developing countries were moved between banks in Western countries without eyebrows being raised (Aluko, 2000). As Boyce and Ndikumana (2002) noted, creditors continued to pour loans into the hands of corrupt regimes, despite ample

evidence that these funds were not being used for legitimate purposes. Sound banking practices would have dictated a moratorium, if not a cease and desist, on lending to such governments. Failure to halt lending suggests either that creditors were shielded from losses or that they were pursuing other objectives.

Africa's debt can also be linked to the dependency theory. Africa, by design and default, pursued mono-crop and primary macro-economy systems, driven largely by agriculture. This, in turn, created unfavorable terms of trade, generated chronic balance of payments problems, and consequently spawned new pressures towards borrowing from external sources. In the wake of the 1982 Mexican moratorium, African countries took radical policy measures to reduce current account deficits in order to generate foreign exchange for debt service payments. The measures included drastic cuts in imports, and sought to substantially increase exports. Due to structural rigidities of African economies, worsening terms of trade, inelasticity of demand for commodities and protectionist measures practiced by the developed countries, most of the resources needed to honor debt service obligations had to be raised through reduction in imports which, in some cases, were as high as 55 percent of GDP. African countries increased their production of export commodities (tea, coffee, groundnuts, cocoa, cotton, copper, etc) in order to sell more to the international market but both the demand and prices for their primary export products did not increase. Rather the surplus primary product exports led to severe collapses in the prices of export commodities in 1986, resulting in loss of export earnings of more than US$19 billion. In 1986, the magnitude of the debt that Africa had to service using reduced foreign earnings reached US$200 billion. Further, a larger part of this debt was as a result of fluctuations in exchange rates.

The external debt of Africa witnessed a rapid build-up during the period immediately after the global debt crisis, with external debt obligations skyrocketing from US$72.4 billion in 1980 to US$ 223 billion in 1995. By 2004, the external debt of Africa had increased to US$ 270.3 billion. The sharp external debt build-up in the post-1989 period was attributable to continued decline in the terms of trade, uncontrolled fluctuations in export earnings, higher international interest rates, realignment of exchange rates and, rescheduling and refinancing of Africa's external debt. In fact, increases in Africa's external debt since 1982 can be attributed to exogenous factors largely beyond the control of the countries. Indeed, the doubling of Africa's external debt stock in the

1980s took place against the background of when countries borrowed virtually no additional money for productive investment but the meager borrowing was directed mainly to debt servicing.

Debt itself became a self-generating phenomenon that created an even heavier burden when debtor countries rescheduled their debt. Of the 42 countries that rescheduled their debt between 1975 and 1985, 19 were from the African region. As from 1986 to 1990, the IMF extracted through debt rescheduling over US$3 billion more than it gave as development or stability loans to low-income countries in Africa. On aggregate, as a consequence of rescheduling, Africa's interest payment more than doubled from US$0.5 billion in 1975 to US$1.4 billion in 1979 and by 1990, it had risen to US$5.3 billion. In fact, by 2005, interest payments on debt for Africa had skyrocketed to US$8.1 billion. Thus, although foreign loans were supposed to alleviate the recipient's budgetary crisis, the result in reality was and is that debtors are continuously digging a new pit to fill the old one (Akokpari, 2001).

Although the share of Africa's debt as a proportion of the total debt of developing countries is low, the relative debt burden borne by African nations remains high. This external debt is largely long-term. Moreover, there is a growing importance of debt owed to bilateral and multilateral creditors, a trend away from concessionality[3] to non-concessionality and an increase in the importance of interest and principal arrears (usually capitalized through the Paris and London clubs) as a component of long-term debt. Indicators of the debt burden also disclose that African countries' total debt is enormous relative to the capacity of the economies, and, in particular their export sectors.

2.2 Effects of External Debt on Emerging Market Economies and Africa

2.2.1 Empirical Evidence of Debt on African Countries

Most African countries have been subjected to net financial outflows (of debt servicing related flows) since the mid 1980s. The performance of these economies, coupled with a mounting debt burden, indicates that African countries are incapable of simultaneously servicing their debt and attaining a reasonable level of economic growth, let alone addressing issues of poverty alleviation.

[3] External debt with concessionality is a loan contracted at below market interest rates with a grace period and a longer term to maturity.

The repayment of a debt which has swollen to colossal proportions prevents the populations from satisfying their most basic needs.

Debt grew more rapidly than exports as shown by the debt export ratio which increased by 338 percent from 82.6 percent in 1980 to 279.2 percent in 1994. It declined to 249 percent in 1999 and has since been declining (see Table 2.1 below). The high debt export ratio is of great concern because of its negative effects on investment and savings. The high ratio points to potential debt servicing problems, because most of the foreign currencies needed to service foreign debt largely come from export earnings (which are frequently denominated in foreign currencies). The high debt-to-exports ratio show that African countries' external debt increases faster than exports. The high debt exports ratio for Africa are indications that Africa's debt is unsustainable and likely un-repayable. The debt as a fraction of exports of goods and services is among the highest in the developing World as can be seen in Table 2.1 below.

Table 2.1: Comparative Data for External Debt to Export Ratio

Year	Emerging Markets & Developing Countries	Africa	Sub-Saharan (SSA) Africa	Western Hemisphere	Developing Asia	Middle East
1980	88.0	95.5	82.6	202.3	121.3	26.9
1981	101.2	125.7	120.3	234.0	130.6	29.4
1982	124.2	161.4	164.4	298.4	148.1	41.8
1983	138.2	178.7	186.4	312.3	161.7	54.3
1984	139.7	183.3	189.0	295.4	157.6	56.7
1985	158.3	200.8	204.1	312.0	185.2	66.0
1986	189.3	257.5	249.3	371.9	212.9	109.0
1987	181.0	248.5	238.4	364.8	195.3	91.8
1988	168.6	251.0	243.0	305.2	178.8	95.3
1989	160.8	235.7	227.8	273.0	166.3	83.7
1990	164.9	229.8	231.6	267.4	163.6	72.0
1991	168.9	253.8	260.6	275.1	159.9	69.1
1992	170.5	244.7	252.0	268.5	151.0	68.7
1993	176.3	260.3	269.1	267.7	154.4	87.9
1994	167.3	273.3	279.2	249.4	138.5	90.6
1995	150.7	247.4	251.2	228.1	125.9	79.9
1996	142.3	232.8	239.8	214.3	120.3	71.6
1997	139.5	221.6	231.6	204.1	116.7	69.9
1998	161.9	250.2	262.0	230.2	128.7	106.6
1999	155.4	232.8	249.0	225.7	119.8	87.5
2000	122.1	182.0	200.1	181.6	93.9	60.9
2001	125.1	183.5	205.6	192.4	97.6	65.1
2002	118.7	183.8	205.4	188.9	86.4	62.9
2003	107.3	158.8	176.0	178.6	74.7	54.8
2004	91.2	130.6	146.1	148.0	62.5	48.6
2005	75.8	94.5	107.0	116.0	53.2	40.5
2006	67.4	68.7	78.8	94.6	48.2	40.5
2007	74.0	61.1	68.6	95.8	45.0	53.5
2008	65.1	50.1	57.0	87.1	41.5	38.7

Source: IMF, World Economic Outlook Online Database, April 2009

In the 1980s and early 1990s, high interest rates, low growth rate of output, and primary deficits contributed to an increase in the debt to GDP ratio of African countries. The debt to GDP ratio rose by 304 percent from 25.1 percent in 1980 to 76.2 percent in 1994 which implies that debt increased at an average rate of 22.5 percent per annum in a span of 14 years (see Table 2.2). In fact, Africa's external debt as a ratio of GDP is the highest as compared to all developing countries as shown in Table 2.2 below. The debt-to-GDP ratio more than doubled in a span of 6 years and rose from about 25 percent in 1980 to about 60 percent in 1986. The ratio continued rising as countries accumulated more debt and by 1994, the ratio had risen to about 76 percent. The high debt-to-GDP ratio implies that African countries have been accumulating more external debt than GDP.

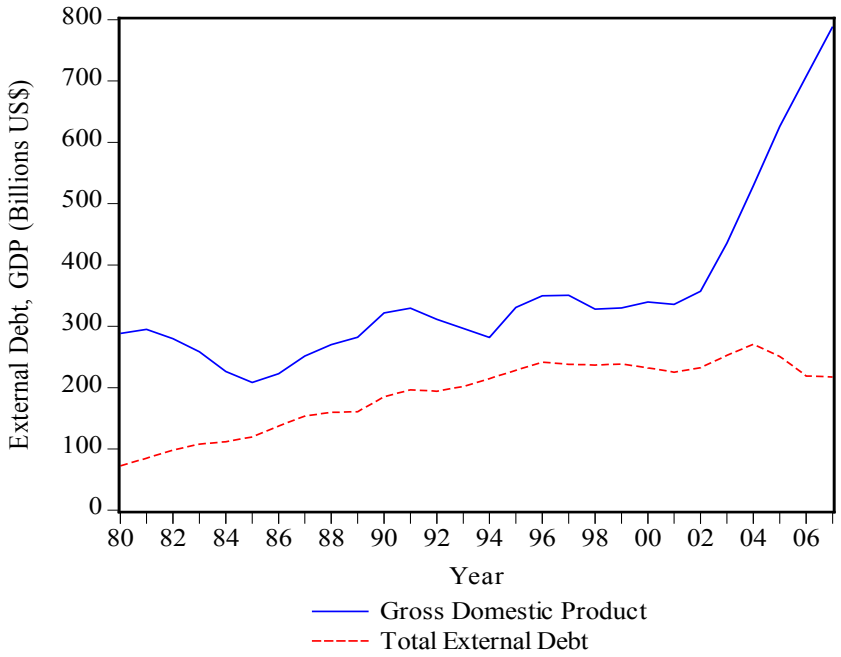
Table 2.2: Comparative Data for Debt to GDP Ratio

Year	Emerging Markets & Developing Countries	Africa	Sub-Saharan (SSA) Africa	Western Hemisphere	Developing Asia	Middle East
1980	17.1	29.1	25.1	28.5	14.4	14.2
1981	19.3	32.1	28.8	32.6	16.6	14.6
1982	22.0	37.4	35.1	45.1	17.9	16.2
1983	23.3	42.2	41.6	52.2	18.8	16.5
1984	24.5	48.4	49.3	52.5	19.5	15.6
1985	26.9	54.1	57.3	49.0	23.2	20.1
1986	27.4	58.4	61.5	51.2	25.7	22.4
1987	27.9	59.3	61.1	53.3	27.0	20.9
1988	25.8	59.4	59.0	46.0	25.7	22.3
1989	24.8	57.9	56.8	40.3	25.5	22.3
1990	26.7	59.7	57.5	39.3	29.9	24.0
1991	27.9	60.9	59.6	38.5	32.1	23.1
1992	38.3	61.4	62.2	37.0	31.5	23.0
1993	38.6	66.1	68.0	36.7	31.7	30.7
1994	38.6	74.6	76.2	34.3	34.1	32.5
1995	37.0	69.4	69.1	35.5	31.6	29.4
1996	35.2	68.1	69.1	34.3	29.9	27.2
1997	35.3	66.4	67.8	33.2	31.1	26.2
1998	40.4	69.3	72.2	37.4	35.1	32.3
1999	42.0	68.6	72.2	43.5	32.3	30.3
2000	37.3	64.1	68.3	37.9	28.3	26.2
2001	36.9	61.9	67.0	39.6	27.7	25.4
2002	37.0	60.4	65.2	44.1	25.7	26.1
2003	35.7	54.0	58.1	43.7	23.7	25.2
2004	33.0	46.9	51.1	38.2	22.1	25.3
2005	28.7	37.0	40.0	29.5	20.2	23.6
2006	26.3	28.1	30.9	24.6	19.1	24.0
2007	27.0	24.1	26.0	22.9	17.4	31.7
2008	24.1	21.0	22.7	20.9	15.6	23.7

Source: IMF, World Economic Outlook Online Database, April 2009

Gross Domestic Product and external debt for Africa moved in the opposite direction in most of the years between 1980 and 2008, which implies that as countries accumulated more debt, their GDPs declined. As shown in Figure 2.1 below, from 1980 to 1985, GDP declined whereas countries accumulated more debt in the form of structural adjustment loans. Between 1992 and 1994 debt increased while GDP declined; after 1995, GDP increased while external debt declined. As from 2003, there was a sharp increase in GDP while debt declined as a result of debt relief. This negative relationship between external debt and GDP implies that even though debt was meant to boost the economies' output, external funds did not improve these economies. Perhaps the negative relationship confirms the fact that the borrowed funds were mainly shipped back to the West by the rulers as opposed to being invested in the economy and boost GDP.

Figure 2.1: Level of External Debt and Gross Domestic Product for Africa (1980 – 2007)



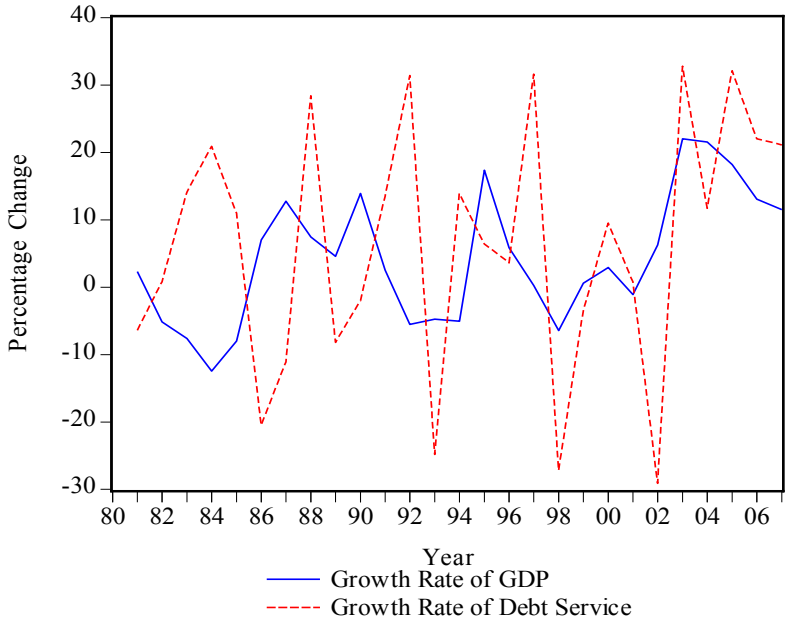
Source: IMF, World Economic Outlook Online Database, April 2007

The process of debt servicing compounded the external debt of Africa. As African governments strengthened their determination to demonstrate a capacity to repay debt in order to establish credit-worthiness, a great percentage of loans and export earnings were committed to servicing existing debt (see Table 2.4 below). For example, Uganda committed 81.4 percent of its meager export earnings in 1990 to debt servicing. Ghana and Zambia committed more than half of their export earnings (56 percent and 52.1 percent, respectively) to debt serving in 1988 and 1980, respectively. Nigeria's debt service exports ratio rose by 8 times from 4.1 percent in 1980 to 32.9 percent 1984. The same applied to Zimbabwe where debt export ratio increased by 8.5 times from 3.8 percent in 1980 to 32.3 percent in 1987. Such high debt service ratios led to further external borrowing and virtually nothing was left for development. In the late 1990s, debt service to exports ratios drastically fell amidst deficient export earnings. This decline in debt service to exports ratio hides more than it reveals.

Rugumamu (2001) argues that external debt repayment is economically exhausting as it continues to block future development; it is politically destabilizing as it threatens social harmony; and, it is ethically unacceptable as it hurts the poorest of the poor. As countries committed more funds to

service their debts, GDP was depressed. As can be seen in Figure 2.2, there was a negative relationship between growth rates of debt service and GDP between 1980 and 2004. This implies that servicing of debt places an enormous fiscal pressure on African countries.

Figure 2.2: Growth Rates of Gross Domestic Product and Debt Service for Africa (1980 – 2007)



Source: IMF, World Economic Outlook Online Database, April 2007

Servicing of external debt places an enormous fiscal pressure on African countries. Such pressure has had an adverse effect on public investment and provision of social services as is reflected in the decline in the share of public investment in GDP from late 1970s onwards as well as high level of fiscal deficit. Table 2.3 below shows the decline in public investments for selected African countries. Naturally, a reduction in levels of public investment has adverse consequences for physical and social infrastructure.

Table 2.3: Public Investment and Debt Service for Selected African countries (1980 – 2005)

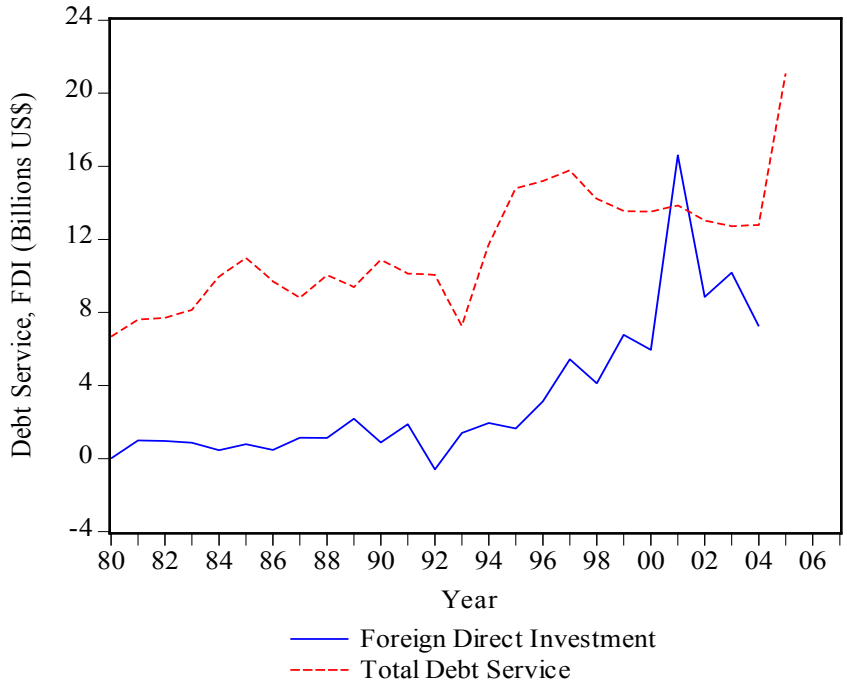
Country		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cote d'Ivoire	PI/GDP	9.0	8.8	6.8	6.3	4.6	3.7	3.6	4.5	4.1	4.4	3.6	3.4	3.8	3.7	4.1	4.2	4.3	4.8	5.1	4.2	2.8	1.8	3.2	2.6		
	TDS/GDP	13.8	18.2	20.3	18.5	16.6	16	14.4	13.6	10.5	11	11.7	12.2	10.4	9.9	15	9.51	11.3	11.6	10.8	11.5	9.79	5.89	7.24	4.16	3.51	2.84
Ghana	PI/GDP	..	..	..	..	..	..	..	..	..	7.8	7.5	8.3	10.3	11.1	13.3	14.0	13.3	12.4	11.3	9.8	10.4	10.4	9.6	7.8		
	TDS/GDP	3.58	2.81	2.75	3.58	3.01	3.54	3.98	8.18	10.5	8.61	6.19	4.45	4.79	4.95	6.26	5.98	6.42	7.33	6.4	5.51	7.81	5.26	2.89	5.96	2.74	2.65
Kenya	PI/GDP	10.4	10.4	8.6	6.9	7.5	10.7	8.1	7.1	8.3	7.8	9.4	8.3	7.1	8.0	8.5	7.4	7.0	6.4	6.0	5.5	5.5	5.1	4.6	4.4		
	TDS/GDP	5.97	7.08	7.73	8.61	9.35	10.1	9.36	8.67	8.83	8.57	9.21	8.82	8.15	11	12.3	10	6.95	5.01	4.7	5.37	4.65	3.73	4.1	3.95	2.11	1.26
Malawi	PI/GDP	17.5	10.2	8.4	8.3	9.8	8.3	10.0	5.0	8.2	7.6	8.0	8.3	10.2	8.4	15.1	9.7	6.5	6.7	8.8	10.3	10.0	10.4	8.0	9.7		
	TDS/GDP	7.06	9.25	7.98	6.6	8.78	9.72	12.3	9.78	7.64	6.02	7.05	5.84	6.01	3.78	6.72	8.45	3.88	3.19	4.95	4.12	3.61	2.67	1.89	2.36	3.15	4.56
Nigeria	PI/GDP	..	14.3	9.6	7.2	3.6	4.4	6.4	7.8	7.2	..	..	11.4	13.4	10.7	3.6	5.3	5.2	7.1	11.3	10.4	9.3	12.1	10.2	9.9		
	TDS/GDP	1.79	2.99	4.19	7.33	14.4	15.6	10.1	4.72	9.67	8.88	11.7	10.8	11.5	6.98	7.91	6.52	7.11	3.91	4.14	3.06	4.01	5.33	3.19	2.82	2.4	8.98
Senegal	PI/GDP	5.9	4.2	3.9	4.0	4.0	3.9	4.0	4.1	3.9	4.2	4.1	4.6	5.2	4.2	5.0	4.4	6.4	6.4	7.2	8.3	6.2	6.4	7.9	9.0		
	TDS/GDP	8.68	7.38	4.78	4.69	6.91	7.35	7.96	8.41	7.8	8.24	5.69	5.65	3.47	2.33	6.43	6.32	6.31	5.74	6.91	5.04	5.11	4.66	4.42	3.81	4.4	2.35
South Africa	PI/GDP	..	..	..	..	..	..	..	..	..	7.7	7.0	6.1	5.2	4.4	4.1	4.3	4.4	4.5	1.8	1.5	1.4	1.9	1.3	1.2		
	TDS/GDP	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.14	2.24	2.95	4.4	3.27	3.22	2.91	3.68	4.23	2.59	1.78	1.99
Tanzania	PI/GDP	11.6	5.1	4.1	2.3	2.0	1.8	1.8	2.2	2.3	3.5	3.1	1.7	2.7	4.2	6.0	3.4	3.5	2.9	3.3	3.1	6.0	5.6	7.6	7.4		
	TDS/GDP	3.14	3.01	2.28	2.67	2.33	2.71	3.45	3.05	3.17	4.01	4.2	4.14	5.1	4.95	4.07	4.42	4.14	2.2	2.83	2.62	1.89	1.62	1.11	0.89	1.05	1.05
Uganda	PI/GDP					5.6	4.9	6.6	6.0	5.3	5.4	6.2	7.4	7.4	6.7	4.8	4.7	4.5	4.1	4.7	5.4	6.4	5.8	5.3	4.7		
	TDS/GDP	4.58	5.09	2.89	3.82	3.55	4.4	4.37	2.55	3.1	3.56	3.36	4.43	3.96	4.79	3.73	2.35	2.45	2.57	2.33	2.18	1.25	0.88	1.21	1.34	1.51	1.97
Zambia	PI/GDP	..	..	..	..	..	..	..	..	..	..	..	6.2	7.8	6.7	4.0	5.1	6.1	5.4	11.3	10.6	10.0	11.1	11.8	11.5		
	TDS/GDP	10.6	10.5	8.62	8.98	8.94	6.06	23.2	7.55	5.07	4.76	6.1	17.6	11	11	11.2	75.1	7.67	6.29	6.24	4.74	5.73	5.09	6.14	13	7.82	3.29
Zimbabwe	PI/GDP	4.7	5.3	9.9	11.7	9.8	9.5	7.3	7.6	6.7	5.7	2.9	3.4	3.5	3.8	3.1	2.9	2.3	2.8	1.8	4.1	0.0	1.0	1.7	1.8		
	TDS/GDP	0.98	1.35	2.44	6.5	5.63	7.49	7.65	7.9	6.82	5.3	5.36	5.32	8.89	9.52	8.68	8.94	7.45	7.85	15.6	10.5	5.69	1.63	0.5	0.68	1.97	6.66

Source: World Bank, African Economic Indicators, 2005.
PI is public investments and TDS is total external debt.

The gross fixed capital formation also declined for selected African countries as shown in Table 2.4. The gross fixed capital formation as a percentage of GDP for Côte d'Ivoire declined from 24.4 percent in 1980 to 8.5 percent in 1990. That of Malawi declined from 22.2 percent in 1980 to 12.2 percent in 1986, Nigeria (24.4 percent in 1981 to 9.6 percent in 1985), and Zambia (18.2 percent in 1980 to 6.6 percent in 1989). The decline in gross fixed capital formation implies that the borrowed funds were used to finance consumption as opposed to investment projects that stimulate growth.

As shown in Figure 2.3 below, servicing of debt also reduces foreign direct investments. This confirms the debt overhang theory which stipulates that if there is some likelihood in the future that external debt will be larger than the countries' repayment ability, then; the expected debt service would discourage both domestic and foreign investments. In fact, debt service and foreign direct investments moved independently from 1980 to 1991 and from 1997 to 2001. Foreign direct investment hovered around US$1 billion during 1980 to 1991.

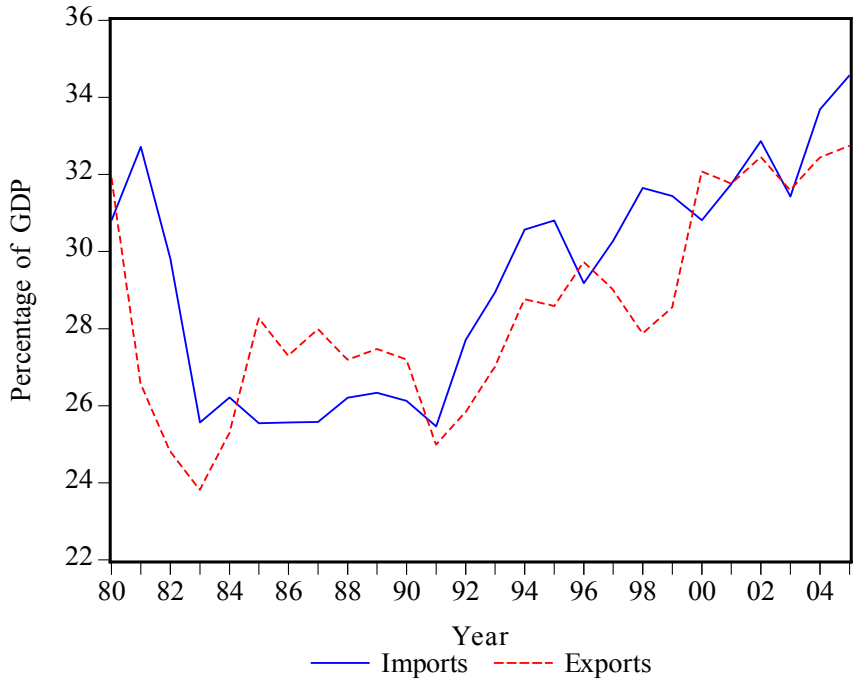
Figure 2.3: Level of Total Debt Service and Foreign Direct Investment for Africa (1980 – 2005)



Source: World Bank, World Development Indicators 2006 Online Database.

Servicing of the external debt erodes foreign exchange reserves, which might otherwise be available for purchase of imports. As debt servicing soaks up a large proportion of export earnings and government expenditure, it reduces the resources available for imports, investment and socioeconomic development, as was evident in the 'import compression problem' in which shortage of foreign exchange adversely affected levels of public and private sector investment. As shown in Figure 2.4, although exports and imports have followed the same trend from 1980 to 2005, they have diverged generating trade deficits and trade surpluses. Exports and imports which were about 32 percent of GDP in 1981 fell, in a span of two years, to about 25 percent of GDP in 1983.

Figure 2.4: Level of Export and Imports as a Percentage of GDP for Africa (1980 – 2005)



Source: World Bank, World Development Indicators 2006 Online Database

Reduction in imports can be seen by the import-debt ratio which declined for most of the countries under review (see Table 2.4 below). Imports as a percentage of external debt for Côte d'Ivoire which was 112.9 percent in 1970 fell by 200 percent to 56.1 percent in 1980. By 1993, the import to debt ratio had fallen to 15 percent. Nigeria's import-debt ratio declined from 649.3 percent in 1976 to 138.1 percent in 1980. By 1988 it had declined to 17 percent, Ghana (29 percent in 1980

to 8.1 percent in 1982), Kenya (77 percent in 1980 to 27.5 percent in 1993), Senegal (88.3 percent in 1980 to 35.9 percent in 1987) and Zimbabwe (225.5 percent in 1980 to 49.7 percent in 1987). Most of the reduction in imports was in vital goods such as spare parts that were needed to keep existing machinery running. Exports also declined during the same period suggesting that one of the effects of reduced important intermediate goods imports is to depress exportable goods.

The region's external debt grew faster than GNP. The region's debt-GNP ratio doubled in five years rising from 28.7 percent in 1981 to 56.2 percent in 1986. By 1994 it had risen to the highest level of 78.7 percent. Most of the countries under review owe several times more than the value of their GNPs (see Table 2.4 below). Zambia's debt/GNP ratio rose from 90.3 percent in 1980 to 414.9 percent in 1986 representing a 459 percent increase in a span of 6 years. Nigeria, whose debt/GNP ratio was at 14.6 percent in 1980 rose by 11 times to 161.7 percent in 1993. Côte d'Ivoire's debt/GNP rose from 77.1 percent in 1980 to 230.7 percent in 1994. These high debt/GNP indicators point to serious debt management problems since these countries do not have the capacity to generate income that can sustain the debt.

Table 2.4: Debt Indicators for Selected African Countries (1980 – 2005)

Country	Indicator	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cote d'Ivoire	*ETD/GNP*	77.1	102.9	127.5	144.0	134.6	153.4	135.2	147.6	143.4	177.0	187.3	199.2	189.1	197.0	230.7	188.7	174.0	141.9	123.6	112.2	124.8	117.1	109.2	93.6	79.5	68.7
	TDS/GNP	14.5	19.4	21.9	20.6	17.9	17.7	15.6	14.9	11.6	12.9	13.7	14	11.8	11.3	16.5	10.4	12.2	12.4	11.5	12.3	10.5	6.26	7.7	4.4	3.68	2.97
	TDS/XGS	38.7	52.6	54.1	49.9	37.5	34.8	35.4	38.4	32.4	33.2	35.4	37.9	32.1	33.2	35.2	23.1	26.5	26.2	25.7	26.8	22.6	13.3	13.9	8.6	6.9	5.5
	MGS/ETD	56.1	43.8	33.2	27.6	25.5	23.4	24.1	22.0	21.4	19.1	17.0	15.6	16.9	15.0	14.0	20.0	20.2	24.9	28.4	30.7	28.6	30.4	32.5	39.4	51.9	64.6
	GFCF/GDP	24.4	24.4	21.7	17.7	13.0	11.8	11.8	11.8	11.5	10.3	8.5	8.6	8.5	9.3	11.5	13.7	14.8	14.3	10.7	14.4	11.2	9.9	10.9	9.7	9.8	10.7
Ghana	*ETD/GNP*	31.7	36.6	36.9	41.4	44.9	50.7	49.0	66.5	60.4	64.2	64.7	64.2	67.2	78.2	95.7	86.9	85.3	84.6	86.2	85.1	126.7	121.9	115.5	101.5	81.5	63.6
	TDS/GNP	3.59	2.82	2.76	3.61	3.04	3.6	4.07	8.4	10.7	8.8	6.31	4.53	4.87	5.04	6.39	6.11	6.56	7.47	6.53	5.63	8.05	5.37	2.95	6.09	2.8	2.69
	TDS/XGS	13.1	14.2	15.5	30.4	21.6	23.5	28.3	45.8	56.3	50.2	38.1	27.2	27.1	24.3	24.4	24.0	25.0	29.5	18.5	16.9	15.6	11.4	6.8	13.9	6.9	7.1
	MGS/ETD	29.0	14.6	8.1	14.6	24.3	27.3	42.0	40.5	40.9	38.8	40.7	40.5	43.5	47.5	39.2	38.7	48.0	63.9	55.3	59.8	55.0	54.2	48.2	52.5	75.8	98.1
	GFCF/GDP	6.1	4.7	3.5	3.8	6.9	9.5	9.3	10.4	11.2	13.2	14.4	15.8	12.7	23.8	22.6	21.1	20.3	23.8	22.4	20.7	24.0	26.6	19.7	23.2	28.4	29.0
Kenya	*ETD/GNP*	48.1	48.6	54.5	62.7	58.6	70.5	65.8	75.2	72.3	73.4	85.8	95.8	87.7	131.9	105.0	83.8	57.6	49.9	48.9	50.9	48.9	43.0	47.9	47.6	43.2	33.1
	TDS/GNP	6.16	7.3	8.04	8.9	9.66	10.5	9.68	8.99	9.18	8.83	9.62	9.25	8.52	11.7	13	10.4	7.09	5.07	4.75	5.44	4.7	3.77	4.14	4	2.12	1.27
	TDS/XGS	21.0	27.0	30.5	33.8	34.8	38.7	35.6	39.8	39.0	36.6	35.4	32.6	31.1	27.1	32.9	30.4	27.5	21.9	22.9	25.4	20.9	15.6	16.0	15.5	7.6	4.4
	MGS/ETD	77.0	71.8	60.3	46.5	56.5	44.2	47.0	36.4	39.7	42.3	38.1	31.1	31.8	27.5	34.3	48.5	50.7	58.3	54.8	51.2	61.1	72.5	61.1	61.9	74.1	106.0
	GFCF/GDP	18.3	18.6	19.0	18.1	17.2	17.3	19.6	19.6	20.4	15.1	20.6	19.0	16.6	16.9	18.9	21.4	16.0	15.4	15.7	15.6	16.7	18.2	17.5	16.1	16.2	18.6
Malawi	*ETD/GNP*	72.9	71.1	77.9	77.4	76.4	94.6	103.0	121.4	102.5	91.5	84.8	77.2	97.1	90.0	177.5	165.8	103.1	84.9	142.7	158.1	158.5	153.5	152.8	179.9	183.9	155.6
	TDS/GNP	7.68	9.91	8.49	7.01	9.2	10.2	13	10.3	7.95	6.22	7.22	5.96	6.14	3.86	6.98	8.74	3.94	3.24	5.07	4.22	3.69	2.72	1.94	2.42	3.23	4.66
	TDS/XGS	27.8	36.0	35.0	29.3	31.1	39.8	53.7	37.4	30.9	30.9	29.3	24.7	24.9	22.4	22.4	24.9	15.9	14.4	14.8	14.0	13.3	9.4	7.6	..	..	..
	MGS/ETD	57.9	47.5	39.4	38.8	36.3	33.1	25.6	24.1	33.0	38.9	40.3	38.8	44.7	36.5	36.1	30.0	31.5	40.2	27.4	28.0	22.8	26.0	30.7	28.3	28.5	34.8
	GFCF/GDP	22.2	15.1	14.6	13.7	13.0	13.3	12.2	15.4	18.1	20.2	20.1	17.0	17.2	13.0	26.8	14.8	9.7	9.3	11.1	12.6	12.3	13.8	10.4	10.8	14.4	13.7
Nigeria	*ETD/GNP*	14.6	19.6	24.6	51.2	64.9	68.1	118.2	137.9	132.6	138.4	130.7	134.9	97.5	161.7	155.3	131.7	95.0	83.7	103.3	87.5	77.9	70.4	74.7	68.8	62.5	25.6
	TDS/GNP	1.88	3.07	4.29	7.47	14.8	16.2	10.9	5.26	9.9	9.73	13	11.8	12.6	7.84	8.78	7.08	7.59	4.16	4.54	3.19	4.58	5.81	3.65	3.25	2.86	10.2
	TDS/XGS	4.1	9.2	16.2	23.6	32.9	32.7	38.0	14.1	30.4	24.7	22.6	21.9	28.7	12.5	17.9	13.8	14.0	7.8	11.3	6.9	8.2	12.2	7.6	5.7	4.3	15.8
	MGS/ETD	138.1	139.5	92.7	34.9	20.5	19.0	18.7	19.9	17.0	19.9	24.5	25.5	45.7	34.9	29.1	34.8	30.8	48.1	40.4	49.1	47.2	50.3	63.8	69.7	71.2	157.2
	GFCF/GDP	21.4	24.4	22.1	15.9	11.3	9.6	14.5	17.0	19.3	17.7	14.5	23.4	21.8	23.2	19.6	16.3	14.2	17.4	24.1	23.4	20.3	24.1	26.2	23.9	22.4	20.9
Senegal	*ETD/GNP*	51.0	70.5	75.4	87.2	99.4	104.4	89.5	91.5	81.5	73.9	68.0	67.5	62.3	72.4	105.4	90.4	82.7	88.2	88.0	84.3	83.6	81.2	83.9	69.5	51.2	46.9
	TDS/GNP	8.99	7.72	5	4.9	7.3	7.73	8.33	8.79	8.16	8.62	5.89	5.86	3.55	2.42	6.69	6.55	6.41	5.84	7	5.14	5.22	4.74	4.52	3.89	4.49	2.39
	TDS/XGS	28.7	17.1	12.8	11.3	16.7	20.8	26.1	32.4	31.4	28.6	19.9	20.9	13.4	9.4	17.1	16.8	19.1	17.5	20.7	14.5	14.3	12.3	11.7	10.4	11.8	
	MGS/ETD	88.3	78.4	66.3	55.5	51.8	42.3	38.3	35.9	37.3	45.5	46.2	44.5	46.5	40.3	41.1	46.0	44.0	41.3	42.6	45.9	48.6	50.5	50.9	60.8	82.7	90.5
	GFCF/GDP	13.2	12.6	12.2	13.0	12.3	11.6	12.0	12.4	12.7	13.3	12.9	13.5	14.0	13.5	16.0	14.7	16.3	15.7	17.6	19.4	17.0	18.8	16.4	20.4	23.1	21.6

With exception of South Africa's debt data, data source is the World Bank's World Development Indicators 2006 Online Database and IMF's IFS online database. The source of South Africa's debt data is the Reserve Bank of South Africa's website. ETD is External Debt Stock, GNP is Gross National Product, TDS is Total Debt Service, GDP is Gross Domestic Product, XGS is Exports of Goods and Services, MGS is Imports of Goods and Services, and GFCF is Gross Fixed Capital Formation.

Continuation of Table 2.4

Country	Indicator	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
South Africa	*ETD/GNP*	1	1.22	1.59	1.48	1.92	1.92	1.45	1.11	0.95	0.64	0.7	0.65	0.65	1.2	16.3	17.1	18.5	17.4	18.9	18.4	19.2	21.0	23.2	17.2	13.6	13.1
	TDS/GNP	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.18	2.29	3.01	4.49	3.35	3.3	2.98	3.8	4.34	2.67	1.82	2.04
	TDS/XGS	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9.4	9.5	11.6	17.2	12.2	12.1	9.8	11.3	12.0	8.6	6.3	6.7
	MGS/ETD	3366	2871	1970	1780	1378	1341	1657	1971	2392	3235	3432	3300	3190	1736	124.4	131.7	128.0	138.0	133.0	126.7	133.2	128.4	126.3	138.5	205.5	223.3
	GFCF/GDP	25.9	27.5	27.5	26.0	24.0	22.8	19.6	17.8	19.4	20.2	19.1	17.2	15.7	14.7	15.2	15.9	16.3	16.5	17.1	15.5	15.1	15.1	15.0	15.8	16.2	17.2
Tanzania	*ETD/GNP*	103.9	98.6	93.3	110.5	131.5	143.9	110.5	111.7	122.2	138.0	158.5	137.5	151.1	165.8	166.3	144.6	115.8	91.4	88.3	89.6	77.4	66.8	70.5	68.1	69.4	64.4
	TDS/GNP	3.14	3.02	2.29	2.64	2.37	2.75	3.53	3.17	3.29	4.18	4.4	4.3	5.31	5.15	4.21	4.53	4.22	2.23	2.86	2.65	1.91	1.63	1.12	0.89	1.06	1.05
	TDS/XGS	21.2	22.1	28.6	33.4	25.7	39.9	35.1	39.2	31.9	33.0	32.9	39.9	40.1	26.8	18.9	17.9	18.9	13.5	20.1	19.1	12.8	8.4	5.5	4.1	4.5	4.3
	MGS/ETD	25.4	21.1	19.1	12.7	12.9	11.8	23.1	24.4	23.7	24.9	24.7	25.4	27.1	29.9	27.2	27.3	26.9	29.5	32.5	29.6	29.8	37.3	35.1	40.3	40.2	41.1
	GFCF/GDP	20.5	20.9	23.6	17.4	17.6	16.9	23.8	21.6	16.1	17.7	25.8	26.0	27.0	24.9	24.4	19.6	16.5	14.7	13.7	15.4	17.4	16.8	18.9	18.5	18.3	18.8
Uganda	*ETD/GNP*	55.5	53.1	40.5	45.8	30.0	35.5	36.4	30.9	29.8	41.8	61.1	85.1	105.7	95.5	85.8	62.9	61.4	62.1	59.6	58.5	60.5	67.4	70.0	74.8	71.8	52.2
	TDS/GNP	4.61	5.13	2.93	3.9	3.59	4.47	4.42	2.57	3.12	3.6	3.42	4.51	4.09	4.87	3.79	2.37	2.47	2.57	2.33	2.19	1.28	0.9	1.24	1.37	1.54	2.01
	TDS/XGS	17.3	24.8	18.2	23.3	30.2	41.6	40.7	47.9	75.7	67.6	81.4	74.8	59.7	51.5	27.5	19.8	18.2	20.2	20.8	13.8	7.8	4.7	6.1	7.2	6.9	9.2
	MGS/ETD	47.2	42.0	43.8	30.4	48.4	42.9	42.3	58.9	60.2	43.8	32.3	26.2	23.7	22.5	22.6	33.5	38.4	33.6	34.3	41.6	39.0	36.9	38.9	36.3	39.2	53.1
	GFCF/GDP	..	..	9.7	7.9	8.2	8.7	8.4	9.7	10.8	11.1	12.7	15.2	15.9	15.2	14.6	16.4	17.0	16.9	15.9	19.3	19.6	18.2	18.9	20.1	22.1	20.9
Zambia	*ETD/GNP*	90.3	92.5	100.6	122.1	153.6	226.0	414.9	337.3	201.7	182.7	229.5	232.5	233.7	214.6	218.9	215.1	230.4	179.7	227.3	196.9	185.8	174.9	182.4	165.8	145.6	83.3
	TDS/GNP	11.4	10.8	9.18	9.72	9.95	6.87	28.4	8.9	5.69	5.29	6.67	19.8	12.2	12	12	80.8	8.18	6.63	6.69	4.99	6.02	5.33	6.41	13.5	8.48	3.52
	TDS/XGS	25.2	35.9	30.9	29.1	25.0	15.7	52.1	19.0	15.1	13.3	14.7	46.9	..	..	..	..	..	19.4	21.0	16.1	20.2					
	MGS/ETD	54.4	45.8	38.6	27.9	24.1	18.7	13.0	12.5	14.6	20.6	17.4	18.1	22.8	20.4	18.1	19.9	18.0	20.7	18.5	22.0	17.8	17.8	16.6	17.5	20.3	32.4
	GFCF/GDP	18.2	17.5	17.2	14.7	12.6	10.2	10.7	9.0	7.7	6.6	13.5	11.4	10.6	11.5	11.3	12.4	11.2	13.1	14.8	16.0	17.2	18.7	21.6	24.8	24.6	24.7
Zimbabwe	*ETD/GNP*	11.9	16.1	22.7	29.3	35.3	43.9	43.5	44.1	35.5	34.9	38.6	41.6	63.7	67.3	68.0	73.5	60.3	60.9	80.9	75.6	53.6	36.2	17.9	58.0	106.1	132.2
	TDS/GNP	0.99	1.38	2.52	6.75	5.79	7.67	7.89	8.14	7.02	5.43	5.54	5.51	9.27	9.9	9.06	9.37	7.71	8.25	16.6	11	5.89	1.69	0.5	0.7	2.07	6.97
	TDS/XGS	3.8	6.4	13.2	36.9	26.2	29.0	31.1	32.3	28.5	22.4	23.1	23.1	32.3	31.0	25.2	..	..	..	..	..	..	..	..	..	..	..
	MGS/ETD	225.5	164.7	101.4	69.0	60.6	51.4	51.0	49.7	59.0	63.8	61.1	67.6	59.7	50.1	56.1	58.3	61.7	77.0	59.6	61.8	70.0	62.2	57.1	47.8	50.1	41.9
	GFCF/GDP	14.1	17.2	18.4	18.0	17.0	14.3	15.1	16.1	15.6	14.0	18.2	20.6	22.4	23.6	21.4	24.6	18.0	18.0	20.6	13.3	11.8	12.1	10.2	12.9	17.1	17.3

With exception of South Africa's debt data, data source is the World Bank's World Development Indicators 2006 Online Database and IMF's IFS online database. The source of South Africa's debt data is the Reserve Bank of South Africa's website. ETD is External Debt Stock, GNP is Gross National Product, TDS is Total Debt Service, GDP is Gross Domestic Product, XGS is Exports of Goods and Services, MGS is Imports of Goods and Services, and GFCF is Gross Fixed Capital Formation.

2.2.2 Theories of External Debt and their Evidence in Emerging Market Economies

There are five channels through which external debt and its attendant debt servicing affects the economies of emerging market economies and Africa. These channels are embodied in the debt overhang hypothesis, crowding-out effect, macroeconomic propagated shocks, default and loss of creditworthiness, and capital flight.

2.2.2.1 Debt Overhang Hypothesis

When a country's debt service burden is so heavy that a large portion of its current output accrues to foreign lenders and consequently creates disincentive to invest, it results in debt overhang. The debt overhang hypothesis suggests that if there is some likelihood in the future that external debt will be larger than the country's repayment ability, then, the expected debt service costs would discourage further domestic and foreign investment and harm economic growth. Investors would be less willing to incur costs today for increased output in the future, as the additional output would be used to meet external debt servicing demands. High debt service burden increases expected future taxes on the private sector and lowers private investment. In addition, debt overhang can worsen economic performance by changing the quality of investment when quick-yielding projects are preferred to higher value long-term investments (Sen, Kasibhatla and Stewart, 2007; Servén, 1997). This misallocation of investment in turn lowers the efficiency of overall capital accumulation. Numerous studies on debt overhang (Ajayi, 1997; Khan and Villanueva, 1991; Elbadawi, Ndulu, and Ndung'u, 1996; Greene and Khan, 1990; Fosu, 1999; Moughalu and Ezirim, 2006) have found that debt overhang has adverse consequences on investment and growth.

Krugman (1988) argues that if there is some likelihood that in the future debt will be larger than the country's repayment ability, then expected debt service will be an increasing function of the country's output level. Thus, returns from investing in the country would face a high marginal tax by external creditors, and new domestic and foreign investment would be discouraged. On the other hand, Corden (1989) argues that high debt reduces growth mainly by lowering the efficiency of investment rather than its volume. Any activity that requires incurring costs today for the sake of increased output in future will be discouraged due to fears that, part of the proceeds will be taxed away by creditors. Debt overhang leads to a poor macroeconomic policy environment, which in turn affects efficiency of investment. In support of Corden are Pattillo, Poirson, and

Ricci, (2001) who posit that the poor macroeconomic environment leads to investment projects that are poorly designed, poorly implemented and badly allocated, thus lowering the contribution of capital accumulation to growth. This was mainly the case for highly indebted poor countries whose poor policies and continued borrowing in the face of negative external conditions meant that the investment, to the extent that it actually took place, did not contribute much to growth. Instead, the continued borrowing of these countries and poor export performance led to very high accumulated debt stocks that have created uncertainty and debt overhang effects.

Authors like for example Koeda (2006), argue that a country's initial debt condition, initial income and total factor productivity will determine whether or not the country is trapped in a debt overhang. With larger initial debt, the country has stronger incentives to manage its debt at a low interest rate by stagnating around the cut-off (an income level above which the country loses its eligibility for aid assistance), thus becomes permanently aid-dependent. Since the cost of servicing debt is kept artificially low, the country may be motivated to carry a large amount of debt by consuming excessively, resulting in low growth. With a lower initial income, the country tries to borrow a larger quantity of concessional loans to raise both investment and consumption in the short-run; and thus becomes more likely to be trapped in the low steady state. With a lower level of total factor productivity, the benefit of remaining at the cut-off is more likely to exceed the long-run benefit of achieving the high steady state. In the absence of effective measures to raise the country's total factor productivity, the low income country may have an incentive to accumulate a significant amount of concessional debt and allocate resources to consumption as opposed to investments. Koeda further asserts that a one-time debt relief stock treatment may help the country to get out of the poverty trap, provided that the freed-up resources are used effectively. If the country's initial debt and income conditions are relatively poor, it is important for the country to allocate the freed-up resources for development purposes that would directly raise the country's total factor productivity.

Cassimon and Vaessen (2007) posit that an excessive debt burden can provoke a series of ill-advised actions by the government, creating a vicious circle that can only be stopped by reducing debt to a sustainable level. Excessive debt service might not only severely crowd-out spending on development priorities, but it might also elicit sub-optimal fiscal policy and other government behavior (such as excessive domestic borrowing, excessive inflationary financing, and excessive

taxation of some sectors of the economy) and lessen incentives for economic reforms. As a consequence, both private domestic and foreign investors are discouraged from investing productively in the recipient country; thus, leading to a depressed economic growth rate.

2.2.2.2 Crowding-out Effect

Another consequence of external debt is the crowding-out effect. High debt service payments put great pressure on budgets, leading to rising fiscal deficits in the highly indebted countries. The stiff demand of high debt service payments on the budget results in forced reductions in public spending, thus "crowding out" spending on education and health care (Iyoha, 1999). Servicing of external debt also crowds out domestic investment (Cohen, 1993). Likewise, Ajayi (1997) argues that resources used to service debt crowd-out public investment and discourage private investment because of the complementarity between public and private investments.

As Berben and Brosens (2007) confirm, the level of government debt has a significant negative effect on private consumption for high debt countries. This means that a fiscal expansion will be partly crowded-out by private consumption. In low debt countries, government debt is not relevant for private consumption. They therefore posit that in high debt countries, fiscal policy may be less effective in stabilizing business cycle fluctuations. Pozzi, Heylen, and Dossche (2004) assert that high and rising government debt to GDP ratios may raise the welfare cost to consumers who ignore future taxes. On the other hand, it may induce banks to reduce the amounts they lend, thereby raising the incidence of liquidity constraints and excess sensitivity of private consumption.

2.2.2.3 Capital Flight

Foreign borrowing can cause capital flight, while at the same time capital flight can lead to more external borrowing. Boyce (1992) argues that foreign borrowing causes capital flight by contributing to an increased likelihood of a debt crisis, worsening macroeconomic conditions, and the deterioration of the investment climate. In such cases of *debt-driven capital flight*, Boyce posits that capital flees a country in response to economic circumstances attributable to the external debt itself. High levels of debt also may be interpreted as a signal of higher tax rates in the future as the government seeks to service the debt. These effects will deter domestic investment while inducing capital flight. Foreign borrowing also provides the resources as well as

a motive for channelling private capital abroad; a phenomenon Boyce (1992) terms *debt-fueled capital flight*. In such cases, funds borrowed abroad (by the government or by private borrowers with government guarantees) are re-exported as private assets. The d*ebt-fueled* capital flight typically involves a process of "layering" between the external creditor and the private resident in whose name external assets are acquired. On the creditor's books, the debt is owed by the government or by a corporate entity, typically with a government guarantee of repayment in case of default. The external assets, by contrast, are in the names of individuals: government officials who siphoned part of the proceeds of the loan, or private residents who borrowed in the name of a firm. The holder of the external asset thus is not identical to the holder of the external liability. Yet in practice the same individual is engaged in both transactions. In the case of *flight-driven external borrowing*, capital flight drains national foreign exchange resources, forcing the government to borrow abroad. In the case of *flight-fueled external borrowing*, flight capital directly provides the resources to finance foreign loans to the same residents who export their capital, an observable fact that Boyce (1992) refers to as "round-tripping" or "back-to-back loans," motivated by the desire to obtain government guarantees on foreign borrowing, or by the need to devise a pretext for unexplained wealth.

As a matter of fact, Boyce and Ndikumana (2008) found strong linkages between capital flight and external borrowing. The regression results suggest that out of every dollar of new borrowing, as much as 60 cents left the country in the form of capital flight the same year. Furthermore, a one-dollar increase in the stock of debt resulted in 3 to 4 cents of capital flight in subsequent years.

Mwinyimvua and Ngasamiaku (2006) emphasize that capital flight (which occurs through over-invoicing imports and under-invoicing exports) leads to erosion of the domestic tax base in as far as income generated and wealth held abroad cannot be taxed. This reduces the potential government revenue and also shifts the tax burden from capital to less mobile assets like land and labor. Ajayi, (1997) echoes the same findings in his study of African countries. He also finds evidence of trade-faking (over-invoicing and under-invoicing of both exports and imports), instead of over-invoicing imports and under-invoicing exports in Africa's severely indebted low income countries.

Alesina and Tabellini (1989) argue that the uncertainty over future fiscal policies leads simultaneously to capital flight, low domestic investment and occurrence of large external debts.

Capital flight and excessive government borrowing are more likely to occur in politically turbulent countries. Mahdavi (2004) supports their argument and asserts that external debt increases when fiscal deficits, coupled with over-valued exchange rates, encourage capital flight. This in turn drains national foreign exchange reserves and leads to flight-driven external borrowing.

2.2.2.4 Macroeconomic Shock Propagation

Shock-propagation has been identified as another salient consequence of high external indebtedness. Uncertainty concerning the longevity of shocks generates forecast errors that are autocorrelated even when decision makers use rationally all available information. These autocorrelated forecast errors can generate substantial debt accumulation. In particular, decision makers tend to over-borrow during periods of negative, permanent external shocks (permanent decline in the terms of trade and permanent increase in the world interest rate) and during periods of positive transitory external shocks. Senhadji (1997) argues that over-borrowing occurs if a permanent decline in the terms of trade is perceived to be transitory or if a transitory improvement in the terms of trade is believed to be permanent. This over-borrowing behavior can be relatively persistent, generating debt accumulation, especially if shocks are highly unpredictable. His findings support the view that the short-lived commodity booms of the 1970s may have done more harm than good by encouraging some developing countries to over-borrow, contributing to their debt accumulation, and hence increased their vulnerability to the exceptionally high interest rates of the early 1980s. Senhadji's findings corroborate those of Bevan et al (1993), who in their study of trade shocks in developing countries find that when the windfall from a boom accrues to the government, it invests in over-ambitious projects in the construction industry. When the boom reverts to normal levels, governments are unable to reduce investment expenditures and therefore resort to external borrowing to finance these projects and consequently accumulate external debt.

The world interest rate has been identified as a potential mechanism for transmitting international shocks to small open economies. Glenn (1997) argues that when the marginal cost of borrowing increases (after an adverse world interest rate shock), consumers put off current consumption for the future and thus consumption drops. He also argues that debt is an increasing function of the marginal cost of borrowing and therefore debt increases as world interest rates increase. On his part, Senhadji (1997) argues that over-borrowing will occur if a permanent increase in the World interest rate is perceived to be transitory or if a transitory decline in the World interest rate is

believed to be permanent. On the contrary, Blankenau, Kose and Yi, (2001) found that world interest rates have little effect on output, domestic investments, net exports and net foreign assets. Their results substantiate Mendoza's (1991) which found that world interest rate fluctuations contribute to small fluctuations in macroeconomic variables. Kose and Riezman (1999) also found that world interest rates play a minor role in driving domestic economic activity. Specifically, world interest rates account for less than 1 percent of the output fluctuations in Africa. Kose and Riezman state that the world interest rate only results in a shift from domestic savings to foreign assets and decreases investment in production.

Mendoza and Smith (2006) argue that when a country's debt is "sufficiently high", an adverse productivity shock triggers credit collateral constraints on domestic agents. If the asset market is liquid, in the sense that the asset holdings of domestic agents are above short-selling limits, collateral constraints force domestic agents to fire-sell assets to foreign traders. These traders are slow to adjust their portfolio because of high trading costs, and as a result asset prices fall and the equity premium rises. The price fall sets in motion Fisher's debt-deflation mechanism[4] as domestic agents engage in further fire sales of assets to comply with increasingly tight collateral constraints. At high leverage ratios, these fire sales cannot prevent a correction in the economy's net foreign asset position, and as a result the price decline is accompanied by reversals in consumption and the current account. Thus a "Sudden Stop[5]" takes place. Sudden stops become rare in the long run, after economies build up buffer stocks of savings that lower the long-run probability of catastrophic events (see Mendoza and Smith, 2006).

On the other hand, Kose (2002) studied the effect of a favourable productivity shock in small open economies. His finding is that an increase in productivity leads to an economy wide boom as output increases and the representative household increases consumption. However, the increase in consumption is smaller than the increase in output as households aim to smooth out consumption. He also found that the increase in productivity causes an increase in demand for imported capital and labour supply. The increase in investment is larger than the increase in

[4]A situation in which the collateral used to secure a loan, or another form of debt, decreases in value. This can be detrimental to the borrower, as it may lead to a restructuring of the loan agreement or even a loan recall.
[5] This is defined as unusually large recessions marked by sharp, abrupt reversals in capital inflows and the current account, large contractions in absorption and production, and collapses in real asset prices and in the price of non-tradable goods relative to tradables.

output. Additionally, he found that the trade balance deteriorates as households increase foreign borrowing to increase their capital stock and take advantage of the favourable productivity shock.

World price shocks play a significant role in driving business cycles in developing economies. Evidence is provided by Kose (2002) who found that World price shocks have a direct impact on output fluctuations especially for an economy that heavily relies on imported intermediate inputs. World price disturbances also play an important role in explaining consumption variation. Additionally, Cashin, Liang and McDermott (2000) examined the persistence of shocks to world commodity prices. Their findings are that if shocks to commodity price series are extremely persistent, then an adverse price shock to any given commodity is likely to engender depressed prices for a long period of time. In such circumstances, government-supported price-stabilization activities and compensatory financing are unlikely to be ineffective, and external borrowing for consumption-smoothing is likely to be unsustainable.

Monetary shock has a relative effect on real economic variables such as output, interest rate, consumption and investment. Lane (1999) argues that the impact effect of monetary shock is an increase in the level of domestic output and consumption. The world real interest rate falls and nominal depreciation translates into a decline in the domestic terms of trade. In support of Lane are Muscatelli, Spinelli and Trecroci (2007) who point out that monetary shocks generate a temporary depreciation of the real exchange rate in a flexible exchange rate regime. As a result, the depreciated exchange rate creates a trade surplus which is used to repay foreign debt. However, the persistence of the depreciation rate depends on the degree of nominal rigidity in wage and price-setting.

2.2.2.5 Risk of Default and Loss of Creditworthiness

External debt increases the vulnerability of indebted emerging market economies to macroeconomic volatility and financial crises. Capital account reversals often lead to sovereign debt repayment crises that are only resolved after prolonged and difficult debt restructuring. Foreign indebtedness exacerbates domestic financial distress or crisis, increasing both the incidence and severity of crisis for emerging market economies. International capital flows to emerging markets are themselves volatile and sometimes propagate external shocks to domestic consumption and investment. Higher levels of external debt increase the exposure of developing

countries to world output and interest rate fluctuations and to the possibility of capital flow reversals. Debt crises, defaults and delayed debt restructuring are all very costly and are associated with income losses for debtor countries (Kletzer, 2005).

When a country's debt exceeds some safe limit, new loans dry up, and default becomes more attractive. The inability to borrow creates an intertemporal distortion that generates conflicting incentives: one is to increase creditworthiness with a view to returning to the financial market to finance valuable investment opportunities; and second is to reduce creditworthiness in an attempt to get better terms in an eventual debt settlement that includes debt relief. For countries with a binding credit ceiling, a policy of trade intervention increases welfare. The choice between export promotion (EP) and import substitution (IS) depends on whether it is more profitable to increase the ceiling above inherited debt in order to borrow more, or to reduce it below inherited debt in order to repay less. The determinants of this choice of a joint trade and debt strategy are the stock of inherited debt, the level of world interest rates, the terms of trade and the behavior of creditors. The IS policy is more profitable with a large inherited foreign debt, a high interest rate and low terms of trade and it becomes relevant when creditors fail to reduce inherited debt (Diwan, 1990).

Cole and Kehoe (2000) argue that if every investor expects other investors not to lend to the country, and if that would trigger default then no individual investor would be willing to lend new funds thus self-fulfilling their expectations. Their model implies that the only way to avoid debt crises is to avoid relatively high levels of debt with a short maturity structure. On the other hand, Chamon (2007) demonstrates that if the coordination failure as argued by Cole and Kehoe (2000) is the only reason investors are unwilling to lend, then the coordination failure can be overcome by offering the new debt through a mechanism where investors are allowed to condition their participation on a large amount of debt being issued successfully. The borrowing country can then choose any outcome for that issue provided it satisfies the participation constraints laid out by the investors in their contingent bids.

Furthermore, the repayment of today's investors may also depend on whether or not future investors will lend to the country. Alesina, Prati and Tabellini (1990) argue that investors today expect their future counterparts not to lend and if this prospect implies a default on the debt offered today, then today's investors are not willing to hold the country's debt. This triggers a default and following it, future investors will not lend to the country, making the initial

expectations self-fulfilling. However, this coordination failure can be eliminated if the setting is modified to one where the country is forced to pay its debt over a long but finite horizon or be forced to default (Chamon, 2007). As a result, investors at that future date would be willing to lend to a fundamentally sound country under the expectations that their future counterparts will not. The country can self-impose the constraint that it must pay its debt before that future date or be forced to default by issuing state-contingent securities that pay a large amount of debt that is enough to force a default if that condition is not met.

On their part, Grossman and Huyck (1988) assert that a sovereign's decision to validate lender's expectations about the servicing of its debt presumably depends mainly on the sovereign's concerns for its trustworthy reputation for debt servicing. A trustworthy reputation is valuable because it provides continued access to loans. They show that although all bad states of the world cause excusable default, only the worst state of the world can produce total default. Moreover, when a sovereign is consistent with lender's expectations about debt servicing, excusable default does not preclude continued access to loans. They further argue that in the reputational equilibrium, the amount of debt and associated debt servicing expectations are such that the short-run gains from repudiation are smaller than the long-run costs from loss of a trustworthy reputation. Thus, although sovereigns sometimes excusably default, they always resist the temptation, which is greatest in the good states of the world, to repudiate their debts.

Blanchard (2006, Pp. 560-567) points out that the higher the ratio of debt to GDP, the larger the potential for catastrophic debt dynamics. Even if the fear that the government may not fully repay the debt was initially unfounded, it can easily become self-fulfilling. The increased interest cost the government must pay on its debt can lead the government to lose control of its budget and can lead to an increase in debt to a level such that the government is unable to service the debt, thus validating the initial fears. When debt ratios are very high, debt repudiation becomes the solution. Repudiating the debt (cancelling it in part or full) allows for a decrease in taxes and thus a decrease in distortions. It decreases the risk of vicious cycles. Repudiation is generally considered a last resort to be used when everything else has failed.

Countries will be unable to repay their debt because they are either insolvent or illiquid. Manasse, Roubini and Schimmelpfennig (2003) posit that a sovereign's stock of debt relative to its ability to pay, measured, for example, by GDP, exports or government revenues determines whether it is

insolvent or not. A sovereign is solvent, if the discounted value of future primary balances is greater or equal to the current public debt stock. Likewise, a country is solvent, if the discounted value of future trade balances exceeds the current stock of external debt. The exchange rate regime and exchange rate misalignment impact these considerations because an overvaluation can cause an external imbalance that leads to debt accumulation. They further argue that a currency crisis, triggered by overvaluation, can lead to severe balance sheet effects if part of the debt is in foreign currency. Openness can affect the costs of default and thus a country's willingness to default or not. Measures of macroeconomic stability such as low inflation and/or money growth reflect policy credibility and predictability and thus influence investors' risk attitudes towards a country.

Drudi and Giordano (2000) argue that the government would always prefer to inflate away its debt instead of defaulting on it explicitly, by simply not repaying or restructuring it. Even though default is a non-distortionary lump-sum tax, it also has very high costs in terms of loss of reputation for defaulting governments, income redistribution and risk of bankruptcies in the financial sector.

Large external debt and its servicing leads to deterioration of the relations between African countries and creditors, hence reduces the amount of trade financing that could be obtained. It also creates macroeconomic uncertainty, causing investors to exercise their option of waiting until the uncertainty is resolved or the returns are high enough to compensate for the risk of investment. The outcome is that capital formation tends to be dominated by short-term investments in trading activities with quick returns rather than long-term physical investment (Mwega and Rwegasira, 2003). The creditworthiness of many African countries was put to severe test in the wake of mounting debt servicing obligations. Many African countries experienced great difficulties in borrowing on reasonable terms and conditions in the 1980s and 1990s, at the very time when external resources were most needed.

2.3 The History and Effectiveness of Attempts to Address the Debt Problem

2.3.1 Rescheduling

For many decades, creditor countries relied on debt rescheduling and refinancing, complemented by minor cancellations, especially for Official Development Assistance (ODA) debts; debt buy-

back[6]; debt conversion and other restructuring mechanics in addressing Africa's debt crisis. Debt rescheduling was initially negotiated with debtor countries on a case-by-case basis. This was however replaced by a more systematic framework that applied standard terms to debtor countries and provided increasing concessionality.

In 1987, the Venice terms were introduced for the poorest countries that were undertaking adjustments. Several countries benefited from this rescheduling arrangement, which provided for lower interest rates, and larger payments and grace periods. The Toronto terms succeeded the Venice terms in June 1988 and were made available for the low income, heavily indebted International Development Association (IDA) countries only. This arrangement provided lower interest rates, further lengthening of maturities and partial debt service write-offs that could provide about 33 percent debt service relief. The Houston terms were proposed in July 1990 for middle income countries and allowed for deferral of payments, rather than debt reduction. Nigeria rescheduled its debt four times under this arrangement. The London terms were formulated in 1991 to provide 50 percent debt service reduction as well as other enhancements that could ensure more even spread of debt service payments. The Naples terms were adopted in December 1994 for the poorest and most indebted countries. They provided up to 67 percent debt relief on the present value (PV) of the debt.

During the period 1980 to 1986, not less than 22 African countries negotiated debt rescheduling under the Paris and London Clubs. The large number of rescheduling within these few years and their frequency reveal a serious problem of debt servicing by many African countries. African countries have gone through numerous rescheduling arrangements but these initiatives have failed to restore debt sustainability or reverse the growth of debt stock. Rescheduling did not provide debt burden relief, but merely postponed debt service payments while at the same time increased the debt burden by applying market-related interest rates. For instance, Africa received US$294 billion in disbursements, paid out US$268 billion in debt service and yet remained saddled with a debt stock of around US$210 billion in 1994. In fact, Table F1 in appendix F shows that the ratio of external debt-to-exports and that of external debt-to-GDP more than doubled, during the rescheduling period, for most African countries.

[6] This is the purchase by a debtor of its own debt, discounted at par.

2.3.2 Structural Adjustment Programs

As Africa's debt mounted, the international financial institutions instituted structural adjustment programs (SAPs) both as a method of managing the debt and as an alternative path to recovery. They emphasized policy measures such as liberalization, de-subsidization, downsizing, devaluation and privatization. SAPs were to check state intervention and patronage, which were considered to be the central causes of the region's economic downturn. In an effort to establish SAP as a credible alternative development paradigm, the international financial institutions granted huge amounts of loans to countries considered strong adjusters.

Structural Adjustment Loan (SAL) was launched in February 1980 by the World Bank. Its aim was to help countries reduce their current account deficits to more manageable proportions by supporting programs of adjustment. SALs were supposed to facilitate balance of payments correction and were intended to end after a period of several years of adjustments. The reforms envisaged by the program were designed to improve the level of public savings and the efficiency in the use of public resources; restructure public enterprise management, financing and accountability to ensure efficient market oriented operations; reflect the costs of providing public services to the public sector; and restructure incentives to promote efficient export-oriented industrial development.

In fact, after a decade of strict implementation of SAPs, the results have been mixed at best. Iyoha (1999) asserts that in virtually all African countries, structural adjustments meant a period of austerity, declining income and standards of living, mounting unemployment and increasing poverty. Devaluation, which featured virtually in all SAPs, led to an increase in total debt and debt service payments denominated in domestic currencies. The deflation required by the SAPs led to a fall in domestic product and a reduction in national income available for consumption, provision of public services and investment. In his empirical study, Easterly (2005) finds that per capita growth did not improve with increased intensity of structural adjustment lending.

The Table below shows the performance of economic variables during the SAPs period. As shown in the Table, during the structural adjustment period, Ghana reduced its expenditure on education from 3.08 percent of GDP in 1980 to 1.48 percent in 1984 while that of Zambia declined from 5.39 percent of GDP in 1983 to 1.95 percent in 1993. In Nigeria, 2.99 percent of its GDP

went to debt service in 1981 while education expenditure was 6.21 percent. By 1984, a span of three years, Nigeria had reduced its education expenditure by 5.5 times to 1.13 percent whereas debt service increased by 5.2 times to 15.58 percent. By 1992, its expenditure on education had declined to 0.43 percent. In almost all the sampled countries, the proportion of GDP that went to debt service far outweighed the percentage that went to education expenditure. Expenditure in domestic investments also fell in most of the countries. Specifically, Côte d'Ivoire's domestic investments fell by four times from 28.2 percent of GDP in 1980 to 6.7 percent in 1990. Nigeria's domestic investments fell from 21.5 percent of GDP in 1980 to 6 percent in 1984 whereas that of Zambia fell from 23.3 percent of GDP in 1980 to 8.2 percent in 1994. A reduction in investment meant a fall in economic growth. Meanwhile, foreign investment which was expected to increase on the adoption of SAPs failed to materialize due to political instability, poor macroeconomic policies, weak economic performance and the debt overhang syndrome. In fact, foreign direct investment was negative for some of the countries under review during the structural adjustment period (see Table 2.5 below).

Table 2.5: Education, Domestic Investment, Foreign Direct Investment and Debt Service Indicators for Selected African Countries (1980 – 2005)

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cote d'Ivoire	***EDUC/GDP***	6.86	..	..	..	..	..	..	..	..	..	..	..	6.78	6.90	5.19	4.74	4.06	4.03	3.74	5.27	4.63	4.63	..	..	..	..
	TDS/GDP	13.83	18.18	20.35	18.54	16.65	15.97	14.42	13.56	10.48	11.03	11.69	12.19	10.40	9.90	14.97	9.51	11.32	11.60	10.82	11.54	9.79	5.89	7.24	4.16	3.51	2.84
	TDI/GDP	28.20	25.90	23.20	20.60	10.90	12.60	11.10	12.20	14.40	8.90	6.70	7.40	6.90	8.30	13.70	15.60	12.10	14.40	13.30	13.10	10.10	11.00	10.40	9.70		
	FDI/GDP	0.93	0.388	0.627	0.549	0.318	0.418	0.772	0.868	0.504	0.19	0.446	0.155	-2.07	0.796	0.938	1.923	2.217	3.543	2.973	2.578	2.253	2.586	1.851	1.204	1.828	1.626
Ghana	***EDUC/GDP***	3.08	2.45	..	..	1.48	2.53	3.38	3.32	3.20	3.37	3.22	..	4.46	4.26	4.21	4.68	4.08	..	..	4.11	..	..	..	..	..	5.45
	TDS/GDP	3.58	2.81	2.75	3.58	3.01	3.54	3.98	8.18	10.45	8.61	6.19	4.45	4.79	4.95	6.26	5.98	6.42	7.33	6.40	5.51	7.81	5.26	2.89	5.96	2.74	2.65
	TDI/GDP	5.60	4.60	3.40	3.70	6.90	9.60	9.40	10.40	10.90	13.20	14.40	15.60	12.80	22.20	24.00	20.00	21.20	24.80	23.10	21.00	24.00	26.60	19.70	23.00		
	FDI/GDP	0.351	0.385	0.404	0.059	0.045	0.124	0.075	0.093	0.096	0.286	0.251	0.303	0.351	2.095	4.283	1.649	1.733	1.188	2.24	3.161	3.337	1.681	0.957	1.794	1.57	0.993
Kenya	***EDUC/GDP***	6.54	6.41	6.13	4.70	5.32	6.13	..	6.81	6.15	..	6.73	6.70	6.29	7.01	6.71	6.47	6.35	..	..	5.32	5.19	5.21	6.14	6.47	6.74	..
	TDS/GDP	5.97	7.08	7.73	8.61	9.35	10.13	9.36	8.67	8.83	8.57	9.21	8.82	8.15	10.99	12.33	10.00	6.95	5.01	4.70	5.37	4.65	3.73	4.10	3.95	2.11	1.26
	TDI/GDP	29.20	27.70	21.80	20.80	20.70	26.00	21.80	24.30	25.00	20.60	19.70	19.30	13.70	17.70	16.40	17.50	16.80	15.40	17.30	16.20	15.40	14.60	13.40	12.90		
	FDI/GDP	1.087	0.206	0.202	0.397	0.174	0.47	0.452	0.494	0.005	0.752	0.664	0.231	0.077	0.027	0.052	0.359	0.106	0.15	0.081	0.107	0.873	0.041	0.214	0.558	0.284	0.113
Malawi	***EDUC/GDP***	3.10	3.53	2.85	2.68	2.49	3.30	3.63	3.24	3.23	3.33	3.17	3.17	4.72	4.34	4.13	5.33	..	..	..	4.55	4.14	..	..	5.81	..	..
	TDS/GDP	7.06	9.25	7.98	6.60	8.78	9.72	12.33	9.78	7.64	6.02	7.05	5.84	6.01	3.78	6.72	8.45	3.88	3.19	4.95	4.12	3.61	2.67	1.89	2.36	3.15	4.56
	TDI/GDP	24.70	17.60	21.40	22.80	12.90	18.60	12.30	15.40	18.70	21.20	19.70	20.20	19.90	15.20	29.10	17.40	12.30	11.60	13.50	14.70	13.60	13.90	10.90	11.20		
	FDI/GDP	0.766	0.09	0.508	0.209	2.259	0.046	-0.25	0.008	1.264	0.584	1.239	-1.3	-0.39	0.386	2.115	0.404	0.693	0.558	0.691	3.296	1.491	1.124	0.305	0.221	-0.04	0.145
Nigeria	***EDUC/GDP***	..	6.21	2.02	1.84	1.35	1.13	1.60	..	0.73	0.86	0.89	0.89	0.43	0.83	0.83	0.65	..	..	..	..	..	..	..	..	..	..
	TDS/GDP	1.79	2.99	4.19	7.33	14.42	15.58	10.14	4.72	9.67	8.88	11.71	10.78	11.46	6.98	7.91	6.52	7.11	3.91	4.14	3.06	4.01	5.33	3.19	2.82	2.40	8.98
	TDI/GDP	21.50	21.40	15.40	11.40	6.00	7.50	9.70	11.40	15.60	17.70	14.70	23.40	21.80	23.30	19.60	16.30	14.20	17.40	24.10	23.40	17.70	22.80	26.10	23.10		
	FDI/GDP	-1.15	0.905	0.865	1.043	0.671	1.709	0.956	2.605	1.657	7.903	2.065	2.608	2.741	6.301	8.28	3.84	4.514	4.249	3.271	2.89	2.479	2.48	4.012	3.44	2.601	2.035
Senegal	***EDUC/GDP***	..	..	..	..	..	..	..	..	..	..	3.92	3.92	4.24	4.25	3.85	3.84	3.77	..	3.46	3.41	3.38	3.52	3.63	..	4.06	5.38
	TDS/GDP	8.68	7.38	4.78	4.69	6.91	7.35	7.96	8.41	7.80	8.24	5.69	5.65	3.47	2.33	6.43	6.32	6.31	5.74	6.91	5.04	5.11	4.66	4.42	3.81	4.40	2.35
	TDI/GDP	15.30	11.90	11.30	11.90	11.70	9.80	11.00	11.70	12.50	11.90	13.80	12.90	14.80	14.10	18.50	16.70	18.50	17.80	19.80	20.60	18.50	18.10	18.50	20.10		
	FDI/GDP	0.485	1.387	1.086	-1.4	1.245	-0.61	-0.22	-0.09	0.3	0.579	0.998	-0.14	0.355	-0.01	1.836	0.708	0.188	4.024	1.51	3.221	1.435	0.7	1.567	0.819	1.01	0.655
South Africa	***EDUC/GDP***	..	..	..	..	..	..	5.43	5.58	5.13	5.42	5.92	5.92	6.24	6.18	6.40	5.89	6.80	..	..	6.03	5.58	5.29	3.77	3.08	2.92	2.89
	TDS/GDP	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.14	2.24	2.95	4.40	3.27	3.22	2.91	3.68	4.23	2.59	1.78	1.99
	TDI/GDP	29.90	..	..	..	..	..	..	..	..	16.50	11.80	11.90	12.00	14.00	16.80	18.00	17.30	16.60	17.00	16.40	15.90	15.30	16.10	17.20		
	FDI/GDP	-0.01	0.075	0.412	0.082	0.493	-0.67	-0.06	-0.18	0.138	-0.16	-0.07	0.211	0.003	0.009	0.276	0.826	0.568	2.561	0.41	1.129	0.729	6.136	0.663	0.471	0.327	2.612
Tanzania	***EDUC/GDP***	..	..	..	..	..	..	..	..	2.31	2.21	2.82	2.82	..	..	..	..	..	..	..	2.17	..	..	..	..	..	..
	TDS/GDP	3.14	3.01	2.28	2.67	2.33	2.71	3.45	3.05	3.17	4.01	4.20	4.14	5.10	4.95	4.07	4.42	4.14	2.20	2.83	2.62	1.89	1.62	1.11	0.89	1.05	1.05
	TDI/GDP	23.00	20.60	21.00	13.60	15.30	15.70	19.50	22.50	19.80	17.40	22.60	26.20	26.80	26.10	24.60	19.80	16.60	14.90	13.80	15.50	17.60	17.00	19.10	18.60		
	FDI/GDP	0.089	0.319	0.259	0.025	-0.15	0.226	-0.17	-0.01	0.074	0.132	2E-04	2E-04	0.264	0.48	1.108	2.282	2.31	2.055	2.056	5.982	5.104	4.949	4.398	5.119	4.154	3.909
Uganda	***EDUC/GDP***	1.24	2.52	1.69	2.43	3.43	..	..	5.10	..	1.45	1.47	1.47	..	..	2.20	2.53	..	..	..	..	2.46	..	..	..	5.23	..
	TDS/GDP	4.58	5.09	2.89	3.82	3.55	4.40	4.37	2.55	3.10	3.56	3.36	4.43	3.96	4.79	3.73	2.35	2.45	2.57	2.33	2.18	1.25	0.88	1.21	1.34	1.51	1.97
	TDI/GDP	6.20	..	..	9.10	8.80	9.90	12.50	12.90	10.10	11.10	12.70	15.20	15.90	15.20	15.40	12.80	20.70	18.50	16.40	19.50	20.00	18.60	19.70	20.70		
	FDI/GDP	0.321	..	0.093	..	..	-0.11	..	..	0.072	-0.03	-0.14	0.03	0.105	1.695	2.21	2.106	2.002	2.791	3.189	2.337	2.712	2.667	3.164	3.235	3.26	2.946

Source: World Development Indicators, 2006 Online Database, IFS database

EDUC is Education Expenditure, GDP is Gross Domestic Product, TDS is Total Debt Service, TDI is Total Domestic Investment and FDI is Foreign Direct Investment.

Continuation of Table 2.5

Country	Indicator	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Zambia	***EDUC/GDP***	4.13	4.01	5.16	5.39	5.00	4.15	3.34	2.66	2.39	2.45	2.41	2.76	2.10	1.95	1.98	2.04	..	..	2.31	1.93	1.99	1.99	..	..	2.83	1.99
	TDS/GDP	10.55	10.47	8.62	8.98	8.94	6.06	23.18	7.55	5.07	4.76	6.10	17.57	10.98	11.05	11.19	75.12	7.67	6.29	6.24	4.74	5.73	5.09	6.14	13.02	7.82	3.29
	TDI/GDP	23.30	19.30	16.80	13.80	14.70	14.90	23.80	13.90	11.40	10.80	17.30	11.00	11.90	15.00	8.20	15.90	12.80	14.60	16.40	17.60	18.70	20.00	23.00	26.10		
	FDI/GDP	1.5899	-0.958	1.0069	0.775	0.6307	2.2879	1.7018	3.2893	2.501	4.0966	6.1666	1.0169	1.4138	9.6044	1.1953	2.7892	3.5807	5.3038	6.1164	5.1735	3.7576	1.9714	2.2182	3.9754	4.4071	3.5625
Zimbabwe	***EDUC/GDP***	5.22	..	5.52	5.72	6.26	6.83	7.01	7.44	6.82	5.91	7.73	7.73	7.11	6.86	..	..	..	..	..	..	4.57	..	..	..	..	..
	TDS/GDP	0.98	1.35	2.44	6.50	5.63	7.49	7.65	7.90	6.82	5.30	5.36	5.32	8.89	9.52	8.68	8.94	7.45	7.85	15.55	10.52	5.69	1.63	0.50	0.68	1.97	6.66
	TDI/GDP	18.80	23.10	21.20	15.90	19.00	21.10	19.40	19.10	19.70	15.00	17.40	19.10	20.20	22.80	23.70	19.70	18.50	18.10	17.10	16.10	12.60	7.80	8.30	11.40		
	FDI/GDP	0.0232	0.0443	-0.01	-0.027	-0.039	0.0506	0.1199	-0.453	-0.231	-0.123	-0.139	0.0323	0.2217	0.4264	0.5034	1.6551	0.9459	1.603	7.324	0.9892	0.3135	0.037	0.1183	0.048	0.1846	3.0482

Source: World Development Indicators, 2006 Online Database, IFS database

EDUC is Education Expenditure, GDP is Gross Domestic Product, TDS is Total Debt Service, TDI is Total Domestic Investment and FDI is Foreign Direct Investment.

Structural adjustments programs failed because of design flaws. The commitment to reform was demonstrably weak and where economic and political reforms were accepted they were poorly implemented. SAPs amounted to reorganizing a bankrupt company and placing it, together with massive infusion of new loans or capital, in the hands of the same incompetent managers who ruined it in the first place (Ayittey, 1999). Furthermore, SAPs assumed that development occurred in a vacuum such that civil wars, infrastructural deterioration and environmental degradation had no effect on economic development.

The deterioration of macroeconomic conditions of African countries during the 1980s and 1990s even with availability of structural adjustment loans has been explained by Vamvakidis (2007). He asserts that foreign aid is often given through low interest-rate loans and therefore a government that can easily borrow abroad may use such borrowing to postpone otherwise necessary reforms. This is because there is less urgency to cut a high fiscal deficit when it can be easily financed by borrowing abroad. Furthermore, the availability of external financing may postpone the eventually inevitable adjustment in an economy in which macroeconomic conditions are deteriorating and there is urgent need for structural reforms. In this case, external financing acts like a "pain reliever", postponing the very much needed treatment.

2.3.3 Highly Indebted Poor Countries Initiative

The introduction of HIPC initiative in 1996 was a tacit admission by the creditors that SAPs, in which more confidence was reposed, lacked the capacity to halt the rise in developing countries' debt. By this time, the overall external debts for African countries had become so large relative to their economic sizes and their export earnings such that it was evident that it would be impossible for them to pay a significant part of their debts without the imposition of an insurmountable burden on them.

The HIPC initiative initially identified 41 poor countries for debt forgiveness, 33 were in Africa. Currently there are 40 countries under HIPC of which 32 are in Africa after Angola was dropped in 2000 because its debt could be reduced to levels deemed sustainable through other debt relief mechanisms. The objective of the initiative was to reduce the external debt burden of the poor countries adjudged to be heavily indebted to a level that they would not have the capacity to repay. The purpose of the initiative was to encourage improved economic and social performance in debtor countries, to facilitate the provision of interim finance to strong performers, foster a more

productive relationship between creditors and debtors, and to provide debtor countries an exit facility from repeated debt rescheduling exercises. The modalities for implementing the HIPC initiative were based on two overriding principles: eligibility and sustainability. Sustainability refers to a debt level that allows a debtor country to meet its current and future external obligations in full without resorting to rescheduling in the future or accumulation of arrears.

However, this debt relief initiative had serious flaws both in its design and implementation. Firstly, the eligibility for debt reduction was too closely linked to performance under the IMF/World Bank economic reform programs that had previously failed. Secondly, very few countries were viewed as sufficiently impoverished or indebted to qualify. The criteria used by the World Bank and IMF (PV of debt to exports of 200-250 percent and the debt-service to GDP ratio of 20–25 percent) were not only high but also arbitrary. Thirdly, the criteria for eligibility and debt sustainability still required poor countries to divert scarce resources away from vital human needs and investment in authentic development. Finally, the time frame for receiving debt relief was too long. Under typical HIPC debt relief conditions, countries had to establish a good track record for implementing IMF economic policy reforms for three years before receiving bilateral debt relief from creditor governments. They had to wait up to three more years to receive relief from IMF and World Bank. Besides these built-in design problems, political bickering and lack of political will among creditors led to serious problems in HIPC implementation. By the end of 1998, out of 41 HIPCs that desperately needed debt reduction, only six countries, namely Uganda, Bolivia, Côte d'Ivoire, Burkina Faso, Guyana and Mozambique had entered into the agreement IMF and IDA (2006a).

In recognition of the failure of the initial HIPC initiative to deliver on debt relief, coupled with aggressive world-wide campaigns for debt cancellation, HIPC II (the enhanced version) was adopted in 1999, making it easier for countries to meet the qualifying conditions, including implementing World Bank and IMF structural adjustment programs. HIPC II was designed to provide faster, deeper and broader debt relief and strengthen the link between debt relief, poverty reduction and social policies.

In order for countries to reach the decision point, all eligible countries requesting for HIPC initiative assistance are expected to prepare a Poverty Reduction Strategy Paper (PRSP) detailing how the money saved will be spent on the social sector. To qualify for HIPC II, the ratio of the

country's debt to export should be higher than 150 percent. Where the ratio of debt-to-revenues is used, this should exceed 250 percent. Upon the attainment of the decision point, the country receives from the participating creditor countries at least 90 percent debt relief, until it attains completion point when it would get the total debt relief. During the period between the decision and completion points, which is not time bound, the country should establish another track record of good policy performance under the IMF/World Bank supported programs which include satisfactory implementation of key structural macroeconomic policies and poverty reduction strategy. Whatever debt stock relief creditors give at the completion point is irrevocable for both official and commercial creditors. As of July 2006, of the 32 African countries eligible or potentially eligible HIPCs, fifteen had reached the completion point[7]. There were ten countries that had reached decision point and seven countries that were in pre-decision point[8].

In order to deal with debt problems of non-HIPC countries, the Paris Club approved in October 2003 the Evian approach. The Evian approach was designed to improve Paris Club capacity to deal efficiently with the debt of non-HIPCs. Its aim was to take into account debt sustainability considerations; given that Paris Club standard treatments have not been able to address debt sustainability problems and could lead to debtor countries bearing, unsustainable debt into cycles of debt rescheduling. It is supposed to tailor Paris Club debt treatments to the financial needs of the debtor countries over time and contribute to the efforts of resolving crisis more orderly, timely and predictably.

The Multilateral Debt Relief Initiative (MDRI) was launched in June 2005 by the G8 to reduce further the debt of HIPCs and provide additional resources to help them meet the Millennium Development Goals (MDGs). The MDRI is separate from the HIPC initiative but linked to it in terms of operation. Under the MDRI, the multilateral institutions - IMF, IDA and African Development Bank (AfDB) provide 100 percent debt relief on eligible debts to countries that have reached completion point under the HIPC initiative (IMF and World Bank, 2006).

[7] The fifteen countries are Benin, Burkina-Faso, Cameroon, Ethiopia, Ghana, Madagascar, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Tanzania, Uganda and Zambia.

[8] The ten countries that have reached decision point include Burundi, Chad, Republic of Congo, Democratic Republic of Congo, The Gambia, Guinea, Guinea-Bissau, Malawi, São Tomé and Príncipe and Sierra Leone. The seven at the pre-decision point are countries are Central Africa Republic, Comoros, Côte d'Ivoire, Liberia, Somalia, Sudan and Togo. These statistics are in IMF and IDA (2006a and 2006b)

HIPC initiative and MDRI relief have significantly lowered debt ratios in beneficiary countries, but other economic circumstances remain unchanged. IMF and IDA (2006d) acknowledge that the HIPCs' project and debt management capacities remain generally weak. HIPCs face large MDG-related needs, yet most of the related expenses (for example in health and education) do not immediately generate the cash flows required to service commercial debt. The apparent borrowing space created by debt relief poses new policy challenges. Debt relief frees up resources that African countries may wish to use to make faster progress towards achieving the MDGs. Meanwhile, there is emergence of new lenders, both public and private who present new opportunities. Such lending, however, if in excessive volumes or on unfavorable terms, could contribute to the re-emergence of debt vulnerabilities in these countries and create risks to development.

2.3.4 Challenges of the Highly Indebted Poor Countries Initiative

Jubilee Plus, a London-based debt activist group concluded, after analyzing the World Bank data, that at least 15 African countries would continue to face unsustainable levels of debt after receiving HIPC relief. Their argument was that the Bank's definition of sustainable debt failed to include new debt which the poorest countries must continue to borrow in order to pay charges on their remaining old debt. The bank also fails vital ongoing obligations such as key social and infrastructure spending that must be met by the poorest countries. As some observers have noted, HIPC cannot provide an exit from current debt problems and long-term debt sustainability is a mirage (Gumisai, 2001).

The major challenge of HIPC initiative is its voluntary nature which has contributed to the low participation of non-Paris Club official bilateral creditors. Even though efforts have been deployed to encourage all creditors to join in, with a view of ensuring that debt relief provided would be comprehensive and the costs shared equally, there is no legal basis requiring creditors to participate and provide debt relief on terms comparable to those granted by other creditors. In practice, many non-Paris Club creditors as well as commercial creditors have not participated in the HIPC initiative (IMF and IDA, 2006d). Debt relief delivered to HIPCs by non-Paris Club official bilateral creditors is low even under optimistic assumptions. Estimated debt relief delivered ranges between US$1.1 billion and US$1.4 billion in end-2005 PV terms, or 27 percent and 37 percent of total HIPC initiative assistance costs attributable to these creditors. Even under

the most optimistic scenario, this is less than half of the debt relief expected to be delivered by non-Paris Club official bilateral creditors.

Commercial creditors account for about 4 percent of the total cost of HIPC initiative debt relief to the 29 post-decision-point countries. Their share in total debt relief has almost doubled since mid-2005, mainly due to Republic of Congo reaching its decision point. However, commercial creditors pose a challenge to the HIPC initiative. Firstly, very few commercial creditors have provided their share of HIPC debt relief. According to a recent survey conducted by IMF and IDA, some commercial creditors have only provided debt relief for three countries – Democratic Republic of Congo, Guyana and Madagascar. This debt relief only amounts to 5.5 percent of the total HIPC initiative assistance to be provided by commercial creditors to the 29 post-decision-point HIPCs. The low participation of commercial creditors could hinder some HIPCs' access to debt relief from IMF. HIPCs that have significant debt to commercial creditors (such as the Republic of Congo, Côte d'Ivoire and Liberia) could find it difficult to get the financing assurances required to access interim relief from creditors such as IMF. As of end-July 2006, the IMF had not received sufficient financing assurances to start disbursing interim assistance to the Republic of Congo which reached its decision point in April 2006.

Secondly, a growing number of commercial creditors and distressed debt funds are engaging in litigation against HIPCs. The HIPCs facing the most litigation are the Republic of Congo, Guyana and Uganda with eight, seven and six lawsuits, respectively. Of the total 44 litigations, 26 creditors have obtained court judgments in their favour against seven HIPCs[9] amounting to about US$1 billion. Litigation has lead to significant financial and economic costs to HIPCs. The total reported claims under litigation as of 2006 amount to about US$1.9 billion, and are about 22 percent higher than the total HIPC initiative debt relief to be provided by commercial creditors. For example, lawsuits against Cameroon and Nicaragua have resulted in court awards equivalent to more than half and four times, respectively, of the debt relief that should have been provided by commercial creditors to these countries. In Republic of Congo, and São Tomé and Príncipe, litigated debts are equivalent to about 15 percent and 13 percent of GDP, respectively.

[9] The seven are Cameroon, the Democratic Republic of Congo, Republic of Congo, Nicaragua, Sierra Leone, Uganda and Zambia. Sierra Leone, Uganda and Zambia have already paid cumulative US$30 million to some of their litigating creditors, although through out-of-court settlements.

IMF and IDA admit that helping countries move through the HIPC initiative process has become challenging. Some HIPCs experienced extended interruptions to Poverty Reduction and Growth Facility (PRGF)-supported program implementation, mainly due to fiscal policy slippages. Weak budget execution and poor policy implementation have slowed the achievement of agreed triggers. Preparing fully participatory Poverty Reduction Strategy Papers (PRSPs) takes longer than expected, given that many countries lack the institutional and human capacity needed to prepare such documents. Progress in several pre-decision-point countries has been hindered by internal conflict, governance issues and protracted arrears.

Moreover, access to debt relief by some pre-decision-point HIPCs could be curtailed by the initiative's sunset clause. A sunset clause was included in the initial legal framework in 1986 in order to prevent HIPC from becoming permanent, minimize moral hazard and encourage early adoption of reforms. IMF and IDA have subsequently extended the sunset clause four times and it was to take effect on December 31, 2006 (IMF and IDA 2006c). These extensions were granted to allow countries more time to start qualifying programs so as to be able to benefit from HIPC debt relief. As of July 2006, members of IMF and IDA had decided to let the sunset clause take effect and grandfather all countries that were assessed to have met the income and indebtedness criteria based on end-2004 data[10]. This would permit the countries to qualify for HIPC debt relief at their own pace.

Although HIPCs that have reached completion point have received debt relief, debt has increased substantially, exceeding the HIPC thresholds. By 2003, debts to export ratios for selected HIPCs were above 150 percent (see Table 2.6 below). In fact, debt to export ratios at completion points for most HIPCs are on average almost 40 percentage points higher than those projected at decision points. Debt burdens of HIPCs have accelerated because of exogenous shocks/structural vulnerability (commodity price shocks, natural disasters, unexpected changes in discount rates and exchange rate fluctuations) of these economies, high current account deficits, inadequate debt management policies, inadequate social and structural policies that can stimulate growth and attract investments, lending policies of many creditors (loans with commercial interest rates and with short maturity period) and political instability. As World market prices for commodity products have decreased substantially in recent years, growth rates of the HIPCs are below the

[10] The countries to be grandfathered are Comoros, Eritrea, Liberia, Somalia and Sudan.

expectations on which the original sustainability analysis was based. This is because these countries depend on a small number of commodity export products. This lack of diversification is largely a reflection of the low development levels of these countries.

Table 2.6: External Debt and Current Account Balance Indicators for Selected African Countries

	Cote d'Ivoire			Ghana			Kenya			Malawi			Nigeria			Senegal		
Year	CA bal	ETD/XGS	ETD	CA bal	ETD/XGS	ETD	CA bal	ETD/XGS	ETD	CA bal	ETD/XGS	ETD	CA bal	ETD/XGS	ETD	CA bal	ETD/XGS	ETD
1980	-1826.5	205.0	7462.4	30.2	115.5	1401.7	-876.3	164.3	3386.8	-259.6	263.7	829.9	5177.6	32.1	8921.4	-386.1	162.7	1473.3
1981	-1411.3	279.2	8140.8	-419.2	184.8	1538.8	-561.6	179.5	3228.2	-145.6	258.7	821.4	-6473.9	58.6	11420.7	-461.5	156.6	1670.7
1982	-1016.1	315.1	8961.4	-107.3	207.7	1484.2	-305.3	206.6	3367.8	-111.7	321.4	864.7	-7281.8	92.8	11971.6	-265.6	192.6	1859.9
1983	-928.7	349.0	8858.4	-172.2	348.5	1665.9	-47.3	237.9	3628.3	-130.8	323.2	892.3	-4331.8	161.5	17560.8	-304.4	201.7	2073.0
1984	-72.8	281.8	8545.9	-38.8	318.0	1959.4	-126.9	211.1	3511.5	-41.7	257.7	879.9	122.6	143.9	17770.5	-272.4	227.4	2197.2
1985	67.9	301.9	9659.0	-133.9	331.7	2243.3	-115.0	260.2	4180.6	-126.4	369.7	1020.7	2603.6	137.9	18643.3	-359.6	281.2	2559.4
1986	-297.7	307.3	11449.8	-85.3	341.1	2746.6	-45.0	242.0	4602.8	-84.9	425.7	1157.3	210.9	411.7	22211.9	-368.8	281.0	3220.6
1987	-968.3	381.1	13577.1	-97.9	362.2	3284.4	-502.1	332.6	5782.9	-60.6	442.0	1366.7	-73.2	370.5	29021.4	-429.8	336.9	4026.6
1988	-1238.9	402.0	13342.3	-67.1	316.8	3056.4	-471.3	307.1	5809.0	-86.9	397.9	1359.0	-296.5	406.8	29621.0	-404.6	313.4	3883.0
1989	-966.4	457.6	14820.6	-93.9	366.0	3294.4	-590.4	304.4	5888.7	-51.2	455.1	1410.1	1089.5	350.8	30122.0	-347.9	245.4	3268.5
1990	-1214.2	484.5	17251.1	-223.2	391.1	3734.4	-527.1	315.9	7055.1	-86.2	344.4	1558.2	4988.2	226.4	33438.9	-363.3	230.0	3743.8
1991	-1074.1	537.8	18174.0	-252.1	385.7	4156.5	-213.3	337.9	7453.1	-227.7	319.3	1664.9	1202.6	249.9	33527.2	-371.7	240.6	3579.2
1992	-1012.7	513.1	18546.5	-377.0	374.2	4238.5	-180.2	320.5	6897.9	-284.9	393.1	1708.9	2267.8	222.3	29018.7	-401.3	235.8	3674.2
1993	-891.7	579.2	19070.9	-558.8	377.4	4575.2	71.2	305.3	7111.4	-165.6	522.4	1826.2	-780.4	257.8	30735.6	-433.0	280.9	3794.9
1994	-13.8	491.7	17395.2	-254.6	364.9	5101.1	97.9	266.3	7124.2	-180.7	569.7	2021.1	-2127.9	317.3	33092.3	-187.5	269.7	3687.7
1995	-492.4	417.5	18898.5	-143.7	340.7	5494.9	-400.4	245.8	7309.0	-78.0	472.5	2238.8	-2578.4	257.4	34092.5	-244.5	232.6	3906.0
1996	-162.3	376.7	19523.6	-306.9	325.6	5787.7	-73.5	224.1	6813.6	-147.4	415.4	2311.7	3506.9	175.3	31406.6	-200.7	246.9	3776.0
1997	-154.7	300.6	15608.7	-403.5	334.5	5712.3	-456.8	215.5	6465.1	-276.2	376.0	2225.6	551.6	156.6	28454.9	-184.8	264.2	3795.3
1998	-290.2	275.5	14851.8	-521.7	243.9	6310.9	-475.3	236.2	6824.0	-4.4	418.1	2438.9	-4243.5	257.6	30294.5	-247.5	260.8	4068.8
1999	-119.5	243.4	13170.0	-964.3	254.9	6419.9	-89.6	237.8	6474.8	-157.5	523.3	2742.0	505.8	189.2	29127.6	-320.2	237.8	3930.7
2000	-241.3	269.0	12138.0	-386.5	245.8	6115.9	-199.4	217.9	6145.0	-73.5	573.9	2705.5	7429.0	138.9	31354.9	-332.4	229.8	3589.7
2001	-61.3	249.3	11618.1	-324.6	257.7	6342.7	-320.3	177.6	5520.9	-60.0	533.5	2584.7	2477.8	147.7	31041.6	-245.5	211.6	3643.7
2002	768.2	196.5	11791.4	-31.9	264.9	6961.7	-117.7	185.2	6127.8	-200.7	603.1	2887.4	1083.1	156.0	30476.0	-316.8	216.8	4085.6
2003	294.2	184.0	12186.7	302.3	231.0	7572.9	146.2	184.2	6881.9	..	..	3098.9	3390.7	121.4	34700.2	-436.6	185.0	4366.7
2004	240.9	149.1	11739.4	-315.8	200.0	7067.1	-352.9	155.0	6947.0	..	..	3416.6	16840.3	93.5	37883.1	-513.1	134.8	3825.2
2005	-12.4	126.6	10734.8	-811.6	168.0	6738.7	-495.0	114.3	6169.2	..	..	3154.8	24202.0	39.4	22178.3	..	..	3792.9

Source: Global Development Finance

CA bal is current account balance, ETD is external debt stock, and XGS is exports of goods and services. CA balance and ETD are in Millions of US$.

Continuation of Table 2.6

	South Africa			Tanzania			Uganda			Zambia			Zimbabwe		
Year	CA bal	ETD/ XGS	ETD	CA bal	ETD/ XGS	ETD	CA bal	ETD/ XGS	ETD	CA bal	ETD/ XGS	ETD	CA bal	ETD/ XGS	ETD
1980	3161.4	2.6	..	-521.2	698.7	5322.8	-82.7	207.8	687.1	-516.3	199.7	3244.4	-149.4	45.6	0.8
1981	-4978.4	4.2	..	-406.6	719.8	5821.3	25.4	256.7	703.0	-720.6	308.2	3603.6	-546.1	75.0	1.3
1982	-3525.8	6.0	..	-523.3	1169.0	6198.4	-69.9	250.8	870.5	-560.6	339.1	3658.0	-632.1	118.7	1.9
1983	-323.2	5.7	..	-304.6	1397.2	6864.1	-72.2	273.5	1005.5	-263.0	365.7	3747.2	-397.9	160.2	2.2
1984	-1951.8	7.9	..	-359.0	1428.0	7225.0	103.5	252.3	1070.0	-146.6	385.8	3752.8	-42.9	159.3	2.2
1985	2261.4	6.5	..	-375.1	2085.2	9104.7	4.6	330.7	1231.4	-395.3	517.2	4487.2	-64.2	166.1	2.4
1986	2766.0	5.2	..	-321.1	1098.7	4901.2	-43.3	335.4	1413.6	-347.6	760.4	5633.3	16.8	171.5	2.6
1987	5104.7	4.1	..	-407.4	1379.9	5507.9	-112.0	575.6	1920.2	-245.2	719.3	6480.4	58.0	174.9	2.9
1988	2533.6	3.8	..	-356.5	1185.5	6011.3	-195.2	722.1	1922.9	-293.2	535.2	6694.2	125.3	143.9	2.7
1989	1498.0	2.9	..	-335.1	1088.4	5852.9	-259.5	784.2	2177.7	-218.6	459.4	6553.4	16.9	143.8	2.8
1990	1551.6	2.7	..	-558.9	1185.8	6454.0	-263.3	1453.1	2583.7	-594.4	507.0	6904.8	-139.8	161.1	3.3
1991	1399.1	2.8	..	-737.5	1278.2	6559.8	-169.8	1411.5	2778.2	-305.7	549.9	6958.5	-456.9	174.2	3.5
1992	1980.2	2.9	..	-714.2	1141.3	6670.0	-99.6	1542.5	2927.7	..	..	6700.2	-603.7	221.9	4.1
1993	2803.1	5.1	..	-894.8	862.6	6786.1	-171.1	1010.0	3029.8	..	..	6477.9	-115.8	210.8	4.2
1994	29.6	70.0	21671.0	-637.4	748.1	7245.8	-174.2	623.5	3372.7	..	..	6808.5	-424.9	189.1	4.5
1995	-2493.2	71.4	25358.0	-589.8	572.2	7421.3	-281.5	525.4	3583.1	..	..	6957.8	..	..	5.0
1996	-1678.2	71.2	26050.0	-412.8	519.3	7387.0	-211.5	452.9	3685.5	..	..	7060.1	..	..	5.0
1997	-2227.4	66.6	25272.4	-473.4	550.9	6910.0	-315.7	487.0	3884.9	-182.0	524.8	6659.8	..	..	4.9
1998	-2199.1	68.6	24752.7	-751.0	619.6	7308.4	-363.7	531.5	3918.3	-570.4	712.5	6870.4	..	..	4.6
1999	-675.2	67.3	23907.3	-835.3	645.1	7654.9	-293.2	369.4	3498.9	-386.4	635.2	5859.4	..	..	4.3
2000	-190.6	62.9	24861.0	-498.6	516.9	6931.1	-358.8	366.6	3498.1	-552.7	623.6	5722.5	..	..	3.8
2001	342.6	62.6	24050.0	-237.4	341.9	6245.2	-369.5	348.1	3732.5	..	567.16	6069.1	..	..	3.6
2002	884.3	64.3	25040.5	22.4	346.8	6840.3	-362.0	347.2	3993.3	..	605.61	6460.6	..	..	3.9
2003	-1902.4	55.8	27807.3	-111.0	310.2	6989.6	-354.3	393.7	4575.0	..	516.65	6926.6	..	..	4.5
2004	-7003.3	46.6	28499.9	-246.2	291.7	7804.8	-191.8	322.0	4789.6	..	346.9	7279.2	..	..	4.8
2005	43.1	30631.6	-536.3	260.8	7763.3	-259.1	238.8	4462.6	..	209.0956	5668.3	..	..	4.3	

Source: Global Development Finance

CA bal is current account balance, ETD is external debt stock, and XGS is exports of goods and services. CA balance and ETD are in Millions of US$.

2.4 What is the way forward in Addressing Africa's Debt Burden?

From the foregoing discussion, external debt and its attendant debt service have led to debt overhang problem, crowding-out of domestic investments and expenditure on education, and thus hampered economic growth for African countries. External debt burden has also led to capital flight and subjected these countries to risks of default and creditworthiness. As has been discussed in the review, there is a negative relationship between debt service and foreign investments in Africa. This means that as countries committed more funds to debt service their foreign direct investments declined because of the debt overhang syndrome. There is also a negative relationship between external debt and GDP which implies that as debt stock increased, GDP declined. Furthermore, there is a negative relationship between growth rate in debt service and growth rate in GDP which suggests that debt service depressed growth rate in GDP. Moreover, the countries imported more than they exported during the review period suggesting that most of the imports were in consumables instead of intermediate inputs that would have grown exports, which in turn would have contributed to reducing the debt burden. Poor performance of exports led to reduction of the foreign exchange earnings that are required for servicing external debts and import of basic equipment and raw materials.

Creditor countries have come up with several debt management initiatives such as SAPs, rescheduling, and HIPC. In all African countries, structural adjustments have meant a period of austerity, declining income and standards of living, mounting unemployment and increasing poverty. Rescheduling compounded the debt stock as countries had to repay more debt than they had initially bargained or contracted. The substantial number of rescheduling the countries had to go through is a further indication of Africa's seeming intractable debt problem. Although the HIPC initiative has provided total debt cancellation to some of the highly indebted poor countries it is evidently not enough to alleviate Africa's external debt burden. Its main purpose appears to be the strengthening and legitimizing of the structural adjustment policies imposed by the World Bank and the IMF as an appendage to the HIPC initiative.

Irrespective of the debt management programs put forward largely by the creditors, Africa's debt burden has continued to increase over the last two decades and reached the highest level of US$270.3 billion in 2004. External debt crisis has been exacerbated by the region's limited governance and macro-economy management capacity. Past efforts at finding solutions to

Africa's indebtedness have been unimaginative and therefore can be adjudged as inadequate for resolving Africa's external indebtedness. Debt burden and its attendant debt service can only be appropriately dealt with, if and only if the countries adopt better present and future debt management and macroeconomic policies. In the next two chapters, this study starts the process of identifying theoretically grounded and more improved debt management policies that will prevent future build-up of unsustainable debts by African countries.

CHAPTER THREE: A MACROECONOMIC MODEL OF EXTERNAL DEBT BURDEN FOR AFRICA

3.1 Recap of the Sources of External Debt

This chapter derives a macroeconomic model of external debt's potential burden for Africa. As discussed in chapter one, the external debt burden of African countries increased immediately after the two oil crises of 1973 and 1979. Ndikumana (2004) argues that the rush to lend by oil exporters and their bankers, who were faced with excess supply of dollars resulting from the oil revenue booms of the 1970s, contributed to the indebtedness of African countries. That is, over-borrowing during the 1970s was generally a result of OPEC's surpluses, in addition to high growth of African countries, improved terms of trade of Africa countries, and low world interest rates. Further, the oil price shocks of the 1970s triggered worldwide inflation. The contractionary monetary policy that was used to fight this inflation led to an increase in world interest rate and consequently exacerbated Africa's debt burden. Huang and Guo (2007) confirm that an oil price shock triggers an immediate depreciation of the real exchange rate. Exchange rate depreciation, in turn, leads to worsening of the terms of trade and potentially increases foreign debt.

Another factor that contributed to the accumulation of external debt is the commodity booms of the 1970s. Senhadji (1997) notes that the commodity boom of the 1970's contributed to the indebtedness of African countries through over-borrowing that became common among these countries. He posits that over-borrowing occurs if a permanent decline in the terms of trade is perceived to be transitory or if a transitory improvement in the terms of trade is believed to be permanent. Similarly, over-borrowing can occur if a permanent increase in the world interest rate is perceived to be transitory or if a transitory decline in the world interest rate is perceived to be permanent.

This debt-fostering international economic environment of the 1970s (i.e., commodity price booms and low interest rates) ended in early 1980s. The collapse in commodity prices in 1986 led to losses in export earnings while import prices headed in the opposite direction. This led to unfavorable terms of trade for most African countries; this in turn, forced these countries to borrow from external sources and thus engendered the accumulation of more debt (Iyoha, 1999; Boyce, 1992; and Ndikumana, 2004).

Additionally, there was need for African countries to borrow in order to finance and sustain development programs of the post-independence era. However, most of the loans contracted were either consumption loans or loans invested in projects that were unproductive. Lots of these loans did not earn the foreign exchange that was needed to repay the debt; thus, exacerbating the external debt burden of African countries.

According to Ndikumana (2004), adverse external shocks such as terms of trade shocks, world recessions that reduce the demand for developing country's products, drought and political crises, accentuate the accumulation of external debts by distorting balance of payments and weakening fiscal situations. As noted by Nishimura and Ohyama (1995) and Senhadji (2003), a permanent increase in the terms of trade raises the marginal product of capital, which in turn stimulates investment. Consumption responds positively to investment spending, resulting in an increase in GDP. Exports increase more than imports, yielding a surplus in both trade and current account. Foreign borrowing falls, as the trade surplus is used to repay some of the foreign debt. Senhadji (2003) further asserts that a permanent increase in the world interest rate depresses both consumption and investment. Aggregate output falls because of the large trade surplus that is set aside to pay for the high cost of servicing the foreign debt. The economy responds to the permanent increase in debt service cost by reducing new borrowing.

Therefore, the rapid external debt build-up of the 1980s is attributable to the then continued decline in the terms of trade, uncontrolled fluctuations in export earnings due to weak export markets, higher international interest rates, realignment of exchange rates, and rescheduling and refinancing of Africa's external debt (Iyoha, 1999 and Ndikumana, 2004). The accumulation of foreign debt by African countries during the late 1980s and 1990s is deemed to be due mainly to cost increases in servicing the debt which in turn is believed to be caused by increases in the world interest rate and declining terms of trade.

The extent to which the highlighted unfavorable environment contributed towards debt accumulation in African countries is the focus of this chapter. This chapter analyses how the world commodity price shock[11], the world interest rates shock, the unfavorable terms of trade and the fluctuations in exchange rates led to the accumulation of external debt in African countries. I

[11] In this study, the world commodity price shock refers to shocks to export prices. A negative world commodity price shock refers to a fall in commodity prices and vice versa.

derive a Dynamic Stochastic General Equilibrium (DSGE) model of external debt's potential burden for a small open economy. The choice of the DSGE model is based on the fact it explicitly specifies the objectives and constraints faced by households and firms, and then determine the prices and allocations that result from their market interaction in an uncertain environment (Ruge-Murcia, 2007). In addition, most econometric models suffer from the Lucas Critique particularly when the model encompasses the estimation of rational expectations that have an explicit structural interpretation. The DSGE model that I develop is explicitly derived from first principles. It describes the general equilibrium allocations and prices of a model economy in which agents (households, firms, financial intermediaries and so forth) dynamically maximize their objectives (utility, profits, etc) subject to their budget and resource constraints. The DSGE model parameters describe the tastes and preferences of agents, the production function (technology), and other features of the economy.

The model I derive shares some of the basic small, open-economy features of models by Adolfson, Laséen, Lindé and Villani (2007), Smets and Wouters (2003), Kose (2002), Senhadji (1997), McCallum and Nelson (1999) and Fuhrer (2000); but I include the evolution of foreign debt. The other distinguishing feature is that I assume monetary authorities pursue money growth as the monetary reaction policy as opposed to the Taylor rule. Accordingly, the model is estimated by using data from 11 African countries. The data is used to assess the model's impulse responses of important/target economic variables to debt-related shocks. Further, insights from the model are used to derive pre-qualification schemes for better debt sourcing and management in a later chapter. Section 3.2 looks at the outline of the structural model. Section 3.3 presents the estimation of the model. Section 3.4 provides simulations of the model and section 3.5 concludes the chapter.

3.2 Outline of the Model

3.2.1 Set up of the Model

The model describes a small open economy that relies heavily on a narrow range of commodities, and a significant fraction of the economy's export revenue is used to pay back a huge foreign debt. As in Senhadji (2003), the developing economy is assumed to rely only on imports for capital formation and has imperfect access to international financial markets in the sense that the economy faces an upward-sloping supply function of foreign loans. Households consume both imports and

domestically produced goods. If the price of imported goods increases, it causes inflationary pressure in the economy. If monetary authorities increase domestic interest rates to a level greater than interest rate on foreign debt, households increase their consumption of foreign debt.

Firms export some of the domestically produced goods. According to Kose (2002), when the relative price of exports falls, it leads to a substantive decline in the importation of productive inputs, which in turn results in a contraction of exports. This leads firms to reduce domestic investment and production. Firms' profits decline and further exacerbate foreign debt accumulation, as internal equity finance, which could have at least maintained current production levels, shrinks.

Monetary authorities in this economy control money supply. I follow Lane (1999), and assume that an expansionary monetary shock will lead to an increase in domestic output and consumption, and consequently increase domestic interest rates. In addition, monetary shocks generate a temporary depreciation of the real exchange rate under a flexible exchange rate regime. The depreciation translates into a decline in the domestic terms of trade, thus foreign consumption in the economy increases. Nishimura and Ohyama (1995) suggest that terms of trade improvement would improve the country's current account and, therefore, decrease its external debt. Apart from controlling money supply, monetary authorities respond to inflationary pressures engendered by oil price shocks by tightening monetary policy. This leads to an increase in interest rates. Monetary authorities also respond to adverse commodity price shocks by increasing foreign borrowing. This is because negative commodity price shocks depress economic growth.

3.2.2 Household's Behaviour

The representative economy is populated by identical households. Households maximize a utility function with three arguments – domestic goods consumption, import goods consumption and money balances – over an infinite life horizon. Consumption appears in the utility function relative to a time-varying external habit variable, along the lines of Fuhrer (2000) and Smets and Wouters (2003). Habit formation implies that households' marginal utility of consumption in the current period is affected by the quantity of goods they consumed in the previous period. Fuhrer (2000) shows that habit formation impacts a utility-based smoothing motive for both changes and levels of consumption. Consequently, habit formation improves the ability of the model to match the hump-shaped response of consumption to shocks.

Formally, households maximize an intertemporal utility function given by:

$$E_0 \sum_{t=0}^{\infty} \beta^t U_t \ , \tag{1}$$

where β is the discount factor. The instantaneous utility function is separable in the consumption of domestic goods, imports, real money balances and labour. The utility depends positively on the consumption of domestic goods, C_t, relative to an external habit variable, H_t. It depends positively on the consumption of the imports, C_{mt}, relative to an external habit variable, H_{mt}, negatively on labour supply L_t, and positively on the real cash balances M_t/P_t. Just as McCandless (2008, 236) argues, the rationale for adding real balances to the utility function is the presumption that additional real balances reduce the cost of making transactions. The benefit of putting money in the utility function is that if there are other assets that individuals can hold, for instance capital assets, the model will produce a real rate of return for money that is less than that of the other assets. In addition, holdings of real balances might provide insurance against certain individual or economy-wide shocks and might permit transactions with unknown individuals with whom credit transactions might not be feasible. The utility function for this economy is thus:

$$U_t = e^{\xi_{ct}} \frac{1}{1-\sigma} \left[\frac{C_t}{H_t}\right]^{1-\sigma} + e^{\xi_{cmt}} \frac{1}{1-\theta} \left[\frac{C_{mt}}{H_{mt}}\right]^{1-\theta} + e^{\xi_{m_t}} \frac{1}{1-\omega} \left[\frac{M_t}{P_t}\right]^{1-\omega} - e^{\xi_{l_t}} \frac{1}{1+\beta} [L_t]^{1+\beta} \ , \tag{2}$$

where σ is the inverse of the intertemporal elasticity of substitution, θ represents the inverse of the elasticity of imports, ω represents the inverse of the elasticity of money holdings with respect to the interest rate and β is the inverse of the intertemporal elasticity of labour supply. As pointed out by Blanchard (2006, 49), σ determines the household's willingness to shift consumption between different periods. When σ is small, the marginal utility falls more slowly as consumption rises, and so the household is more willing to allow its consumption to vary over time. If σ is close to zero, utility is almost linear in consumption, and so the household is willing to accept large swings in consumption to take advantage of small differences between the discount rate and the rate of return on saving. Equation (2) has four preference shocks: ξ_{ct} represents a general shock to preferences that affects domestic goods; ξ_{cmt} represents a preference shock to imports; ξ_{m_t} is a preference shock to money demand and ξ_{l_t} is a labour supply shock. The external habit stocks are assumed to be proportional to past consumptions and take the forms:

$$H_t = C_{t-1}^{\gamma} \ , H_{mt} = C_{mt-1}^{\gamma}. \qquad 0 < \gamma < 1, \tag{3}$$

H_t is the habit formation reference consumption level, γ measures the importance of the reference level relative to current consumption, H_{mt} and is the habit formation reference level of consumption of imports. If $\gamma = 0$, habit stock has no relevance and utility depends on current consumption. If $\gamma = 1$, habit stock is important and utility depends on both current and past consumption.

Households own the capital stock, which they rent to firms that produce intermediate goods. They can increase their supply of rental services from the capital stock either by investing in additional capital stock or by directly increasing the utilization rate of the physical capital stock. The capital accumulation adjustment cost follows Christiano, Eichenbaum and Evans (2005), hereafter CEE, and Smets and Wouters (2003), and is given by:

$$K_t = (1-\delta)K_{t-1} + S(I_t^m / I_{t-1}^m) I_t^m, \tag{4}$$

where K_t is the capital stock, I_t^m is the imported investments, δ is the depreciation rate, and $S(\cdot)$ is the installation cost for capital, which is assumed to be strictly convex. The installation cost for capital is a positive function of changes in investment and equals zero in the steady state. In this model, $S(\cdot)$ takes the form $\left[\frac{1}{\varphi}\left(\frac{I_t^m}{I_{t-1}^m}\right)^{\varphi}\right] I_t^m$. The investment adjustment cost parameter is φ. The inclusion of investment adjustment cost allows the model to produce fluctuations in the relative price of investment and consumption goods, which is given by the marginal rate of substitution between investment and consumption. As pointed out by Mendoza (1991), investment adjustment cost ensures that the cost of changing the capital stock by a fixed amount increases with the speed of the desired adjustment, giving agents an incentive to gradually undertake changes in investments.

Households hold their financial wealth in the form of cash balances M_t, domestic bonds B_t and capital stock. They also contract foreign debt B_t^f. The current income and financial wealth can be used for consumption and investment in physical capital. Households maximize their objective function subject to an intertermporal budget constraint which is given by:

$$\frac{M_t}{P_t} + \frac{B_t}{P_t} - \frac{e_t P_t^f}{P_t} B_t^f + P_{k_t} K_t - P_{k_t}(1-\delta)K_{t-1} = \frac{M_{t-1}}{P_t} + \frac{B_{t-1}}{P_t}(1+r_t) - \frac{e_t P_t^f}{P_t} B_{t-1}^f \left(1 + r_t^f - \rho_t\right) +$$
$$\Upsilon_t - C_t - Q_t I_t^m - \left[\frac{1}{\varphi}\left(\frac{I_t^m}{I_{t-1}^m}\right)^{\varphi}\right] I_t^m - \left[\frac{1}{\varpi}\left(\frac{L_t}{L_{t-1}}\right)^{\varpi}\right] L_t - \frac{e_t P_t^f}{P_t} C_{mt}, \tag{5}$$

where r_t^f is the interest rate on foreign debt, r_t is the interest rate on domestic bonds, P_{k_t} is the price of capital, P_t^f is the price of imports, e_t is the exchange rate, ρ_t is the risk premium, $Q_t I_t^m$ is the nominal cost of imported investment good, Υ_t is the revenue from both foreign and domestic markets, $Q_t = \frac{e_t P_t^f}{P_t}$ is the real exchange rate, L_{t-1} is the aggregate employment inherited from the previous period, $\left[\frac{1}{\varpi}\left(\frac{L_t}{L_{t-1}}\right)^{\varpi}\right] L_t$ is the labour adjustment cost and ϖ is the labour adjustment cost parameter. I include labour adjustment costs just as in Janko (2008) because firms incur costs whenever labour hours fluctuate over time. Labour adjustment costs also play an important role in affecting the firm's production process.

In view of the fact that households can smooth their consumption stream by borrowing and lending in the international market, the possibility of households playing a ponzi game[12] and accumulating an infinite amount of debt is ruled out by imposing the no ponzi condition: $\lim_{t\to\infty} E_0\left(B_t \frac{1}{(1+r_t)^t}\right) = 0$. This condition prohibits households from operating ponzi-type schemes.

3.2.3 Firm's Behaviour

Firms produce domestic goods, export some of the goods to the foreign market and import intermediate inputs, as they do not have the capacity to produce investment goods. The final domestic goods are produced by different firms and production is represented by a simple Cobb-Douglas production function with constant-returns-to-scale. The production function depends on capital and labour. The output produced is sold to both foreign and domestic markets. The production function for this economy takes the form:

$$Y_t = e^{\xi_{yt}} A_t K_t^{\propto} L_t^{1-\propto} \qquad 0 < \propto < 1. \qquad (6)$$

where A_t is technological progress, K_t is the capital stock, L_t is labour, $\propto$ is the share of capital in output, $1-\propto$ is the share of labour in output and ξ_{yt} is the productivity shock. Productivity shock

[12] A ponzi game is a scheme in which households issue bonds and roll over the interest and principal from period to period by perpetually issuing new bonds to render debt service. That is, the issuer always obtains the funds to pay off debt when it comes due by issuing new debt. Such a scheme allows the issuer to have a present value of lifetime consumption that exceeds the present value of his/her lifetime resources.

affects output through technological progress. It is exogenously determined and follows an AR (1) process.

In this economy, revenue is derived from the output that is sold to both foreign and domestic markets. The economy is assumed to be susceptible to world commodity price shock and productivity shock. If there is an adverse commodity price shock, revenue from the foreign market falls, thus reducing the economy's total revenue. This leads to accumulation of foreign debt as the economy has to borrow from abroad to purchase foreign investment goods which foreign exchange earnings from the dwindling commodity sale would have funded. An unfavorable productivity shock leads to a reduction in investment, consumption and gross domestic product. Thus, the revenue function for this economy is given by:

$$\Upsilon_t = \left[\emptyset + e^{\xi_{xt}} Q_t (1 - \emptyset)\right] \cdot e^{\xi_{yt}} A_t K_t^{\propto} L_t^{1-\propto} . \quad (7)$$

Where $\emptyset$ represents the share of output that is sold to the domestic market whilst $(1 - \emptyset)$ is the share of output that is sold to the foreign market. When $\emptyset$ is zero, the economy's revenue is driven by the foreign market and this implies that the economy is susceptible to world price shock ξ_{xt}. The shock directly affects the economy because it employs imported capital. When $\emptyset$ is large, the economy is not vulnerable to global/world commodity price shocks because revenue is driven by the domestic market, thus fluctuations in world commodity prices will not affect the economy's revenue. Equation (7) implies that when the exchange rate Q_t depreciates, most of the revenue for the economy will be driven by output sold to the foreign market.

3.2.4 First Order Conditions

The maximization of the objective function (1) subject to the budget constraint (5) and the revenue function (7) by choosing a sequence $\{C_t, C_{mt}, M_t/P_t, B_t, B_t^f, K_t, I_t^m, L_t\}_{t=0}^{\infty}$, yields the following first order conditions:

$$e^{\xi_{ct}} \left[\frac{C_t}{C_{t-1}^{\gamma}}\right]^{-\sigma} \frac{1}{C_{t-1}^{\gamma}} = \lambda_t \quad (8)$$

$$e^{\xi_{cmt}} \left[\frac{C_{mt}}{C_{mt-1}^{\gamma}}\right]^{-\theta} \frac{1}{C_{mt-1}^{\gamma}} - \lambda_t \frac{e_t P_t^f}{P_t} = 0 \quad (9)$$

$$e^{\xi_{mt}}\left[\frac{M_t}{P_t}\right]^{-\omega}\frac{1}{P_t}-\frac{\lambda_t}{P_t}+\frac{\beta E\lambda_{t+1}}{EP_{t+1}}=0 \tag{10}$$

$$\frac{\lambda_t}{P_t}=\frac{\beta E\lambda_{t+1}}{EP_{t+1}}(1+r_t) \tag{11}$$

$$\frac{\lambda_t e_t P_t^f}{P_t}=\frac{\beta E e_{t+1}\lambda_{t+1}}{EP_{t+1}}\left(1+r_t^f-\rho_t\right) \tag{12}$$

$$\beta E\lambda_{t+1}=\frac{\lambda_t\left\{P_{k_t}-\left[\emptyset+(1-\emptyset)e^{\xi_{xt}}Q_t\right]e^{\xi_{yt}}F_{k_t}\right\}}{(1-\delta)EP_{k_{t+1}}} \tag{13}$$

$$\beta E\lambda_{t+1}\left[\frac{I_{t+1}^m}{I_t^m}\right]^{\varphi+1}=\lambda_t Q_t+\lambda_t\frac{1+\varphi}{\varphi}\left[\frac{I_t^m}{I_{t-1}^m}\right]^{\varphi} \tag{14}$$

$$e^{\xi_{lt}}L_t^{\beta}=\lambda_t\left\{\left[\emptyset+(1-\emptyset)e^{\xi_{xt}}Q_t\right]e^{\xi_{yt}}F_{l_t}-\frac{1+\varpi}{\varpi}\left[\frac{L_t}{L_{t-1}}\right]^{\varpi}+\frac{EP_{t+1}}{P_t(1+r_t)}\left[\frac{L_t}{L_{t-1}}\right]^{\varpi+1}\right\} \tag{15}$$

From equation (8), it follows that

$$E\lambda_{t+1}=e^{\xi_{c_{t+1}}}\left[\frac{C_{t+1}}{C_t^{\gamma}}\right]^{-\sigma}\frac{1}{C_t^{\gamma}} \tag{16}$$

where λ_t is the budget constraint multiplier. The first order conditions result in the following optimality equations for consumption, demand for imported consumption goods, money balances, demand for imported investment goods, arbitrage condition for price of capital and the labour demand.

$$e^{\xi_{ct}}\left[\frac{C_t}{C_{t-1}^{\gamma}}\right]^{-\sigma}\frac{1}{C_{t-1}^{\gamma}}=e^{\xi_{c_{t+1}}}\beta\left\{\left[\frac{C_{t+1}}{C_t^{\gamma}}\right]^{-\sigma}\frac{1}{C_t^{\gamma}}\right\}\frac{(1+r_t)P_t}{P_{t+1}} \tag{17}$$

$$e^{\xi_{cmt}}\left[\frac{C_{mt}}{C_{mt-1}^{\gamma}}\right]^{-\theta}\frac{1}{C_{mt-1}^{\gamma}}-e^{\xi_{ct}}\left\{\left[\frac{C_t}{C_{t-1}^{\gamma}}\right]^{-\sigma}\frac{1}{C_{t-1}^{\gamma}}\right\}.Q_t=0 \tag{18}$$

$$e^{\xi_{mt}}\left[\frac{M_t}{P_t}\right]^{-\omega}=e^{\xi_{ct}}\left[\frac{C_t}{C_{t-1}^{\gamma}}\right]^{-\sigma}\frac{1}{C_{t-1}^{\gamma}}\left[1-\frac{1}{1+r_t}\right] \tag{19}$$

$$\frac{P_{k_t}-\left[\emptyset+(1-\emptyset)e^{\xi_{xt}}Q_t\right]e^{\xi_{yt}}F_{k_t}}{(1-\delta)EP_{k_{t+1}}}\left[\frac{I_{t+1}^m}{I_t^m}\right]^{\varphi+1}=Q_t+\frac{1+\varphi}{\varphi}\left[\frac{I_t^m}{I_{t-1}^m}\right]^{\varphi} \tag{20}$$

$$\frac{1+E\pi_{t+1}}{1+r_t}=\frac{P_{k_t}-\left[\emptyset+(1-\emptyset)e^{\xi_{xt}}Q_t\right]e^{\xi_{yt}}F_{k_t}}{(1-\delta)EP_{k_{t+1}}} \tag{21}$$

$$e^{\xi_{lt}}L_t^{\beta}/\left\{e^{\xi_{ct}}\left[\frac{C_t}{C_{t-1}^{\gamma}}\right]^{-\sigma}\frac{1}{C_{t-1}^{\gamma}}\right\}=\left\{\frac{EP_{t+1}}{P_t(1+r_t)}\left[\frac{L_t}{L_{t-1}}\right]^{\varpi+1}-\frac{1+\varpi}{\varpi}\left[\frac{L_t}{L_{t-1}}\right]^{\varpi}+\left[\emptyset+(1-\emptyset)e^{\xi_{xt}}Q_t\right]e^{\xi_{yt}}F_{L_t}\right\}$$

(22)

where $Q_t = \frac{e_t P_t^f}{P_t}$ is the real exchange rate.

A common approach to solving DSGE models involves the linearization of the first order conditions by means of the first order Taylor series expansion around a deterministic steady state. Log-linearization of RBC models has been extensively used in recent years following the works of Blanchard and Kahn (1980), King, Plosser and Rebelo (1988 a, b) and Campbell (1994). The process of log-linearization is to first take the logarithms of the functions in equations 17-22 and then take first-order Taylor expansion around the steady state. After log-linearization of the first order conditions using the Taylor expansion, I re-write equations (17) to (22) as follows:

$$\tilde{c}_{m_t} = \frac{\sigma}{\theta}\tilde{c}_t - \frac{\sigma\gamma}{\theta}\tilde{c}_{t-1} - \frac{1}{\theta}\tilde{q}_t + \gamma\tilde{c}_{m_{t-1}} + \frac{1}{\theta}\left(\xi_{c_{mt}} - \xi_{c_t}\right) \tag{23}$$

$$\tilde{r}_t = \sigma\tilde{c}_t - \sigma\gamma\tilde{c}_{t-1} - \omega(\tilde{m}_t - \tilde{p}_t) + \left(\xi_{m_t} - \xi_{c_t}\right) \tag{24}$$

$$\tilde{c}_t = \frac{1}{1-\gamma}\tilde{c}_{t+1} + \frac{\gamma}{1-\gamma}\tilde{c}_{t-1} - \frac{1}{\sigma(1-\gamma)}(\tilde{r}_t - \tilde{\pi}_{t+1}) + \frac{1}{\sigma(1-\gamma)}\left(\xi_{c_t} - \xi_{c_{t+1}}\right) \tag{25}$$

$$\tilde{\imath}_t^m = \frac{1+\emptyset+\emptyset Q^*}{\psi}E\tilde{\imath}_{t+1}^m + \frac{\emptyset}{\psi}\tilde{\imath}_{t-1}^m + \frac{\varphi\eta F_k^*}{\psi(1-\delta)P_k^*}\tilde{\mathrm{p}}_{\mathrm{kt}} + \frac{\varphi(1-\propto)\eta F_k^*}{\psi(1-\delta)P_k^*}\tilde{\mathrm{k}}_{\mathrm{t}} - \left[1 + \frac{(1-\emptyset)F_k^*}{(1-\delta)P_k^*}\right]Q^*\tilde{q}_t - \frac{\varphi(1-\emptyset)F_k^*}{\psi(1+\varphi)(1-\delta)P_k^*}\xi_{xt} - \frac{\varphi\eta F_k^*}{\psi(1+\varphi)(1-\delta)P_k^*}\xi_{y_t} \tag{26}$$

$$\tilde{p}_{k_t} = (1-\emptyset)F_k^*\tilde{q}_t - (1-\alpha)\eta F_k^*\tilde{k}_t + \left\{P_k^* - \eta F_k^*\right\}E\tilde{p}_{k_{t+1}} - (1-\delta)F_k^*(\tilde{r}_t - E\tilde{\pi}_{t+1}) + (1-\emptyset)Q^*F_k^*\xi_{x_t} + \eta F_k^*\xi_{y_t} \tag{27}$$

$$\tilde{r}_t = \tilde{r}_t^f - \tilde{\rho}_t + E\Delta\tilde{e}_{t+1} \tag{28}$$

$$\tilde{l}_t = \frac{\beta\sigma(1-\gamma)-\sigma}{ж}\tilde{c}_t - \frac{\sigma(1-\sigma)}{ж}\tilde{c}_{t-1} + \frac{ᘓ}{ж}\tilde{l}_{t-1} - \frac{1}{ж}(\tilde{r}_t - \tilde{\pi}_{t+1}) + \frac{(1-\emptyset)F_l^*}{ж}\tilde{q}_t + \frac{(1-\emptyset)Q^*F_l^*}{ж}\xi_{x_t} + \frac{\eta F_l^*}{ж}\xi_{y_t} + \frac{1}{ж}\left(\xi_{c_t} - \xi_{l_t}\right) \tag{29}$$

$$\tilde{y}_t = \vartheta_1\tilde{c}_t + \vartheta_2\tilde{g}_t + \vartheta_3\tilde{x}_t - \vartheta_4(\tilde{c}_{mt} + \tilde{\imath}_t^m), \tag{30}$$

where $\psi = 1 + 2\emptyset + \emptyset Q^*$, $\eta = [\emptyset + (1-\emptyset)Q^*]$, $ᘓ = \frac{(1+\varpi)\pi^*}{\mathrm{r}^*} - 1$, $ж = ϐ - ᘓ + \alpha\eta F_l^*$, g_t is the government spending gap, x_t is the exports gap, y_t is the output gap and a tilde on top of a

variable is the log deviation from steady state. The output gap is defined as the difference between the actual and the potential output.

Equations (23) to (30) are the demand for imported consumption goods function, the interest rate function, the consumption based IS, the demand for imported investment goods function, the arbitrage condition for price of capital, the arbitrage condition for interest rates, the labour function and the equilibrium in the goods market, respectively. Equation (23) implies that when the exchange rate depreciates, the demand for imported consumption goods reduces. This is because a shock to the exchange rate directly affects the price of imports. If habit formation reference level γ is equal to zero, consumption of imports will be affected by previous period's imports and the real exchange rate.

The LM equation (24) shows that the economy will increase money supply if the interest rates are high. Consequently, when $\gamma = 0$, the real interest rate will be driven by both the real money balances and the current consumption. The consumption based IS equation (25) shows the relationship between consumption and the expected consumption and the real interest rate. The equation is similar to that of Smets and Wouters (2003) and shows that if a rise in consumption is expected, only a high interest rate can prevent agents from borrowing against that future rise. The fundamental feature of the IS-LM that is consistent with Romer (2000) is that different interest rates are relevant to different parts of the model. The real interest rate is relevant to the demand for goods and thus the IS curve, while the nominal interest rate is relevant to the demand for money and thus the LM curve.

Equation (26) illustrates that capital stock is positively related to imported investments and this substantiates the fact that most of these countries import capital for investment purposes. It also shows that when the exchange rate depreciates, the imported investments fall. In addition, the equation demonstrates that if agents speculate that imported investments will increase in future, they increase importation of investment goods in the current period. Demand for imported investments also increases when there is an unfavourable productivity shock. Equation (27) implies that a depreciation of the exchange rate will increase the price of capital. This is because the economy relies on imports for capital formation.

Equation (28) is the uncovered interest rate parity (UIP) condition which suggests that the difference between domestic and foreign interest rates equals the future change in the exchange rate minus the risk premium. To ensure a well-defined steady state, I follow Adolfson *et al* (2008) in assuming that there is a time-varying risk premium ρ_t in the foreign debt holding and that the time-varying risk premium is negatively correlated with the expected change in the nominal exchange rate. This will account for the so called 'forward premium puzzle' recorded in data: that a currency whose interest rate is high tends to appreciate, implying that the risk premium must be negatively correlated with the expected exchange rate depreciation (see e.g. Adolfson *et al*, 2008; Fama, 1984; Froot and Frankel, 1989).

Labour demand equation (29) shows that consumption, productivity shock and depreciation of the exchange rate increases labour whereas commodity price shock and real interest rates increases reduce the demand for labour. A depreciation of the exchange rate boosts exports and therefore increases labour demand while a negative commodity price shock leads to a fall in exports and thus labour demand reduces.

Firms sell some of the output produced in the economy to the foreign market. Following McCallum and Nelson (1999), foreigners' demand function for households' exports is positively related to the real exchange rate and the revenue of the foreign economy. The foreigners' demand function for households' exports is given by:

$$X_t = Q_t^{\upsilon} Y_t^{f\varsigma} \qquad \upsilon < 0\ ,\varsigma > 0. \tag{31}$$

Q_t is the real exchange rate and Y_t^f is the revenue in the foreign economy. Equation (31) implies that a depreciation of the exchange rate will lead to an increase in exports. Log linearizing equation (31) around the steady state gives the following equation for foreigner's demand for domestically produced goods (exports):

$$\tilde{x}_t = \upsilon \tilde{q}_t + \varsigma \tilde{y}_t^f. \tag{32}$$

Equation (32) indicates that if the revenue in the foreign economy increases, exports will increase. Moreover, a depreciation of the real exchange rate leads to an increase in exports. Exports are used to repay the foreign debt. Therefore an increase in exports will lead to a reduction in the foreign debt.

3.2.5 Evolution of Foreign Debt

From the uncovered interest parity condition (equation 28), the choice between the domestic and foreign debt holdings balances into an arbitrage condition. The interest rate on foreign debt is assumed to be a function of the domestic interest rate r_t, the expected change in the exchange rate and the time-varying risk premium. The interest rate on foreign debt is given by:

$$r_t^f = r_t - E\Delta e_{t+1} + \rho_t. \tag{33}$$

When ρ_t is equal to zero, equation (33) boils down to the conventional UIP condition. Hostland and Karam (2006) argue that when the risk premium on external debt exceeds some threshold level, foreign investors become unwilling to lend and issuers become unable to borrow. Also, when the debt burden rises above the initial level, investors demand a higher risk premium to compensate for the higher probability of debt default at some point in the future. As in Senhadji (1997), the time-varying risk premium ρ_t is a function of the foreign debt to exports ratio and the world commodity price shock. In this study the time-varying risk premium takes the form:

$$\rho_t = \frac{1}{\chi}\left(\frac{e_t P_t^f B_{t-1}^f}{P_t X_t}\right)^{\chi} \cdot e^{-\Phi\xi_{xt}} \cdot \rho_{t-1}^{\varrho} \qquad 0 \leq \varrho \leq 1. \tag{34}$$

B_{t-1}^f is the previous period's foreign debt, ϱ measures the persistence of risk premium and χ is the coefficient of the time-varying risk premium. When the coefficient of the time-varying risk premium is zero, the time-varying risk premium will be driven by changes in the world commodity prices. When the world commodity prices fall, the time-varying risk premium increases. The world commodity price shock ξ_{xt} appears in the risk premium because private banks and multilateral institutions tend to over-lend during periods of commodity booms. This leads countries to take on more foreign debt, thus time-varying risk premium increases. Note that risk premium reduces as countries become more efficient.

Linearizing equation (34) around the steady state gives the following equation for ρ_t:

$$\tilde{\rho}_t = \chi\left[\tilde{e}_t + \tilde{b}_{t-1}^f - \tilde{x}_t\right] + \varrho\tilde{\rho}_{t-1} - \Phi\xi_{xt}. \tag{35}$$

Substituting equation (35) into (33) gives the following equation for the interest rate on foreign debt:

$$r_t^f = r_t^* + \chi\left[\tilde{e}_t + \tilde{b}_{t-1}^f - \tilde{x}_t\right] + \varrho\tilde{\rho}_{t-1} - \Phi\xi_{xt}. \quad (36)$$

Equation (36) shows that when exports increase, the interest rate on foreign debt declines. The world price shock is negatively related to the interest rate on foreign debt. This means that when the world commodity price declines, the interest rate on foreign debt increases.

Following Nishimura and Ohyama (1995) and Schmitt and Uribe (2003), I assume that the average interest cost the debtor country must bear increases as the size of its current borrowing increases. This assumption is plausible because it reflects the fact that a country's risk of solvency is greater when she borrows more. Nishimura and Ohyama argue that lenders may need to be compensated for the increasing risk of solvency or they may merely wish to discourage the debtor country from borrowing beyond her repayment ability by raising the rate of interest as the amount of her borrowing increases. The interest rate change may be positive or negative depending on whether lenders wish to discourage or encourage the country from borrowing in the current period on the basis of her borrowing performance which is represented by the amount of borrowing in the previous period.

In addition, foreign debt evolves according to the balance between imports and exports. When the price of an imported input (for example, oil price) increases, the economy has to borrow from the foreign market in order to finance its imports. Therefore, the equation for evolution of foreign debt is given by:

$$B_t^f = \left(1 + r_{t-1}^f\right)B_{t-1}^f + \frac{P_t}{e_t}(C_{mt} - X_t), \quad (37)$$

where C_{mt} represents the imports of goods into the economy, X_t is exports, $\left(1 + r_{t-1}^f\right)B_{t-1}^f$ is the interest payment on foreign debt and e_t is the exchange rate. The interest rate on foreign debt is an increasing function of foreign debt. Equation (37) shows that foreign debt will increase if the economy runs a trade deficit. For the economy to reduce its foreign debt it either has to increase its exports or reduce its imports, that is, it has to run a trade surplus. In fact, if an economy has a large initial external debt, it must run a current account surplus that is sufficient to cover the interest rate payments on that debt. Alternatively, an economy that runs a trade deficit should depreciate its currency (and increase exports) in order to reduce its foreign debt.

Combining equations (36) and (37) and after some substitutions, I obtain the following reduced form equation for the evolution of foreign debt:

$$\tilde{b}_t^f = [(1 + r_0^*) + \chi]\tilde{b}_{t-1}^f + \left[\chi - \frac{P^*(C_m{}^* - X^*)}{e^* B_0^f}\right](\tilde{e}_t - \tilde{p}_t) + \frac{C_m{}^* P^*}{e^* B_0^f}\tilde{c}_{mt} - \left[\chi + \frac{C_m{}^* P^*}{e^* B_0^f}\right]\tilde{x}_t + r_t^* - \varrho\tilde{\rho}_{t-1} - \Phi\xi_{xt} \,. \quad (38)$$

Equation (38) implies that any fluctuations in the real exchange rate will have a direct impact on the economy's foreign debt. The Equation also indicates that imports increase the accumulation of foreign debt while exports reduce the accumulation of foreign debt. This re-emphasizes that the economy has to reduce its import and/or increase its exports in order to reduce its foreign debt. For the economy to swing towards a trade surplus there must be a large depreciation of the exchange rate.

Furthermore, the world risk free interest rate r_t^* is positively related to the economy's foreign debt. If the world interest rate increases, the economy accumulates more foreign debt. This is because a permanent increase in world interest rates depresses consumption and investments. Aggregate output falls because of the trade surplus used to pay for the higher cost of servicing the debt. The economy has to respond to the permanent increase in the cost of servicing debt by reducing new borrowing. In addition, equation (38) shows that if there is a negative shock to world commodity prices, foreign debt increases.

3.2.6 Price Setting and Inflation

The interaction of firms and workers affects the setting of both prices and wages. The nominal wage set by workers depends on the previous period's price level, the next period's price level and the output gap. If workers anticipate that prices will increase in the next period, they set a higher nominal wage. Likewise, if prices increased in the previous period, workers will demand a higher nominal wage. The increase in the nominal wage leads to an increase in costs, which leads to an increase in prices set by firms and thus yielding a higher price level. An increase in output leads to an increase in the nominal wage. I assume pricing decisions are predetermined one period in advance and therefore the equation for wage determination is given by:

$$W_t = \left(P_{t-1}^{\omega} P_{t+1}^{1-\omega}\right) e^{\mathfrak{t} y_t} \,, \quad (39)$$

where W_t is the nominal wage, P_{t-1} is the previous period's price level, P_{t+1} is the next period's price level, y_t is the output gap and ɷ is the degree of wage indexation[13] to the unexpected changes in prices. The degree of wage indexation can be full, where wages are automatically increased by a percentage equal to the inflation rate, or partial, or it can be plateau indexation where, for example, the bottom 10 per cent of wage-earners are indexed and the higher-paid workers receive a fixed monetary increase. Plateau indexation gives a greater percentage increase to lower income earners than to others. When $ɷ = 0$ there is no indexation and the wages that cannot be re-optimized remain constant. When $ɷ = 1$ there is perfect wage indexation to past inflation.

The domestic price is driven by a mark-up in addition to wages, the exchange rate and the price of imported goods. Firms set the domestic price following a simple mark-up pricing rule:

$$P_t = (1 + \varphi)W_t\left(e_{t-1}P_{t-1}^{f}\right)^{\mu}, \tag{40}$$

where φ is the price mark-up on top of production cost, P_t is the domestic price and μ captures the relevance of the imported investment goods in the production of domestic goods. When the mark-up is equal to zero, the domestic price is equal to production cost. Equation (40) shows that an increase in mark-up leads firms to increase their prices given the wages they have to pay. It also shows that when the lagged price of imported goods increases, the domestic price increases. Moreover, when the exchange rate in the previous period depreciates, the domestic price increases. This argument is supported by Carranza *et al* (2009) who posit that if there is a high currency mismatch in the balance sheet of firms, a small variation in the real exchange rate leads to a positive and large inflation pass-through and domestic price index increases. The source of the pass-through is, first, the direct "import inflation" due to the increase in the relative price of imported goods; and second, an "export push" effect stemming from higher demand of the country's tradables and from the increase in investments required to meet the higher demand. These two effects lead to a higher inflation. Additionally, a real depreciation can generate an indirect contractionary effect related to the increase in the financial cost of capital and thus imported capital goods become more expensive. This effect is more intense in countries that rely heavily on imported capital goods. The added financial cost is generated by the necessity of firms to increase investment so as to meet the larger demand for their output.

[13] Wage indexation has existed for decades under different names such as cost of living adjustment.

Substituting equation (39) into equation (40) gives the following equation for domestic price:

$$P_t = (1 + \varrho)\left(P_{t-1}^{\mathbb{Q}} P_{t+1}^{1-\mathbb{Q}}\right) e^{\mathfrak{t} y_t} \left(e_{t-1} P_{t-1}^{f}\right)^{\mu}. \tag{41}$$

Defining domestic price inflation as $\pi_t \equiv \log(P_t / P_{t-1})$ and after log-linearizing equation (41), I obtain the following Phillips curve:

$$\tilde{\pi}_t = \mathbb{Q}\tilde{\pi}_{t-1} + (1 - \mathbb{Q})\tilde{\pi}_{t+1} + \mathfrak{t}\tilde{y}_t + \mu\tilde{q}_{t-1}, \qquad \mathfrak{t} > 0 \; and \; 0 \leq \mathbb{Q} \leq 1, \tag{42}$$

The term $\mathfrak{t}\tilde{y}_t$ implies that, at any time, there is an upward-sloping relationship between inflation and output gap. Modern Keynesian theories assume that there is some inertia in wage and price inflation. Specifically, they assume that there is some link between past and future inflation beyond effects operating through expectations (see Romer, 2006). Equation (42) differs from the classical Phillips curve because inflation responds not only to fluctuations in output gap but also to fluctuations in the exchange rate. It shows that monetary policy affects inflation through the effects of the lagged exchange rate on the real price of imported inputs. This Phillips curve equation is similar to that of Flamini (2007), except that he assumed pricing decisions are predetermined two periods in advance.

3.2.7 Behavior of Monetary Authorities

In view of the fact that the central bank in this economy does not control the world interest rates, I assume that it controls the monetary base as in McCallum (1994). Given that the economy is characterized by falls in export prices, tax evasion and political stalemate which leaves the government with a large budget deficit, investors do not have confidence that the government will honour its debts. Investors are therefore not willing to buy its bonds and so the Central Bank of this economy finances its current account balance through foreign borrowing and seignorage. However, supply of money in this economy is driven by the output gap and the inflation gap according to Taylor (1993). In closing the model, I assume that money supply evolves according to the following monetary reaction function:

$$\tilde{m}_t = \rho_m \tilde{m}_{t-1} - (1 - \rho_m)\left[ß_\pi \tilde{\pi}_{t-1} - ß_y \tilde{y}_{t-1} + ß_q \tilde{q}_{t-1}\right] - ß_{\Delta\pi}\Delta\tilde{\pi}_t + ß_{\Delta y}\Delta\tilde{y}_t + \xi_{mt.} \tag{43}$$

where ρ_m is the degree of persistence of monetary smoothing, $ß_\pi$ and $ß_y$ represent the sensitivity of money supply to lagged inflation gap and lagged output gap, respectively. Equation (43) shows

that monetary authorities adjust money supply in response to changes in inflation gap and output gap. The monetary rule is that the central bank reduces money supply if inflation exceeds its target value and increases money supply when output falls below capacity.

There are five exogenous shocks in this model and they include the world risk-free interest rate shock r_t^*, the world commodity price shock ξ_{xt}, the productivity shock ξ_{yt}, the government spending shock g_t^* and the labour demand shock ξ_{l_t}. The exogenous shocks follow AR(1) process and take the following forms:

$$\tilde{r}_t^* = \rho_r \tilde{r}_{t-1}^* + \xi_{r^*} \quad (44)$$

$$\xi_{xt} = \rho_x \xi_{x_{t-1}} + \xi_{x^*} \quad (45)$$

$$\xi_{yt} = \rho_y \xi_{y_{t-1}} + \xi_{y^*} \quad (46)$$

$$\tilde{g}_t^* = \rho_g \tilde{g}_{t-1}^* + \xi_{g^*} \quad (47)$$

$$\xi_{l_t} = \rho_l \xi_{l_{t-1}} + \xi_{l^*} \quad (48)$$

3.3 Estimation of the Model

3.3.1 Estimation Method

DSGE models are firmly grounded in economic theory and are often regarded as too stylized to be taken directly to the data, and often making traditional econometric methods for estimation, hypothesis testing and forecasting inapplicable (Ireland, 2004). Moreover, since DSGE models make strong assumptions on so many details concerning the structure of the economy, they often yield results that appear to be fragile, at least at first glance.

Various techniques have been employed in estimating DSGE models; for example maximum likelihood (Christiano, 1988; Ireland, 2004 and Canova, 2007), Bayesian (Smets and Wouters, 2003 and Adolfson et al, 2007) and generalized method of moments (McCallum and Nelson, 1999). Ruge-Murcia (2007) used the one sector real business cycle model as a testing ground for four different methods of estimating DSGE models, namely maximum likelihood method (ML), generalized method of moments (GMM), simulated method of moments (SMM) and the indirect inference procedure. He argues that although all methods deliver consistent parameter estimates,

weak identification, stochastic singularity, and small sample distortion are important considerations in the practical application of these methods.

On the problem of identification, Canova and Sala (2009) investigate identification issues in DSGE models; explore their consequences for parameter estimation and model evaluation and provide diagnostics to detect problems in practice. Their suggestion is that if one uses a mixed calibration–estimation approach to analyze economic issues, it is advisable to conduct extensive sensitivity analysis to examine how economic conclusions change when calibrated parameters are varied within a reasonable interval.

Stochastic singularity imposes restrictions on the variables and moments that may be used for model estimation. DSGE models are singular because they use a small number of structural shocks to generate predictions about a large number of observable variables. As shown by Ruge-Murcia (2007), singularity affects more severely ML methods than moment-based methods. This is because ML estimation is limited by the number of linearly independent variables while moment-based estimation is limited by the number of linearly independent moments. Ruge-Murcia also finds that GMM and SMM are generally more robust to misspecification than ML, and adding measurement errors and using information priors are helpful in limiting the effects of misspecification in the ML framework.

Another study which compared ML estimation and simulated based approach in estimating DSGE models is Holtemöller and Schmidt (2006). They compared the properties of the different estimation techniques using a simple New Keynesian Model. Their results show that the coefficients of the ML estimations are closer to the true values than the coefficients of the simulation based approach. This result is more pronounced in the small sample case and thus indicates that it is preferable to use the ML estimation approach for African countries because their data set is small.

I therefore employ maximum likelihood estimation method to estimate the parameters of this study's DSGE model. Maximum likelihood involves four steps. First, the linear rational expectations model is solved for the reduced form state equation in its predetermined variables. Second, the model is written in its state-space form. This involves augmenting the state equation in the predetermined variables with an observation equation which links the predetermined state

variables to observable variables. Third, the Kalman filter is used to form the likelihood function. Fourth, the parameters are estimated by maximizing the likelihood function. In fact, Hansen and Sargent (2005) show that the ML estimator obtained by applying the Kalman filter to the state space representation of DSGE models is consistent and asymptotically efficient. This is also confirmed by Canova (2007; 225-226) who argues that under regularity conditions ML estimates of the parameters of a state space model are consistent and asymptotically normal. The conditions needed include first, that the state equation should define a covariance stationary process. This is the case when the eigenvalues of the matrix are all less than one in absolute value for all t. The second condition is that the true parameters should not lie on the boundary of the parameter space.

I use the Kalman filter to generate optimal inferences about the unobserved state vector and to evaluate the joint likelihood function of observable endogenous variables. As Ruge-Murcia (2007) observed, the maximization of this function yields consistent and asymptotically normal estimates of the model parameters. To limit the effects of specification errors (ML estimates are prone to misspecifications) in the estimates, in addition to using information priors, I added measurement errors to the observation equations. The linearized equations for the model presented earlier in section 2.2, form a dynamic system that determines the path of consumption, output, investment imports, consumption imports, price of capital, inflation, interest rates, debt, labour supply and money supply. After some manipulations, these equations[14] can be written as a state space representation of the form;

$$\mathbf{A}\mathbf{X}_t = \mathbf{B}\mathbf{X}_{t-1} + \mathbf{C}\boldsymbol{\Gamma}_t, \tag{49}$$

$$\boldsymbol{\Gamma}_t = \rho_\Gamma \boldsymbol{\Gamma}_{t-1} + \varepsilon_t, \tag{50}$$

where equation (49) is the observation equation, equation (50) is the state equation and,

$$\mathbf{X}_t = \begin{bmatrix} \tilde{c}_{mt} & \tilde{c}_t & \tilde{r} & \tilde{m}_t & i_t^m & \tilde{p}_{kt} & \tilde{e}_t & \tilde{y}_t & \tilde{x}_t & b_t^f & \tilde{}_t \end{bmatrix}$$

$$\boldsymbol{\Gamma}_t = \begin{bmatrix} \xi_{cmt} & \xi_{ct} & \xi_{mt} & \xi_{yt} & \xi_{xt} \end{bmatrix}.$$

Vectors $\mathbf{X}_{t-1} = [\cdots]$ and $\mathbf{X}_t = [\cdots]$ are transposes of vectors $\mathbf{X}_{t-1} = [\vdots]$ and $\mathbf{X}_t = [\vdots]$. A tilde on a variable denotes percentage deviation from deterministic steady state. The vector $\mathbf{X}_t$ is an $(n \times 1)$ vector of predetermined variables at date t, $\boldsymbol{\Gamma}_t$ is a $(k \times 1)$ vector of stochastic shocks, $\mathbf{A}$

[14] See appendix B for simplified equations of the model.

and **B** are $\left((n+m)\times\ (m+n)\right)$ matrices, and **C** is an $\left((n+m)\times k\right)$ matrix. If the matrix **A** is invertible, then the first order difference system of equation (49) can be written as;

$$\mathbf{X}_t = \mathbf{A}^{-}\mathbf{B}\mathbf{X}_{t-1} + \mathbf{A}^{-}\mathbf{C}\boldsymbol{\Gamma}_t\,. \tag{51}$$

Description of Data

I estimate the model using annual data from eleven African countries: Côte d'Ivoire, Ghana, Kenya, Malawi, Nigeria, Senegal, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Data for labour is collected from Penn World Tables 6.1 and data for the other variables are collected from World Bank's World Development Indicators and IMF's International Financial Statistics. The sample is from 1970 to 2007 and the data is denominated in domestic currency. Data were de-trended using the Hodrick-Prescott (1997) filter (hereafter HP filter) with the smoothing parameter λ = 100. The HP filter decomposes the data into a cyclical component and a growth component and removes the latter. The rationale behind the filtering is that the model is designed to explain business cycles as opposed to very short-run or long-run movements in data (Negro and Schorfheide, 2003). In fact, Canova (2007, 83) argues that the HP filter has been and is still one of the preferred methods to extract cyclical components from economic time series. The HP decomposition has two basic features; first, trend and cycle are assumed to be uncorrelated and second, trend is assumed to be a smooth process; that is, it is allowed to change over time as long as the changes are not abrupt.

In view of the fact that there is no available time series data on capital stocks for most African countries, I employ the perpetual inventory method by Benhabib and Spiegel (1994), King and Levine (1994), and Limam and Miller (2004) to estimate capital stocks for these countries[15]. To measure imported investments and the world interest rate, I used the gross fixed capital formation and the USA interest rate, respectively as proxies.

3.3.2 Calibrated Parameters and Estimation Results

A number of parameters were calibrated since they could not be estimated from the data. Preliminary attempts to estimate the parameters of the model led to unreasonable high estimates for habit formation reference level γ, investment adjustment cost parameter φ, inverse of the

[15] See Appendix A on how I computed capital stocks.

elasticity of imports θ, the share of output that is sold to the domestic market Ø and the foreign interest rate r_0^f. These parameters were therefore calibrated together with share of output in production α, depreciation rate δ, and the market value of a unit of capital Q*. I choose values for these variables so that other relationships in the model have values similar to the ones we see in data.

In the baseline calibration of the model's parameters, habit formation reference level is assumed to be 90 percent of past consumption for all the sampled countries. This value is consistent with the findings reported by Fuhrer (2000), Smets and Wouters, (2003), Adolfson *et al* (2007), CEE (2005) and Boldrin, Christiano and Fisher (2001). The depreciation rate δ is set equal to 0.07 which implies a depreciation of fixed capital of 7% per annum. I set α = 0.6, which implies a share of capital in production of 60%. This is in line with growth and business cycle models. The share of output that is sold to the domestic market is calibrated at 0.8 since these countries mainly consume domestically produced goods. More recent evidence by Eichenbaum and Fisher (2007) suggest an investment adjustment cost parameter of 3. The adjustment cost parameter is thus calibrated at 3 in line with Eichenbaum and Fisher (2007). The calibrated parameter for the inverse of the elasticity of imports θ is 2.

Turning to labour, the calibrated parameter for the labour adjustment cost parameter, ϖ, is 0.98, following Cooper and Willis (2009) and Janko (2008). A large range of calibrations has been used for the inverse of the elasticity of labor supply, ϐ. I follow Smets and Wouters (2003) and calibrate the value at 2. To calibrate foreign interest rate r_0^f, I used the average of the USA interest rate which is equal to 0.03. Finally, I computed an index for Tobin's Q as a proxy for the parameter Q*. This was computed by means of getting an index of the investment-capital stock ratio. I used the average steady state interest rate as the calibrated parameter for r*. The calibrated values for Q* and r*, in addition to other calibrated and estimated parameters, for each country are reported in Table 3.1 below.

Table 3.1: Maximum Likelihood Estimation Results

Estimated parameters	Ghana	Côte d'Ivoire	Kenya	South Africa	Nigeria	Senegal	Uganda	Zambia	Malawi	Zimbabwe	Tanzania
σ	0.43 (3.70)***	0.53 (5.69)***	0.53 (5.97)***	0.11 (0.64)	0.43 (5.88)***	0.37 (2.87)***	0.55 (5.70)***	0.49 (7.83)***	0.71 (13.01)***	0.01 (0.05)	0.47 (4.88)***
ω	-0.24 (-3.23) ***	-0.13 (-3.39)***	-0.38 (-3.19)***	-0.03 (-0.06)	-0.16 (-1.77)*	-0.08 (-1.14)	-0.56 (-4.27)***	-0.22 (-4.58)***	-0.45 (-2.84)***	-0.003 (-0.12)	-0.32 (-1.79)*
ϕ	0.82 (12.49)***	0.66 (9.73)***	0.49 (7.83)***	0.58 (5.09)***	0.57 (4.20)***	0.98 (26.93)***	0. 72 (17.23)***	0.37 (1.99)**	0.65 (7.55)***	0.40 (22.28)***	0.95 (8.36)***
χ	-0.77 (-8.73)***	-0.99 (-7.85)***	-0.46 (-2.71)***	-0.70 (-5.19)***	-0.52 (-4.64)***	-0.41 (-5.46)***	-0.31 (-2.24)**	-0.44 (-5.12)***	-0.43 (-4.67)***	0.04 (1.99)**	-0.91 (-12.63)***
ρ_m	0.66 (4.81)***	0.59 (3.69)***	0.57 (3.29)***	0.24 (1.02)	0.63 (2.39)**	0.36 (2.93)***	0.66 (2.63)***	0.004 (0.04)	0.21 (0.93)	0.93 (28.76)***	0.85 (4.32)***
$ß_\pi$	-0.64 (-1.22)	0.72 (1.37)	1.73 (1.30)	-0.71 (-0.70)	-1.87 (-1.13)	0.74 (2.21)**	-0.68 (-0.84)	-0.26 (-2.06)*	-0.02 (-0.63)	-3.88 (-0.63)	-5.10 (-0.66)
$ß_y$	0.73 (1.03)	0.68 (1.81)*	0.60 (0.60)	0.78 (1.52)	1.40 (1.51)	0.73 (2.97)***	0.06 (0.08)	1.03 (4.55)***	0.31 (1.21)	-8.52 (-0.90)	0.09 (0.03)
μ	0.004 (0.04)	-0.009 (-0.17)	-0.10 (1.43)	-0.02 (0.83)	-0.11 (-1.52)	-0.07 (-1.72)*	-0.12 (2.59)***	0.12 (0.66)	-0.04 (-0.36)	-0.24 (-4.06)***	0.01 (0.82)
$ß_{\Delta\pi}$	-0.29 (-2.75)***	0.20 (0.98)	0.46 (1.83)*	-0.23 (-0.49)	-0.37 (-0.98)	0.33 (2.09)**	-0.03 (-0.20)	-0.15 (-1.70)*	0.16 (1.42)	-0.10 (-1.04)	-0.39 (-1.53)
$ß_{\Delta y}$	0.35 (1.40)	1.04 (4.45)***	0.01 (0.02)	0.49 (1.52)	0.66 (2.05)**	0.58 (2.69)***	0.80 (3.99)***	0.81 (7.36)***	0.24 (1.29)	-0.30 (-1.92)*	0.10 (0.03)
$ß_q$	0.41 (1.53)	0.18 (1.15)	0.50 (2.02)**	-0.07 (-0.69)	0.18 (0.70)	-0.32 (-2.90)***	0.39 (0.69)	-0.04 (-0.36)	-0.20 (-1.17)	1.00 (0.16)	0.73 (0.49)
F_k^*	0.19 (1.28)	0.12 (1.07)	0.18 (2.79)***	-0.24 (-6.20)***	-0.25 (-2.49)**	0.53 (3.27)***	-0.03 (-0.34)	-0.37 (-2.09)**	-0.25 (-1.02)	-0.57 (-6.28)***	0.08 (1.23)
ŧ	0.17 (0.56)	0.19 (1.22)	-0.12 (-1.70)*	-0.06 (-0.31)	-0.38 (-1.94)*	-0.38 (-4.12)***	0.33 (6.91)***	0.06 (0.78)	-0.58 (-2.24)**	0.54 (7.27)***	-0.06 (-0.31)
P_k^*	0.38 (2.53)**	0.23 (2.01)*	-0.02 (-0.04)	-0.10 (-1.72)*	-0.14 (-1.39)	0.11 (0.72)	-0.33 (-3.22)***	-0.05 (-0.38)	-0.34 (-2.22)**	-0.39 (-4.60)***	-0.007 (-0.10)

Continuation of Table 3.1

Estimated parameters	Ghana	Côte d'Ivoire	Kenya	South Africa	Nigeria	Senegal	Uganda	Zambia	Malawi	Zimbabwe	Tanzania
υ	0.67 (5.01)***	0.66 (4.77)***	0.29 (2.03)**	0.36 (3.59)***	0.34 (2.62)**	0.58 (5.27)***	0.40 (2.95)***	0.35 (1.78)*	0.26 (1.72)*	0.46 (3.78)***	0.93 (6.22)***
ς	8.40 (2.27)**	2.32 (1.37)	1.95 (1.71)*	2.74 (2.79)***	6.70 (1.79)*	-1.18 (-1.14)	4.53 (1.79)*	8.52 (3.01)***	-1.74 (-0.83)	5.22 (1.29)	2.38 (1.60)
ϕ	-1.39 (10.98)***	-0.98 (-2.29)**	-0.74 (2.30)*	-1.83 (-2.95)***	-1.19 (-2.73)***	-0.41 (-1.17)	-0.47 (-1.41)	-0.63 (-3.37)***	-0.62 (-2.35)**	0.33 (2.70)***	-0.44 (-1.71)*
ψ	0.56 (5.16)***	0.70 (4.35)***	0.05 (0.33)	0.08 (0.53)	0.24 (1.75)*	0.53 (2.83)***	0.16 (0.92)	0.42 (1.91)*	0.22 (1.77)*	0.07 (0.27)	0.25 (1.65)*
ϱ	-0.04 (-0.29)	-0.28 (-0.66)	-0.02 (-0.10)	0.36 (0.53)	0.11 (0.33)	-0.19 (-0.66)	-0.02 (-0.35)	0.17 (1.01)	0.06 (0.23)	-0.22 (-3.18)***	0.83 (3.44)***
ϑ_1	0.76 (12.28)***	0.60 (6.99)***	0.47 (7.84)***	0.89 (9.35)***	0.03 (0.48)	0.87 (10.91)***	0.35 (4.05)***	0.47 (10.91)***	0.58 (6.23)***	0.94 (23.74)***	0.85 (17.53)***
ϑ_2	0.18 (5.05)***	-0.11 (-2.10)*	0.29 (4.90)***	-0.05 (-0.97)	-0.02 (-0.39)	0.05 (1.21)	0.01 (0.16)	0.04 (3.81)***	0.09 (1.68)*	0.07 (1.25)	0.10 (2.73)***
ϑ_3	0.06 (2.39)**	0.26 (11.54)***	0.06 (1.42)	0.14 (5.21)***	0.30 (8.89)***	0.11 (2.70)***	0.27 (5.78)***	0.41 (10.65)***	0.13 (2.10)**	-0.05 (-1.30)	0.05 (1.58)
ϑ_4	-0.03 (-1.62)	0.04 (2.18)***	-0.006 (-0.24)	0.01 (0.75)	0.03 (1.67)*	-0.03 (-1.21)	0.29 (13.34)***	-0.03 (-0.88)	0.01 (0.58)	0.04 (1.27)	-0.03 (-0.89)
Calibrated parameters											
Ø	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
δ	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
γ	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
α	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
θ	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
φ	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Q*	1.4	2.5	1.3	1.5	1.02	1.1	2.6	1.45	2.0	1.9	1.3
r_0^f	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ϖ	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
β	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
r^*	0.26	0.16	0.17	0.15	0.15	0.17	0.24	0.27	0.30	0.58	0.21

where $\phi = \frac{P^*(C_m{}^* - X^*)}{e^* B_0^f}$, $\psi = \frac{C_m{}^* P^*}{e^* B_0^f}$ and the figures in parenthesis are the Z-statistics. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

3.3.3 Discussion of the Estimated Results

In addition to the prior distribution, Table 3.1 reports results of parameters estimated by using the maximum likelihood method. Overall, most of the estimated parameters are significantly different from zero. Given that the model is non-linear, there are several parameters that are attached to a composite coefficient. I therefore discuss the results for each parameter and the economic relationship that is portrayed by the results. In discussing the relationships between variables, I make reference to the estimated equations of the model.

3.3.3.1 Consumption Function

The estimated parameter for the inverse of the elasticity of consumption σ ranged between 0.11 for South Africa and 0.71 for Malawi. A small inverse of the elasticity of consumption implies that the country's utility is almost linear in consumption, and therefore, households are willing to accept large swings in consumption to take advantage of small differences between the discount rate and the rate of return on savings. Most of the estimated σ values for the sampled countries are in line with the assumptions made in most RBC literature such as Smets and Wouters (2003) and CEE (2005). Specifically, going by the σ values and the calibrated values of γ, a 1 percent increase in the real interest rate would have a negative impact on consumption of about 91 percent for South Africa (refer to equation 25). Similarly, when the real interest rate increases by 1 percent in Côte d'Ivoire, Ghana, Kenya, Nigeria, Uganda, Tanzania and Zambia; consumption reduces by about 20 percent respectively, whereas in Malawi, a 1 percent increase in real interest rates leads to about 14 percent reduction in consumption. These results imply that consumption is more sensitive to changes in interest rates in South Africa than in the other sampled countries.

3.3.3.2 Interest Rate Function

Turning to the inverse of the elasticity of money holdings ω, the estimated parameter is 0.003 for Zimbabwe, 0.08 for Senegal and 0.03 for South Africa. However these low inverses of the elasticity of money holdings (high elasticities) are statistically insignificant. The rest of the sampled countries report higher inverses of the elasticity of money holdings. Since most of these countries do not adjust interest rates but adjust money holdings, when the central bank in Uganda reduces money balances by 1 percent, nominal interest rates increase by about 0.56 percent. In

Zambia and Uganda, central banks reduce money balances by 1 percent in order for interest rates to increase by about 0.20 percent.

3.3.3.3 Consumption Imports Function

Referring to equation 23, the estimated parameter for σ combined with the calibrated parameters show that consumption imports are positively affected by current consumption. Specifically, a 1 percent increase in current consumption increases consumption imports by a high of about 0.36 percent in Malawi and a low of about 0.05 percent in Zimbabwe. Another finding is that a depreciation of the exchange rate reduces consumption imports by about 0.5 for all sampled countries.

3.3.3.4 Phillips Curve

Focusing on the parameter for wage indexation ϖ, Zambia has a low wage indexation parameter of 0.37 whereas Senegal and Tanzania have the highest wage indexation parameters of 0.98 and 0.95, respectively. This implies that in Senegal and Tanzania, when past inflation increases by 1 percent, wages adjust by 0.98 percent and 0.95 percent, respectively; whilst in Zambia wages adjust by about 0.35 percent when past inflation increases by 1 percent. The high wage indexation parameters suggest that the Phillips curve (equation 42) is backward-looking in those countries. What the results suggest is that markets in African countries are incomplete and inefficient and therefore agents use past information to make present decisions. Information is asymmetric and therefore, agents cannot speculate or form expectations since all the market participants do not have access to the information they need for their decision making processes. The estimated wage indexation parameters for Africa are similar to Smets and Wouters' (2003) and Adolfson *et al*'s (2007) wage indexation parameters of 0.763 and 0.45, respectively.

The Phillips curve also shows that the relevance of imported investment goods in the production of domestic good μ is positive as is expected but statistically insignificant for Ghana, Zambia and Tanzania. Surprisingly, Uganda, Senegal and Zimbabwe report negative and statistically significant values for the coefficient of imported investment goods effects in the production of domestic goods. This result implies that a depreciation of the exchange rate in the previous period in these countries, leads to a drastic drop in investments and this offsets the positive competitiveness and imported inflation. Therefore, the effect of the exchange rate pass-through is

negative. Generally, a depreciation of the exchange rate boosts production of exports and discourages imports.

Additionally, the slope coefficient ŧ either has the wrong sign or is statistically insignificant except for Uganda and Zimbabwe. Perhaps, the relatively small effect of the current output gap (or marginal cost) on inflation in the presence of trend inflation is due to the interaction between exogenous price stickiness and forward-looking price-setting behaviour. Alternatively, these results suggest that the output gap may not be an appropriate measure of the real marginal cost as demonstrated by Gali, Gertler and López (2001). They show that when the output gap is used as a proxy for marginal cost, the slope coefficient ŧ has either wrong signs or is insignificant. Their argument is that real marginal cost (computed by getting real wage divided by the marginal product of labour and averaged across firms) is the theoretically appropriate measure of real sector inflationary pressures as opposed to the cyclical measures used in traditional Phillips curve analysis such as detrended output gap or unemployment.

3.3.3.5 External Debt Function

An interesting result from Table 3.1 is that of the coefficient of risk premium χ. Apart from Zimbabwe, all sampled countries reported a negative coefficient for risk premium. These coefficients ranged from negative 0.91 for Tanzania to negative 0.31 for Uganda. However, this negative relationship is too small to affect the relationship specified in equation 38 because the coefficient of risk premium is one of the parameters in a composite coefficient. In reference to equation 38, the results indicate that the previous period's debt has a positive impact on the current period's debt. For example, for Ghana and South Africa, a 1 percent increase in debt in the previous period leads to about 0.30 percent increase in current debt. Likewise, for Côte d'Ivoire, a 1 percent increase in debt in the previous period will result in about 0.04 percent increase in current debt whereas for Zimbabwe, current debt increases by about 0.90 percent.

Another important finding is that of the relationship between exchange rate and foreign debt. The analysis confirms the puzzling fact that devaluation, which featured virtually in all structural adjustment programmes (SAPs), leads to an increase in total debt for Ghana, Kenya, South Africa, Nigeria, Uganda, Zambia and Malawi. In these countries, a depreciation of the exchange rate increases foreign debt by a low of about 0.20 for Uganda, Zambia and Malawi and a high of about

1.10 for South Africa[16]. Note that in this study, debt is denominated in domestic currency and therefore a depreciation of the exchange rate increases foreign debt. In contrast, in Côte d'Ivoire, Zimbabwe and Tanzania a 1 percent depreciation of the real exchange rate leads to a fall in foreign debt by about 0.01 percent, 0.29 percent and 0.47 percent, respectively. It has no effect for Senegal.

The effects of imports and exports on the debt equation provide yet another set of interesting results. Imports have a positive impact on debt for all the sampled countries just as is expected (ψ), with this effect being significant for Ghana, Côte d'Ivoire, Nigeria, Senegal, Zambia, Malawi and Tanzania. The sign suggests that when imports increase by 1 percent, foreign debt increases by about 0.20 percent in Nigeria and Malawi, and 0.70 percent in Côte d'Ivoire. Except for Senegal and Zimbabwe, exports have a negative impact on external debt for the rest of the sampled countries. Ghana and Malawi have the same negative impact such that a 1 percent increase in exports leads to about 0.21 percent reduction in foreign debt. In Côte d'Ivoire and Nigeria, a 1 percent increase in exports leads to about 0.30 percent reduction in foreign debt. South Africa and Tanzania have the highest percentages of the impact of exports on foreign debt of about 0.62 and 0.66 percent, respectively. This finding implies that when exports increase, foreign debt declines; this makes sense because earnings from exports are used to repay foreign debt.

An interesting finding is that the persistence of risk premium (ϱ) is statistically insignificant for most of the sampled countries. This can be explained by the fact that these countries mainly borrow from bilateral and multilateral institutions as opposed to commercial creditors. Their debts are therefore not susceptible to high risk premium since loans from official sources generally carry below-market rates.

3.3.3.6 Monetary Reaction Function

Results for the monetary reaction function (equation 43), show that the degree of persistence of monetary smoothing (ρ_m) has a positive sign, as expected, for all the sampled countries. The value ranges from a low of 0.004 for Zambia to a high of 0.93 for Zimbabwe; thus suggesting that

[16] The values 0.20 and 1.10 are computed from equation 38 by substituting the values of the parameters for the composite coefficient $\left[\chi - \frac{P^*(C_m{}^* - X^*)}{e^* B_0^f}\right]$ where, $\frac{P^*(C_m{}^* - X^*)}{e^* B_0^f}$ is represented by ϕ in Table 3.1.

about 0.90 percent of lagged money growth target deviation is carried over to the next period in Zimbabwe whereas in Zambia only 0.004 percent of the lagged money growth target deviation is carried over to the next period. The sensitivity of money supply to inflation gap ($ß_\pi$) ranges between -0.02 (Malawi) and -5.10 (Tanzania) whilst that of money supply to output gap ($ß_y$) ranges between 0.06 (Uganda) and 1.40 (Nigeria). Referring to equation 43, the results suggest that in Ghana and Uganda, a 1 percent increase in past inflation will induce monetary authorities to reduce money supply by about 0.20 percent. Likewise, a 1 percent increase in past inflation leads to about a 0.30 percent contraction of money supply in Zambia and Zimbabwe.

Additionally, money supply responds positively to changes in output in all sampled countries except Zimbabwe, where the value is statistically insignificant. For example, in Côte d'Ivoire, Ghana, Kenya and Malawi, monetary authorities increase money supply by about 0.25 percent when output increases by 1 percent (see equation 43). The positive relationship between money supply and output can be explained by the fact that when central banks increase money supply, interest rates decline and, in turn spur an increase in fixed capital formation. Consequently, the increased fixed capital formation leads to an increase in output. Similarly, a change in output has a positive impact on money supply in all sampled countries except Zimbabwe. In Côte d'Ivoire, Nigeria, Senegal and Uganda, a 1 percent change in output will lead monetary authorities to increase money supply by about 0.43, 0.24, 0.37 and 0.27 percent, respectively. The results show that monetary authorities in African countries change money supply in response to changes in output gap as opposed to lagged output gap. Both change in inflation and the lagged inflation gap are statistically insignificant for most of the sampled countries.

3.3.3.7 Exports Function

Further, the analysis shows that the exchange rate has a positive and significant impact on exports for all the sampled countries. This is shown by the parameter υ. The values range between 0.26 (Malawi) and 0.93 (Tanzania), and they imply that a depreciation of the exchange rate leads to an increase in exports. This outcome is in line with classical economics. The parameter ς shows that world output has a positive impact on exports in all sampled countries except Senegal and Malawi. When output in the world increases by 1 percent, output in these countries rises by a low of about 2 percent in Kenya and a high of about 8.5 percent in Zambia.

3.3.3.8 Equilibrium in Goods Market

Consumption constitutes the highest percentage of Gross Domestic Product (GDP) in all the sampled countries except for Nigeria where consumption insignificantly constitutes 3 percent of GDP (refer to equation 30). Consumption constitutes over 80 percent of GDP in Zimbabwe, South Africa, Senegal and Tanzania. Another notable feature is that exports have a positive and significant impact on GDP for all the countries except for Zimbabwe, where exports insignificantly and negatively affect GDP. Exports contribute about 30 percent of GDP in Côte d'Ivoire, Nigeria and Uganda whereas in Zambia, exports contribute about 40 percent of GDP. On the other hand, imports (investment plus consumption) play an insignificant role in affecting GDP in most of the sampled countries. Government spending constitutes a small fraction of GDP for all the sampled countries. Specifically, government expenditure only positively and significantly contributes towards GDP in Ghana, Kenya, Zambia, Malawi and Tanzania.

3.3.3.9 Imported Investments Function

The result show that the imported investment function (equation 26), is forward looking in the sense that if agents expect imported investments to increase in future, current imported investments increase by an average of about 0.8 for most of the sampled countries. On the contrary, past imported investments positively affect current imported investments by about 0.2 for most of the sampled countries. The results also show that capital stock has a positive impact on imported investments for most of the countries. The value ranges from a low of 0.033 in Uganda to a high of 2.77 in Zambia. Generally, a 1 percent increase in capital stock leads to an average of about 0.62 percent increase in imported investments. This finding implies that these countries mainly rely on imported capital for investment purposes. Another important relationship that surface in equation 26 is that a depreciation of the exchange rate leads to about a 2 percent fall in imported investments for most of the sampled countries.

3.4 Do Shocks Drive Business Cycles in Africa?

Having estimated the structural model, I now perform a number of dynamic simulations to investigate whether an expansionary monetary policy shock and two exogenous shocks (world commodity price shock and world interest rate shock) drive business cycles in African countries. Before running the simulations to compute the impulse response functions, the linear model is

solved following McCandless 2008 who replicated Uhlig's (1999) method of undetermined coefficients[17]. The model in section 2.2 has two sets of equations[18]: those with expectations and those without. If the model has only one equation with no expectations and the rest of the equations have expectations, it can be solved using the standard quadratic method. The model here has five equations without expectations; therefore, I solve it by using the quadratic matrix equation method.

3.4.1 Solving the Stochastic Model

To solve the linear version of the model, I reduce the solution of the expectational difference equation to the solution of a matrix quadratic equation. In Uhlig's method, all variables are written as linear functions of a vector of endogenous variables and a list of exogenous stochastic processes. I define h_t as a vector of endogenous state variables, f_t as a vector of other endogenous variables (jump variables[19]) that depend on the values of the state variables and z_t as the vector of the stochastic shocks. The state variables naturally follow the ridge but the values of the other variables need to jump to get the system on the stable ridge (see McCandless, 2008; 104). Let $h_t = [\tilde{m}_t, \tilde{b}_t^f, \tilde{\imath}_t^m, \tilde{p}_{k_t}, \tilde{\pi}_t]$ denote the vector of endogenous state variables, $f_t = [\tilde{c}_{m_t}, \tilde{r}_t, \tilde{y}_t, \tilde{x}_t, \tilde{c}_t, \tilde{q}_t]$ denote the vector of the jump variables[20] and $z_t = [\rho_{r^*}, \rho_m, \rho_x]$ denote the vector of the stochastic shocks. These shocks include world interest rate, ρ_{r^*} money supply, ρ_m and world commodity price, ρ_x. Separating equations that include expectations from those that do not, the linear version of the model can be written as:

$$0 = \mathbf{A}h_t + \mathbf{B}h_{t-1} + \mathbf{C}f_t + \mathbf{D}z_t, \tag{52}$$

$$0 = E_t[\mathbf{F}h_{t+1} + \mathbf{G}h_t + \mathbf{H}h_{t-1} + \mathbf{J}f_{t+1} + \mathbf{K}f_t + \mathbf{L}z_{t+1} + \mathbf{M}z_t], \tag{53}$$

$$z_{t+1} = \mathbf{N}z_t + \varepsilon_{t+1} \qquad E_t(\varepsilon_{t+1}) = 0, \tag{54}$$

where **C** is assumed to be of full rank and has a well-defined inverse and **N** has only stable eigenvalues. I follow McCandless' (2008) method in computing matrices **A** to **N**. I use variables

[17] See appendix C.
[18] See appendix B.
[19] The name jump variable comes from the saddle point dynamics of continuous time systems.
[20] I carried out robustness tests to determine the state variables and the jump variables. The solution method to the model rejects variables that are not really state variables by fixing all of their coefficients to zero in matrices **P** and **R**.

dated $t\ and\ t-1$ in deterministic equations and variables dated $t+1, t\ and\ t-1$ in equations involving expectations $E_t[\cdot]$. Matrices **A** to **N** are presented below.

$$\mathbf{A}=\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ -\eta_3' & 0 & 0 & 0 & 0 \\ 0 & 0 & \vartheta_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 & -\mathrm{a}_5 \\ 0 & -1 & 0 & 0 & -\Omega_3 \end{bmatrix} \quad \mathbf{B}=\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \mathrm{a}_1 & 0 & 0 & 0 & \mathrm{a}_2 \\ 0 & \Omega_1 & 0 & 0 & 0 \end{bmatrix} \quad \mathbf{C}=\begin{bmatrix} -1 & 0 & 0 & 0 & \kappa_1 & -\kappa_3 \\ 0 & -1 & 0 & 0 & \eta_1' & 0 \\ -\vartheta_4 & 0 & -1 & \vartheta_3 & \vartheta_1 & 0 \\ 0 & 0 & 0 & -1 & 0 & \ddots \\ 0 & \mathrm{a}_5 & -\mathrm{a}_6 & 0 & 0 & -\mathrm{a}_4 \\ \Omega_4 & 0 & 0 & -\Omega_5 & 0 & \Omega_3 \end{bmatrix}$$

$$\mathbf{D}=\begin{bmatrix} \kappa_3 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -\Omega_5 \end{bmatrix} \quad \mathbf{F}=\begin{bmatrix} 0 & 0 & 0 & 0 & \alpha_3' \\ 0 & 0 & \varepsilon_1' & 0 & 0 \\ 0 & 0 & 0 & \upsilon_1' & \upsilon_4' \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \partial_1 \end{bmatrix} \quad \mathbf{G}=\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & \varepsilon_3' & 0 \\ 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & \omega_1' \\ 0 & 0 & 0 & 0 & -1 \end{bmatrix}$$

$$\mathbf{H}=\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \varepsilon_2' & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -\omega_1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \partial_2 \end{bmatrix} \quad \mathbf{J}=\begin{bmatrix} 0 & 0 & 0 & 0 & \alpha_1' & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \upsilon_4' \\ 0 & 0 & 0 & 0 & 0 & -\omega_1' \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \mathbf{K}=\begin{bmatrix} 0 & -\alpha_3' & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\varepsilon_5' \\ 0 & -\upsilon_4' & 0 & 0 & 0 & \upsilon_2' \\ 0 & 1 & 0 & \omega_1' & 0 & \omega_3' \\ 0 & 0 & \partial_3 & 0 & 0 & -1 \end{bmatrix}$$

$$\mathbf{L}=\begin{bmatrix} \alpha_3' & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \quad \mathbf{M}=\begin{bmatrix} -\alpha_3' & 0 & 0 \\ 0 & \varepsilon_6' & \varepsilon_7' \\ 0 & \upsilon_5' & \upsilon_6' \\ 0 & \omega_3' & 0 \\ 0 & 0 & 0 \end{bmatrix} \quad \mathbf{N}=\begin{bmatrix} \rho_{\mathrm{r}^*} & 0 & 0 \\ 0 & \rho_{\mathrm{m}} & 0 \\ 0 & 0 & \rho_{\mathrm{x}} \end{bmatrix}.$$

The solution to this economy is a set of matrices **P, Q, R** and **S**, which describes the recursive equilibrium, laws of motion so that the equilibrium described by these rules is stable. The equilibrium laws of motion are represented by the following equations:

$$h_t = \mathbf{P}h_{t-1} + \mathbf{Q}z_t, \tag{55}$$

$$f_t = \mathbf{R}h_{t-1} + \mathbf{S}z_t\ . \tag{56}$$

A stationary solution will exist and be unique if, and only if, the number of eigenvalues that are outside the unit circle (which have an absolute value greater than zero) is equal to the number of expectational variables (see e.g. Blanchard and Kahn, 1980). When the number of expectational equations is equal to the number of eigenvalues that are outside the unit circle, one can impose conditions on the equilibrium to guarantee that there is a stable solution to the economy (see McCandless, 2008; 128-132 for details). Uhlig's Theorem 2 suggests that the equilibrium described by the recursive equilibrium laws of motion is stable if and only if all eigenvalues of **P** are smaller than unity in absolute value. However, even if some eigenvalues of matrix **P** are greater than zero in absolute value, a stable equilibrium will still be attained as long as all the eigenvalues along the principal diagonal of matrix **P** are smaller than unity in absolute value.

To calculate the solution, **P** satisfies the following matrix quadratic equation:

$$0 = (\mathbf{F} - \mathbf{J}\mathbf{C}^{-}\mathbf{A})\boldsymbol{P}^2 - (\mathbf{J}\mathbf{C}^{-}\mathbf{B} - \mathbf{G} + \mathbf{K}\mathbf{C}^{-}\mathbf{A})\boldsymbol{P} - \mathbf{K}\mathbf{C}^{-}\mathbf{B} + \mathbf{H}. \tag{57}$$

Once the roots of matrix **P** are determined, **R** is computed as follows:

$$\mathbf{R} = -\mathbf{C}^{-}(\mathbf{A}\mathbf{P} + \mathbf{B}). \tag{58}$$

Q satisfies the equation:

$$\big(\mathbf{N}' \otimes (\mathbf{F} - \mathbf{J}\mathbf{C}^{-}\mathbf{A}) + \mathbf{I}_k \otimes (\mathbf{J}\mathbf{R} + \mathbf{F}\mathbf{P} + \mathbf{G} - \mathbf{K}\mathbf{C}^{-}\mathbf{A})\big)vec(\boldsymbol{Q}) = vec\big((\mathbf{J}\mathbf{C}^{-}\mathbf{D} - \mathbf{L})\mathbf{N} + \mathbf{K}\mathbf{C}^{-}\mathbf{D} - \mathbf{M}\big), \tag{59}$$

where the symbol $\otimes$ denotes the kronecker product and vec(·) denotes columnwise vectorization[21]. The identity matrix $\mathbf{I}_k$ has dimension $k \times k$ where k is the number of columns in the matrix **Q.** The values for matrix **N** come from estimations of foreign interest rates, money supply and exports functions.

Finally, **S** is given by:

[21] Given matrices **A** and **B**, $\mathbf{A} \otimes \mathbf{B} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \otimes \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} = \begin{bmatrix} a_{11}\boldsymbol{B} & a_{12}\boldsymbol{B} \\ a_{21}\boldsymbol{B} & a_{22}\boldsymbol{B} \end{bmatrix}$. $vec(\mathbf{AB}) = (\mathbf{I}_k \otimes \mathbf{A})vec(\mathbf{B})$
See McCandless (2008) and Lütkepohl (2007) for details on how to compute the kronecker product and columnwise vectorization.

$$\mathbf{S} = -\mathbf{C}^{-}(\mathbf{AQ} + \mathbf{D}). \quad (60)$$

Since variables in vectors h_t and f_t are log deviations, the entries in **P, Q, R** and **S** are interpreted as elasticities.

3.4.2 Decision Rules and Impulse Response Analysis

This section describes the multiplier analysis, that is, the response of one variable to an impulse in another variable in a system that involves a number of other variables as well. Thus, I investigate the impulse response relationship between variables in a higher dimensional system. If there is a reaction of one variable to an impulse in another variable, the latter is the causal of the former (see Lütkepohl, 2007; 51-60 for details). Following McCandless (2008, 120-121), the economy begins in a stationary state, with all shocks to stochastic processes set to zero. The variables are also set to zero because they are log differences from the stationary state. The time path the economy follows is defined by the laws of motion represented by equations 55 and 56 above. The stochastic shocks to this model follow the process:

$z_t = \mathbf{N}z_{t-1} + \varepsilon_t$, where ε_t is the shock.

I used Matlab[22] to compute the values for matrices **P, Q, R** and **S** for all the sampled countries and the matrices are presented in appendix D. As noted, for a stable equilibrium, the absolute values of the principal diagonal for matrix **P** must be less than one. To compute the impulse response functions, I use the values in matrices **P, Q, R** and **S,** and a 1 percent shock. I first find the time path of the state variables and then I determine the path of the jump variables. I recursively ran simulations for 50 periods for all the sampled countries.

The matrices **P** and **Q** yield a set of decision rules for imported investment and foreign debt. Note that the coefficient of foreign debt on the imported investment function (column 2, row 3 of matrix **P**) is different from zero for most of the sampled countries and it is also negative. This implies that capital accumulation and foreign debt cannot be separated as is the case in the small open economy framework. In view of the fact that these countries mainly import capital, they use foreign loans to accumulate fixed capital. Therefore there is an upward sloping supply function of foreign loans. This finding corresponds to Senhadji (1997). In countries like Côte d'Ivoire, Ghana, Kenya and Senegal, there is a negative cross effect; the negative coefficient of foreign debt

[22] Mat lab codes for solving the quadratic matrix equation are found in McCandless (2008, 233-235).

on imported investments and the negative coefficient of imported investments on foreign debt (column 3, row 2 of matrix **P)**. Senhadji (1997) argues that this cross-effect reflects the substitutability between physical capital and the foreign debt. The negative effect of external debt on imported investments also confirms the debt overhang hypothesis. Another noteworthy point is that there is a mixed relationship between foreign debt and output. Matrix **P** also shows that in 5 of the sampled countries, external debt has a negative impact on output whilst it has a positive impact in the rest of the countries.

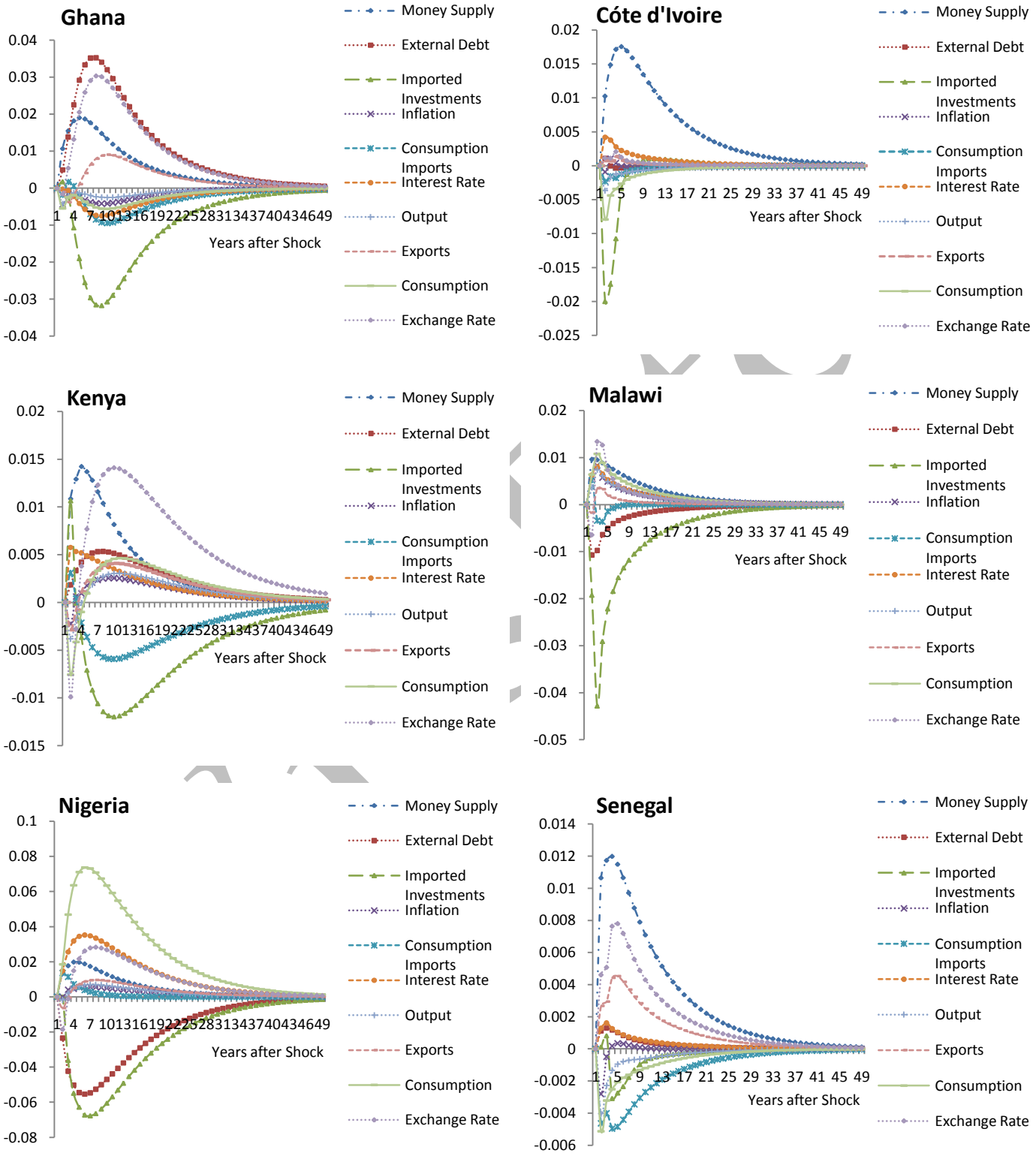
Another point worth mentioning is that a negative external shock (that is, an increase in world interest rates) and a positive external shock (that is, an increase in world commodity price) trigger different borrowing responses for different countries. Matrix **Q** shows that an increase in world interest rate leads to a fall in foreign borrowing for most of the countries (see row 2, column 1 of matrix **Q**) whilst an increase in world commodity prices leads to an increase in foreign borrowing in 6 of the sampled countries (see row 2, column 3 of matrix **Q**). Another interesting outcome from matrix **Q** is that an expansionary monetary shock also leads to different borrowing responses with 7 of the 11 sampled countries reporting an increase in foreign borrowing.

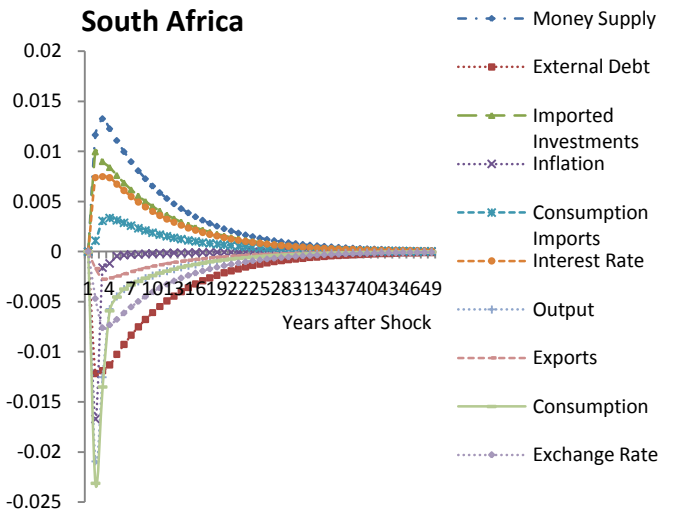
Another notable observation is that all persistent shocks converge to the steady state equilibrium after about 40 years for most of the sampled countries. On the other hand, the effect of a permanent shock converges to the new equilibrium level after about 5 to 9 years for most of the sampled countries. The impulse response functions for permanent shocks are presented in appendix E.

3.4.2.1 Monetary Policy Shock

In this study, monetary authorities pursue money growth as their monetary policy. The Figure below shows the impulse response functions (IRFs) of a 1 percent persistent shock to an expansionary monetary policy. For most of the countries, the results mimic the basic cash in advance model in which a positive money shock drives downwards consumption and output.

Figure 3.1: Persistent Shock to Monetary Policy




South Africa
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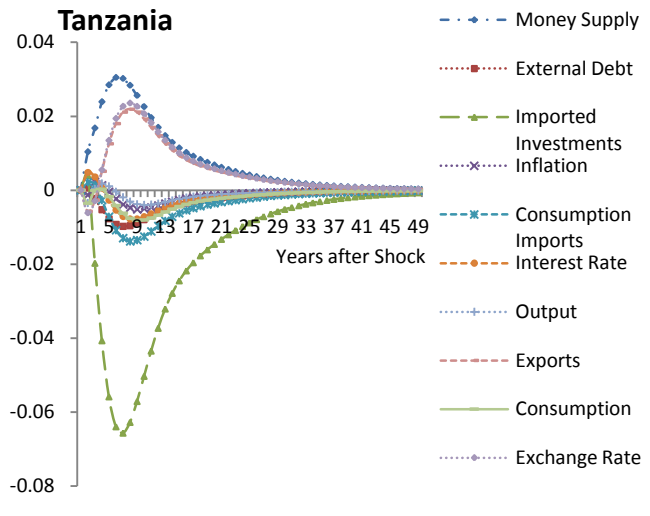
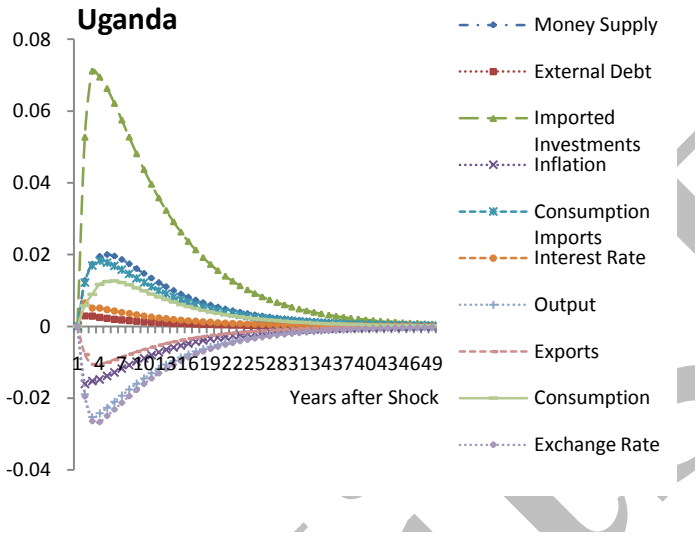
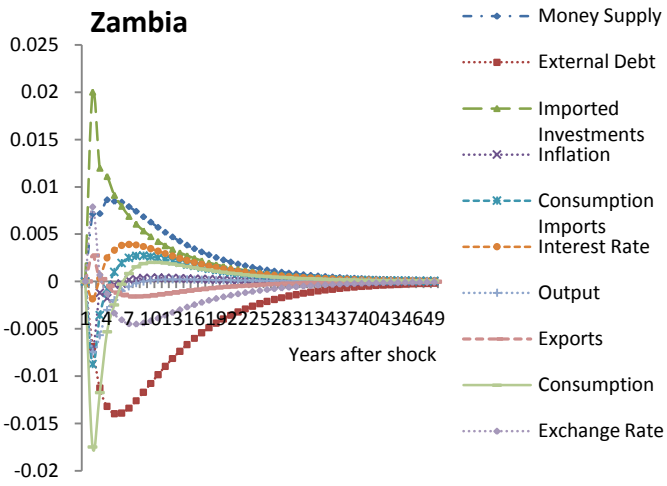
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49
Years after Shock
Money Supply
External Debt
Imported Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Tanzania
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
1 5 9 13 17 21 25 29 33 37 41 45 49
Years after Shock
Money Supply
External Debt
Imported Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Uganda
0.08
0.06
0.04
0.02
0
-0.02
-0.04
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49
Years after Shock
Money Supply
External Debt
Imported Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zambia
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49
Years after shock
Money Supply
External Debt
Imported Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

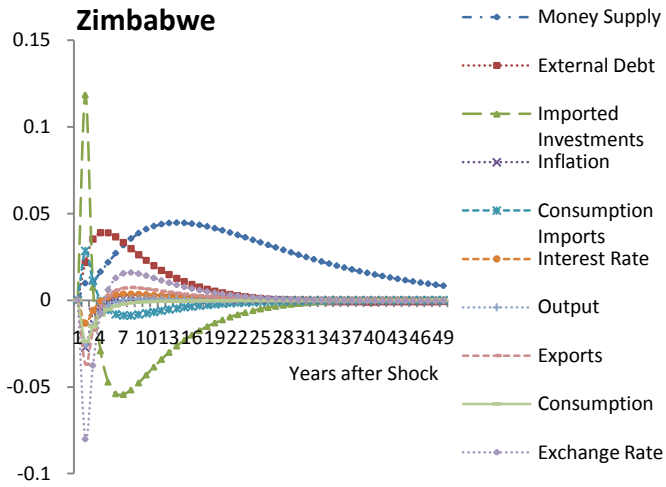

Zimbabwe
0.15
0.1
0.05
0
-0.05
-0.1
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49
Years after Shock
Money Supply
External Debt
Imported Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

Table 3.2: Summary of IRFs of a Persistent Shock to Monetary Policy

Target Variable	External Debt	Imported Investments	Inflation	Consumption Imports	Interest Rates	Output	Exports	Consumption	Exchange Rate	Money Supply
Expected Reaction of Target Variable	±	+	+	+	−	±	−	±	+	+
Ghana	+	+	−	+	−	−	−	−	−	+
Côte d'Ivoire	+	−	−	−	+	−	+	−	+	+
Kenya	+	+	−	+	+	−	−	−	−	+
Malawi	−	−	+	+	+	+	−	+	−	+
Nigeria	−	−	+	+	+	−	−	+	−	+
Senegal	+	+	−	−	+	−	+	−	+	+
South Africa	−	+	−	+	+	−	−	−	−	+
Tanzania	+	+	−	+	+	−	−	−	−	+
Uganda	+	+	−	+	+	−	−	+	−	+
Zambia	−	+	−	−	−	−	+	−	+	+
Zimbabwe	+	+	−	+	−	−	−	−	−	+

The sign + means Increase and − means Decrease. Note that an increase/decrease in the exchange rate implies a depreciation/appreciation of the exchange rate.

Table 3.2 above shows the summary of the responses of economic variables to a persistent expansionary monetary policy shock. An expansionary monetary shock is expected to lead to either an increase or decrease in external debt depending on the policies that are pursued by respective countries. External debt falls after a monetary shock when central banks insulate the increase in money supply by reducing foreign borrowing. This is the case reported in Malawi, Nigeria, South Africa and Zambia. The rest of the countries: Côte d'Ivoire, Ghana, Kenya, Senegal, Tanzania, Uganda and Zimbabwe report an increase in external debt after a monetary shock. The increase in external debt can be explained by the fact that imported investments and consumption imports increased after a monetary shock due to an appreciation of the exchange rate.

The conventional view suggests that an expansionary monetary shock leads to an increase in nominal interest rates. Christiano and Eichenbaum (1992) argue that as long as the amount of money that households allocate to consumption does not respond to the lump-sum injection of cash by monetary authorities, a positive money shock increases the total percentage of the money supply available to financial intermediaries. As long as the gross interest rate exceeds one, financial intermediaries lend all of the cash at their disposal to firms. However this requires that firms absorb a disproportionately large share of new cash injections. For firms to do so voluntarily, interest rates must fall. On the other hand, if the growth rate of money displays positive persistence, then the expected inflation effects of a change in the growth rate of money exert countervailing pressure on interest rates. Whether interest rates fall or rise after a money shock depends on which effect is stronger. From the table above, apart from Ghana, Zambia and Zimbabwe, an expansionary monetary policy shock leads to an increase in real interest rates in all the other sampled countries. Additionally, Ghana, Zambia and Zimbabwe experience a *liquidity effect* in view of the fact that the countries observe a negative comovement between money supply and interest rates. The liquidity effect is at odds with the predictions of the classical monetary model (see Gali, 2008 for details). However, the negative comovement between money supply and interest rate is in line with Friedman (1968). Friedman argued that an exogenous increase in the money supply leads to a drop in the real interest rate, which lasts 1 to 2 years.

Theoretically, an expansionary monetary policy should lead to an increase in aggregate demand in an economy where agents hold money for transaction purposes as opposed to speculative purposes. The increase in aggregate demand leads to an increase in output and consumption. On the other hand, if money is held more for speculative and precautionary reasons than for transaction reasons, the opportunity cost of holding money increases in the form of higher interest rates. The increase in the cost of funds discourages investments and thus the economy produces less output than potential. The impulse response functions show that both output and consumption fall after an expansionary monetary shock in most countries. The fall in consumption arises if households finance consumption from borrowed funds and/or noncurrent income (i.e., from wealth held in interest earning assets). With increase in interest rate, opportunity cost of wealth increases and consequently consumption falls.

In most of these economies, imported investments increase after a monetary shock. The puzzling question is: why is it that the increase in imported investments does not translate into an increase in output and consumption? Perhaps, most of the sampled countries invest in projects that have low returns. In fact, Pattillo *et al* (2001) argue that investments that take place in high uncertainty environments as well as high debt environments are likely to be in trading activities that have quick returns rather than long-term, high-risk, irreversible investments. This misallocation of investment in turn lowers the efficiency of overall capital accumulation thus negatively affecting output. Another explanation for reduced output and consumption is provided by Ndikumana and Boyce (2008) who argue that in African countries, there is high capital flight which has a regressive effect on output. Capital flight also depresses consumption in the domestic economy.

Another notable feature is the response of exchange rate to a monetary shock. Theoretically, exchange rate is expected to depreciate in response to a monetary shock in a flexible exchange rate regime. This is the case for four of the sampled countries. In the rest of the countries, the exchange rate appreciates after an expansionary monetary shock. This can be explained by Kuttner and Mosser (2002) who argue that in the exchange rate channel, monetary transmission mechanism runs from interest rates to the exchange rate via the UIP condition that relates interest rates differentials to the expected exchange rate movements. They point out that an increase in the domestic interest rate relative to foreign rates, leads to a stronger currency and a reduction both in net exports and in the overall level of aggregate demand. The appreciation of the exchange rate can be explained either by the high real interest rates which attract foreign capital or by increased foreign borrowing. The inflow of foreign capital leads to an appreciation of the exchange rate. The appreciation of the exchange rate is accompanied by an increase in consumption imports and a reduction in exports since it is cheaper to import goods into the country. Consequently, a trade deficit is created given that imports exceed exports.

In most of these countries, the design of monetary policy is centered on money growth. The central bank chooses a target rate for money growth corresponding to the lagged inflation rate and the lagged output gap. The assumption is that money growth and inflation rate is positively related. Conventionally, an expansionary monetary policy should therefore lead to an increase in inflation since the increase in money supply leads to an increase in aggregate demand in the economy. However, my impulse response functions show that inflation declines in Africa after an

expansionary monetary shock. The question to ask is: why does the model fail to display an increase in inflation after an expansionary monetary policy shock? The fall in inflation after an expansionary monetary shock has been identified as a "price puzzle" (a temporary drop in the price level after an expansionary monetary policy shock). Ravn, Schmitt-Grohé, Uribe and Uuskula (2008) posit that a price puzzle and an "inflation persistent puzzle" arises when first, variations in aggregate demand affect the price elasticity of demand facing producers. An increase in current aggregate demand increases the price elasticity and therefore leads producers to set lower mark-ups. Second, when setting prices today, producers need to be forward looking and a producer that expects high future demand will have an incentive to lower prices today in order to attract more future demand. In this sense, the model gives rise to a countercyclical mark-up. Inflation responses for Kenya and Côte d'Ivoire replicate the results by Ravn *et al* (2008) in the sense that the response of inflation to an expansionary monetary policy shock is negative during the second period after the shock and subsequently increases persistently around the third period after the shock. In Ghana and Zambia, inflation responds sluggishly to monetary shock whilst in Tanzania, inflation initially cycles after a monetary shock and then it falls after the fourth period.

Another explanation for the price puzzle is provided by Barth and Ramey (2001) who refer to the cost channel of monetary policy as an alternative explanation for an increase in inflation after a monetary tightening. The cost channel operates alongside the interest rate channel (that is, the standard aggregate demand channel) by reflecting that firms depend on credit to finance production, which means that their pricing decisions are directly related to credit conditions since marginal production costs are affected by interest rates. On the other hand, Rabanal (2007) argues that a shift of inflation in response to a monetary policy shock is not necessarily evidence for misspecification but follows from a worsening of credit conditions due to an increase in interest rates. His results suggest that the cost channel fails as an explanation for the price puzzle as he finds that the presence of the cost channel is not enough to generate a positive response of inflation after a monetary policy contraction. An initial rise of inflation is stimulated by an increase in interest rates that enter marginal production costs, but the shift is completely offset by declines in the real wage and the real rental rate of capital, even when wages are set in a staggered way and capital utilization is assumed to be highly variable, which makes the rental rate of capital less volatile.

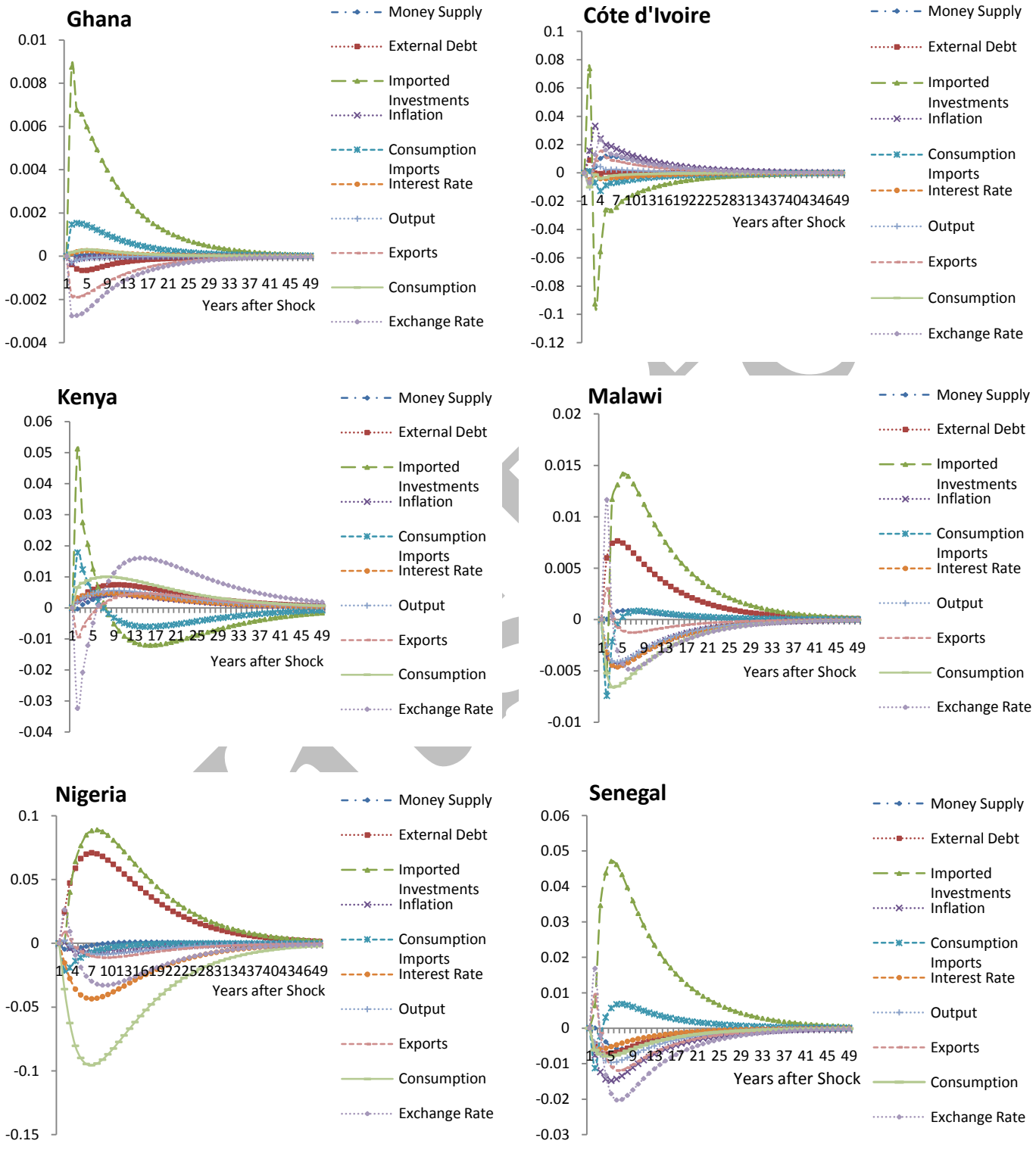
In a similar vein, CEE (2005) estimate a general equilibrium model and conclude that the importance of the cost channel in the US is only minor. Even though a price puzzle emerges in the empirical impulse responses they use for minimizing the distance, the cost channel only contributes to explaining inflation inertia, which emerges after a monetary contraction, while inflation immediately falls. However, this should not be the case in inputs-constrained economies of Africa. A more recent study by Henzel, Hülsewig, Mayer and Wollmershäuser (2009) finds that the cost channel in the euro area is incapable of producing a price puzzle in an unrestricted regression, but its presence helps to generate an initially concave response of inflation to a monetary contraction. Their argument is that the fall in inflation is delayed in the first quarters following the shock, before it follows the traditional hump-shaped and convex response, which can be attributed to the sluggish reaction of real marginal costs that comes along with the simultaneous increase in interest rates.

With a few exceptions, a permanent shock to monetary policy produces similar results to those of a persistent shock in most of the sampled countries (see appendix E for the Figures). In fact, the short-run responses to a permanent shock to an expansionary monetary policy are similar to the responses of persistent shocks. The long-run effects differ from the short-run ones in the sense that in the long-run, most countries report depreciated exchange rates and as a consequence, they run current account surpluses following an expansionary monetary policy. Another result worth pointing out is that output and consumption increase after a 1 percent permanent increase in money in 5 of the sampled countries. The results imply that in these countries, agents respond to a permanent increase in money supply by consuming transaction goods as opposed to investing in interest earning investments.

3.4.2.2 World Commodity Price Shock

As noted by Cashin, Liang and McDermott (2000), movements in commodity prices are a key determinant of the performance of the world economy. They affect the level of stability of export earnings by developing countries, the cost of inputs to production in industrialized countries, the allocation of world capital flows and rates of national economic growth. The impulse response functions above show that world commodity prices play an important role in driving business cycles in Africa. The Figure below shows the impulse response functions of a 1 percent persistent increase in the world commodity price.

Figure 3.2: Persistent Shock to World Commodity Price



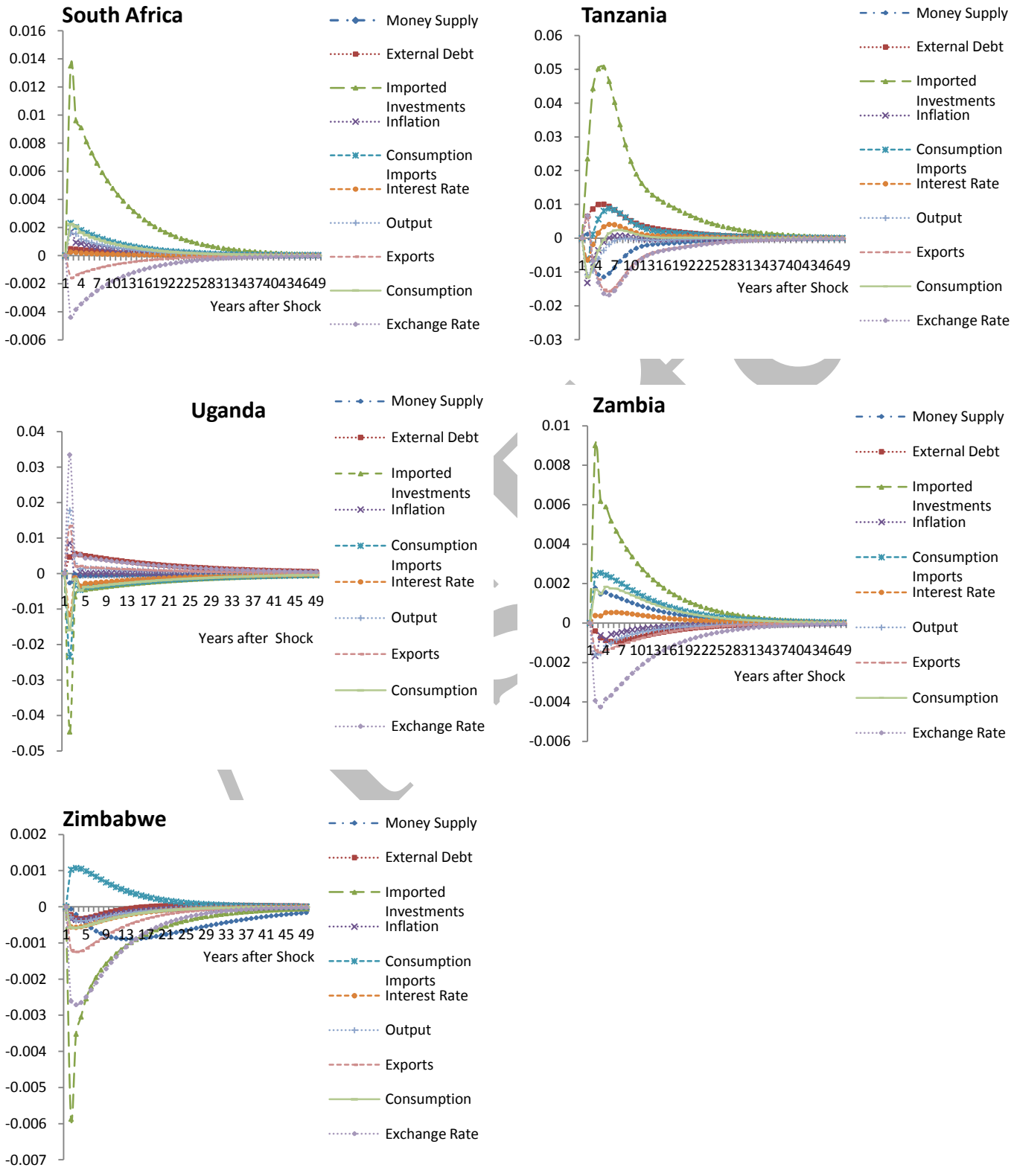

South Africa
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate
Tanzania
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate
Uganda
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
1 5 9 13 17 21 25 29 33 37 41 45 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate
Zambia
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate
Zimbabwe
0.002
0.001
0
-0.001
-0.002
-0.003
-0.004
-0.005
-0.006
-0.007
1 5 9 13 17 21 25 29 33 37 41 45 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

Table 3.3: Summary of IRFs of a Persistent Shock to World Commodity Price

Target Variable	External Debt	Imported Investments	Inflation	Consumption Imports	Interest Rates	Output	Exports	Consumption	Exchange Rate	Money Supply
Expected Reaction of Target Variable	±	+	+	−	−	−	−	−	+	±
Ghana	−	+	−	+	+	−	−	+	−	+
Côte d'Ivoire	+	+	+	+	−	−	−	−	−	+
Kenya	+	+	+	+	+	+	−	+	−	+
Malawi	+	−	−	−	−	−	+	−	+	+
Nigeria	+	+	+	−	−	+	+	−	+	−
Senegal	−	+	−	−	−	−	+	−	+	−
South Africa	+	+	+	+	+	+	−	+	−	+
Tanzania	+	+	−	−	−	−	+	−	+	+
Uganda	+	−	+	−	−	+	+	−	+	−
Zambia	−	+	−	+	+	−	−	+	−	+
Zimbabwe	−	−	−	+	−	−	−	−	−	−

The sign + means Increase and − means Decrease. Note that an increase/decrease in the exchange rate implies a depreciation/appreciation of the exchange rate.

The impulse response functions suggest that a 1 percent positive shock to a commodity price leads to an increase in external debt in all sampled countries except for Ghana, Senegal, Zambia and Zimbabwe. The accumulation of external debt can be explained by Bevan, Collier and Gunning (1989, 1990 and 1993) who find that even though governments in Africa initially try to save windfalls from a commodity price shock, they finally invest far in excess of their savings, so that the final consequence of the windfall is an increase in external debt. Investments are either in poor quality irreversible projects which have low-returns or in overambitious projects that are abandoned when revenues fall. In addition, governments raise their current expenditures in a way that is difficult to reverse when the boom turns to a slump and therefore, they destabilize the economy when sharp and often harmful cuts have to be made. This leads to more external

borrowing to finance the budget deficit; thus, accumulating external debt. If governments save the boom's earnings and use the savings to smooth out investments, foreign debt will fall after a favourable world commodity price shock.

Conversely, Deaton and Miller (1995) did not find any connection between commodity price booms and external debt but find that commodity price booms mainly affect investments. In support of Deaton and Miller (1995), Kose and Riezman (1999) find that commodity price shocks heavily affect investment dynamics in African countries. From Table 3.3 above, imported investments increased after the world commodity price shock in all countries except in Côte d'Ivoire, Malawi and Zambia where imported investments fell after world commodity price shock.

World commodity price shocks ought to lead to an increase in inflation given that the increase in the relative prices of exports causes a substantial increase in ticket prices of imported investments. As a consequence, export sectors should contract production and consumption should fall. This is the case that is reported in most of the sampled countries where consumption and output fall after a favourable commodity price shock. On inflation, the impulse response functions show that it falls after a commodity price shock in most countries. This can be explained by the fact that African countries pursue stabilization policies that ameliorate the domestic effects of world commodity price shocks. Price stabilization policies typically take the form of either buffer stock schemes or buffer fund and are usually implemented in commodity-exporting countries to reduce the effects of volatile world commodity prices on domestic prices or export returns.

Theoretically, the relative value of exports is expected to increase after a favourable world commodity price shock where the affected commodity is an export of the country. This is the case for Malawi, Nigeria, Senegal, Tanzania and Uganda. However, in the rest of the sampled countries, the impulse response functions indicate that exports decline after a commodity price shock. Consumption imports also increase and the commodity price shock leads to a trade deficit instead of a trade surplus. Note that the exchange rate appreciated initially after a commodity price boom in these countries and this could have led to increased imports. The inevitable appreciation of the exchange rate leads to contraction of both the export sector and the manufacturing sector since output falls after a commodity price shock. What this means is that these countries suffer from the "Dutch disease" in the sense that the boom from a favourable commodity price shock has an adverse effect on other sectors of the economy.

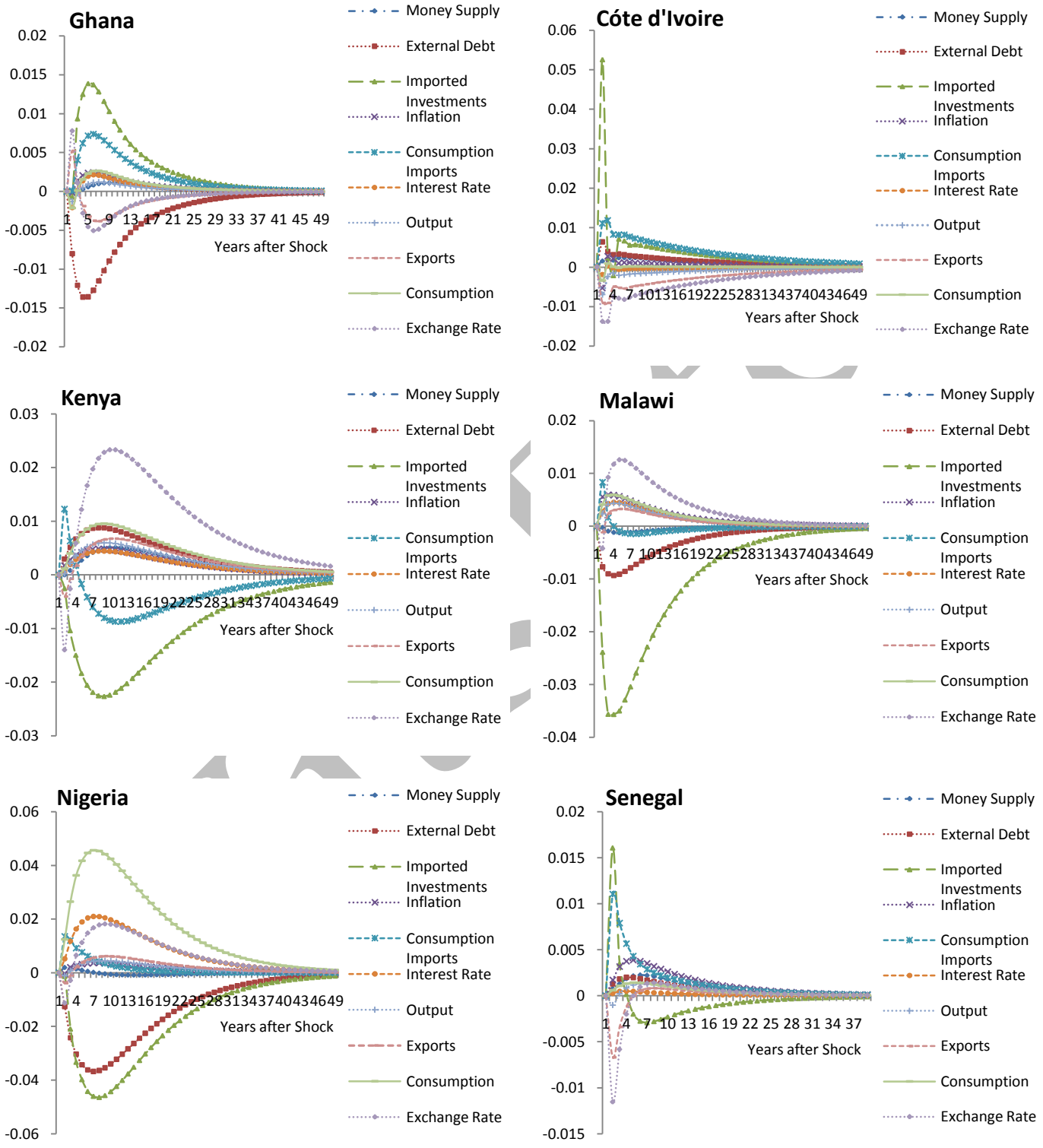
Real interest rates fall after a favourable commodity price shock because agents defer taking up loans from the bank. When agents realize the boom that comes after the shock is temporary, they save the boom and thus push downwards the real interest rates. This is the scenario reported in most African countries. On the other hand, impulse response functions show that money supply responds sluggishly to the world commodity price shock in Kenya, Malawi, Nigeria, Senegal, South Africa and Tanzania.

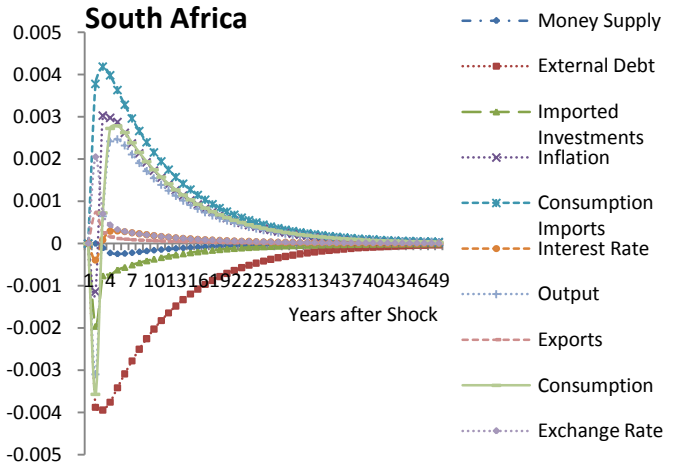
The permanent increase in the world commodity price has similar effects to those of persistent shocks in most of the countries. There are only a few variations in the long-run responses for some variables in some countries. The impulse response functions for a permanent shock to the world commodity price are reported in appendix E.

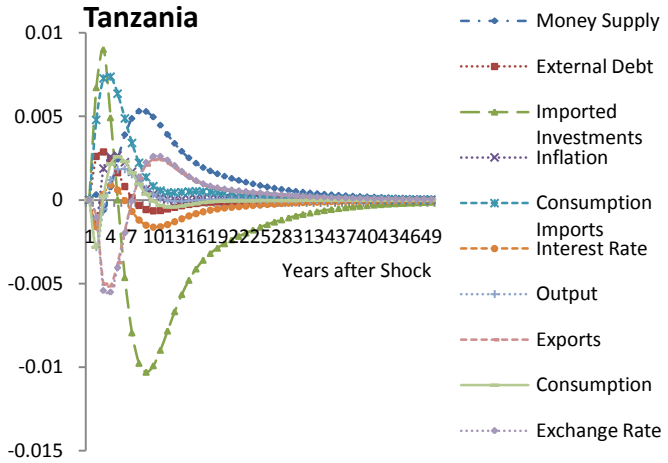
3.4.2.3 World Interest Rate Shock

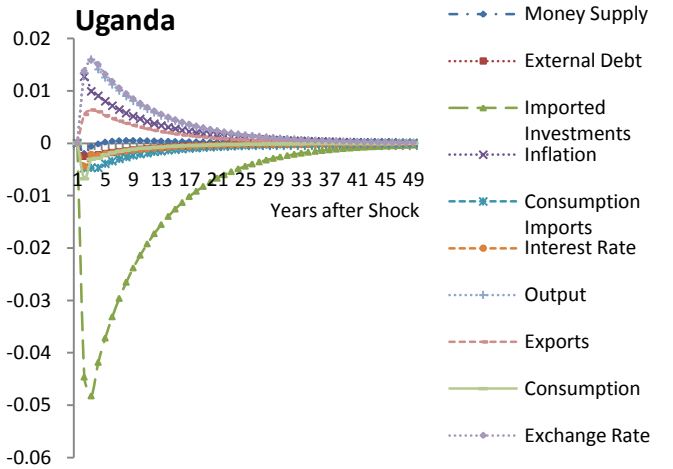
Figure 3.3 shows that world interest rate shocks generate stronger fluctuations in exchange rates, import consumption, investment imports and external debt in most of the sampled countries. The response functions substantiate Mendoza's (1991) inference that world interest rate disturbances might cause significant business cycle fluctuations in highly indebted developing countries. Blankenau *et al* (2001) argue that changes in the world real interest rate can affect behaviour along many margins: they affect households by generating intertemporal substitution, wealth, and portfolio allocation effects, and they affect firms by altering incentives for domestic investment.

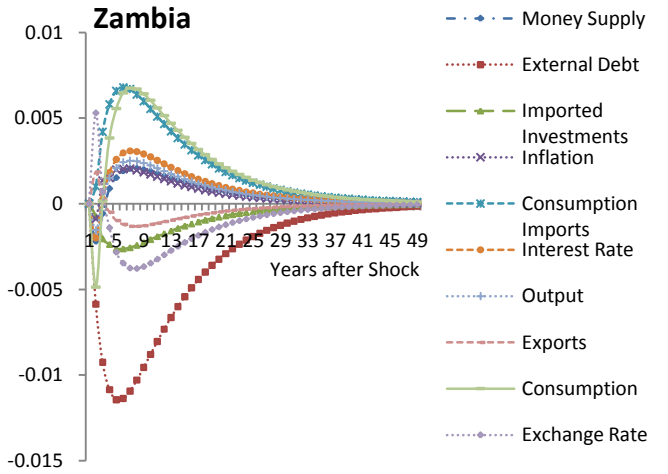
Figure 3.3: Persistent Shock to the World Interest Rate

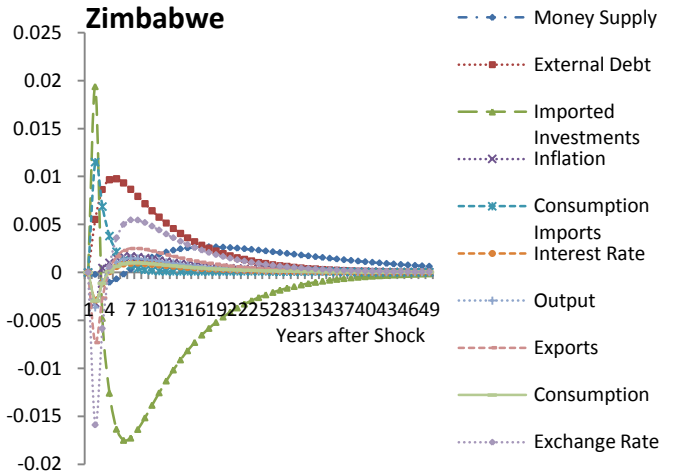



South Africa
0.005
0.004
0.003
0.002
0.001
0
-0.001
-0.002
-0.003
-0.004
-0.005
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Tanzania
0.01
0.005
0
-0.005
-0.01
-0.015
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Uganda
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
1 5 9 13 17 21 25 29 33 37 41 45 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zambia
0.01
0.005
0
-0.005
-0.01
-0.015
1 5 9 13 17 21 25 29 33 37 41 45 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zimbabwe
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0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
1 4 7 10131619222528313437404346 49
Years after Shock
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

Table 3.4: Summary of IRFs of a persistent Shock to the World Interest Rate

Target Variable	External Debt	Imported Investments	Inflation	Consumption Imports	Interest Rates	Output	Exports	Consumption	Exchange Rate	Money Supply
Expected Reaction of Target Variable	±	−	−	+	+	−	±	−	+	±
Ghana	−	−	−	−	−	−	+	−	+	+
Côte d'Ivoire	+	+	−	+	−	−	−	−	−	+
Kenya	+	−	+	+	+	+	−	+	−	−
Malawi	−	−	+	+	+	+	−	+	−	−
Nigeria	−	−	−	+	+	−	−	+	−	+
Senegal	+	+	+	+	+	−	−	+	−	+
South Africa	−	−	−	+	−	−	+	−	+	−
Tanzania	+	+	−	+	−	−	−	−	−	+
Uganda	−	−	+	−	−	+	+	−	+	−
Zambia	−	−	−	+	−	−	+	−	+	−
Zimbabwe	+	+	−	+	−	−	−	−	−	−

The sign + means Increase and − means Decrease. Note that an increase/decrease in the exchange rate implies a depreciation/appreciation of the exchange rate.

In this study, world interest rate is postulated to be an increasing function of external debt. It measures the marginal cost of borrowing foreign debt and thus, foreign debt increases as world interest rates increase. This is the case for Côte d'Ivoire, Kenya, Senegal, Tanzania and Zimbabwe. The rest of the countries reduce foreign borrowing after a shock to the world interest rate. This is because these countries respond to the higher cost of servicing debt by reducing foreign borrowing and, as a result foreign debt falls.

When marginal cost of borrowing increases, consumption declines because consumers put off current consumption to the future. In fact, consumers delay making a full adjustment to the shock and so they gradually cut consumption. According to the impulse responses, output and imported

investments expectedly fall after a shock to the world interest rate in most of the sampled countries. Investments fall because of the flow of capital out of the country. Another explanation for the fall in imported investments is that the increase in the world interest rate results in a reversal of capital flows causing a "capital crunch". The probability that a country will default increases with the increase in interest rates and therefore, rational investors anticipate an increase in expropriation risk and hence invest less. The fall in investments also leads to a decline in exports in most of these countries since they mainly rely on imported intermediate goods in the production of exportables. The fall in exports and the attendant increase in consumption imports generate a trade deficit in most of the sampled countries.

Theoretically, with high world interest rates, capital flows out of the country and creates an incipient deficit which causes the home currency to depreciate. The depreciated exchange rate should encourage exports and discourage consumption imports. This is the case that is reported in Ghana, South Africa, Uganda and Zambia. In the rest of the countries, the exchange rate appreciates in response to an increase in world interest rates. The exchange rate appreciation is accompanied by an increase in consumption imports and a fall in exports, thus creating a trade deficit. The impact of world interest rates on exports mirrors the findings by Blankenau, *et al* (2001) who document that world interest rates only exert large fluctuations on net exports and net foreign assets.

The short-run effects of a permanent increase in the world interest rate are similar to those of a persistent shock (see appendix E for the Figure on responses to a permanent shock). The long-run effects differ from the short run effects in different countries. In the long-run, a permanent shock to the world interest rate leads to an increase in inflation unlike persistent shocks that lead to a fall in inflation. Interest rates also rise after a permanent shock to world interest rate. Another distinguishing feature is the response of consumption and output. Unlike in the case of the persistent shock where output and consumption fall, a permanent shock leads to an increase in output and consumption in the long-run.

3.5 Business Cycle Properties of the Data and Model

In line with Senhadji (2003), I summarize the business cycle properties by two statistics: relative volatility and comovement with GDP. Relative volatility is measured as the ratio of the standard deviation of the variable to the standard deviation of GDP whilst comovement is measured as the

variable's correlation with GDP. The results for volatility and comovement of variables with GDP are presented in Tables F1 and F2 in appendix F. The data shows that external debt, imported investments, consumption imports, exchange rate and exports are volatile whilst interest rates are less volatile. Consumption is as variable as GDP. There are, however, some differences in the magnitudes across different countries. With respect to comovement, consumption is strongly procyclical whilst imported investments, consumption imports, exports and money supply are somewhat procyclical. Inflation and interest rates are, on average, weakly countercyclical.

When the model's business cycle properties are compared to those of the data, the relative volatility of external debt, consumption imports and exports replicate business cycle properties of the data after a persistent expansionary monetary policy shock. Other variables with high volatility include consumption, imported investments, money supply and the exchange rate. With a persistent commodity price shock, volatility declines for external debt and money supply. The volatile variables include imported investments, consumption imports, exports and the exchange rate. When there is a persistent shock to world interest rates, external debt, consumption, imported investments, consumption imports and exchange rates are more volatile than GDP. Another notable observation is that inflation is as variable as GDP after both the commodity price shock and the world interest rate shock. In summary, the three shocks increase substantially the relative volatility of imported investments (which are used for capital formation) and the exchange rate.

In terms of comovement with GDP, with a persistent monetary policy shock, inflation and consumption are strongly procyclical whilst external debt, imported investments, consumption imports and money supply are countercyclical. With a persistent commodity price shock, inflation and consumption are strongly procyclical while exports and exchange rates are somewhat procyclical. Imported investments and consumption imports are countercyclical. If there is a persistent shock to world interest rates, inflation and consumption become strongly procyclical whilst external debt, imported investments and consumption imports are countercyclical.

3.6 Conclusions from the DSGE Model

From the foregoing discussion of results, it is apparent that the structural model developed in this study fits empirical data fairly well and replicates business cycle properties. Most of the estimated parameters are statistically different from zero. The results show that there is high wage indexation in Africa and therefore the Phillips curve is backward-looking. The backward-looking

Phillips curve implies that African markets are inefficient; an outcome that is due largely to information asymmetry. Agents rely on past information to make current periods' decisions. On the contrary, imported investments are forward-looking such that if imported investments are expected to rise in future, current imported investments increase.

The empirical results also show that exports reduce foreign debt whilst imports increase foreign debt. This implies that countries must run a trade surplus if they desire to reduce their external debt burden. The results also prove that a depreciation of the exchange rate leads to an increase in external debt when debt is denominated in domestic currency (the opposite is true when debt is denominated in foreign currency). Additionally, a depreciation/appreciation of the exchange rate leads to an increase/decrease in exports and a fall/rise in consumption imports for most of the countries.

On shock propagation, what clearly comes out is that monetary shock, commodity price shock and world interest rate shock drive business cycles in Africa. The shocks have a high impact on external debt, imported investments, consumption imports, exports, fluctuations in exchange rates, consumption and output. Specifically, an expansionary monetary shock leads to an increase in investments/consumption imports, external debt and the real interest rates in most of the countries. Surprisingly, instead of the exchange rate depreciating after an expansionary monetary shock, it appreciates in most of the sampled countries. World commodity price shock leads to an increase in external debt, imported investments, consumption imports and money supply. World interest rates shock lead to a fall in external debt, imported investments, inflation, exports, consumption and output. Apparently consumption imports increase in response to world interest rates shock whilst exports decline hence causing a trade deficit.

From these results, it appears that countries accumulate debt either when the trade deficit increases or when there is an adverse macroeconomic shock. In order to address the pervasive effects of external debt on African countries, the next chapter derives possible national strategic guides based on national income ratios for better debt sourcing and management. These strategies are geared towards averting the future accumulation of unsustainable debts. To formulate appropriate strategies that will forestall external debt accumulation, insights will be gleaned from the literature in chapter two and the results documented in this chapter.

CHAPTER FOUR: REASONED PLAN/GUIDE FOR BETTER DEBT SOURCING AND MANAGEMENT

4.1 Introduction

Chapter two presented a review of the sources of the current debt problem among African countries and the consequences of the debt crisis on these economies. As discussed in the review of literature, the main sources of debt accumulation are short sighted policy decisions by African leaders, uncontrolled fluctuations in export earnings as a result of weak export markets, creditor investments in unproductive projects that eventually became white elephants, exchange rate fluctuations, and macroeconomic propagated shocks.

In Chapter three, a macroeconomic model of external debt burden for African countries was developed. The estimation results provide evidence that suggests exports reduce debt accumulation whilst imports increase debt accumulation. Fluctuations in exchange rate also affect debt accumulation in these countries. The dynamic effect of shocks on external debt was also analyzed in this chapter. From the simulations, external debt increases in most of the countries as imported investments and consumption imports increase. The simulations show that an internal shock and two external shocks contribute towards fluctuations of external debt in African countries. Specifically, an expansionary monetary policy (internal) shock and a favourable world commodity price (external) shock leads to an increase in external debt whereas an adverse world interest rate (external) shock leads to a fall in external debt.

4.2 Recap of Ineffective Patterns of Borrowing Contracts and Repayment Plan

As highlighted in the review of literature, African countries accumulated external debt immediately after the commodity price booms. The simulations in Figure 3.3 confirm that a favourable world commodity price boom contributes towards the indebtedness of these countries. Conventionally, the commodity booms should create a trade surplus which can be used to acquire capital for investment projects. Even though countries acquired capital goods after the booms as evidenced by the increase in imported investments, they invested the boom in over-ambitious projects that either turned out to be white elephants or the boom was not enough to completely finance the projects. Countries therefore resorted to external borrowing to complete the projects

thus accumulating more debt. In order to arrest this kind of expenditure, African countries must pursue better practices for evaluating and financing sustainable investment projects.

Another destructive external debt contracting practice by African countries comes from corrupt contracts by private agents. As highlighted in chapter two, most of the money that was received, especially during cold war, was deposited back in western banks under dubious circumstances. In other cases, contracts were completed in western countries and the money never reached the debtor country. In such circumstances, the external debt for these countries is "odious debt "[23]. Authors like Sack (1927) and Boyce and Ndikumana (2001, 2002) suggest that countries should not be compelled to repay odious debts because of the circumstances under which the debts were acquired. What comes out clearly is that when private agents are accumulating debt, it is capitalized but when the debt becomes a burden, it becomes a social cost and therefore, it is socialized. Taxpayers are therefore compelled to repay a debt that they never accumulated.

Poor governance and misuse of funds by debtor countries was widely reported, but creditor countries continued to lend money to such debtor countries. Institutions like the International Monetary Fund and the World Bank also had the audacity to lend funds to countries that had poor governance practices amidst evidence that the money was not put into projects that could generate foreign exchange. The loans (especially structural adjustment loans) were more or less like a pain reliever to an advanced cancerous disease that cannot be cured. It is similar to giving an incentive/bonus to a manager who has plunged an institution into bankruptcy with the expectation that the same manager will revamp it. In fact, Easterly (2002) argues that official lenders continue lending even when the loans do no promote development because multilateral and donor agencies are rewarded for volumes of assistance rather than results. The official lenders lend so that the country does not default on earlier obligations to private or official creditors. For instance, World Bank gave loans to finance the same agricultural policy reforms in Kenya five separate times. Easterly's view is that official lenders should bear some of the blame for financing bad governments that pursue policies that are detrimental to their own citizens. Proper governance, good management practices and a good track record of prosperity are essential preconditions for allocating debt funds to African countries.

[23] According to Sack (1927), odious debts are those (a) incurred without the consent of the people (by a "despotic" regime); (b) from which no benefits accrued to the people; and (c) when the creditors have knowledge of the foregoing.

Most African countries were forced to devalue their currencies as part of the structural adjustment programmes. What comes out clearly from my empirical findings is that a depreciated currency increases foreign debt when debt is denominated in domestic currency. The depreciated exchange rate reduces importation of intermediate goods that are necessary in the production of exports and, consequently lead to stagnation of these economies. With depressed export sectors, these countries were forced to reschedule their debts instead of defaulting, since exports are used to repay foreign debt.

African countries mainly import capital for the production sector. The simulations demonstrate that when imported investments increase after a shock, external debt also increases and vice versa. Similarly, consumption imports increase foreign debt. It is therefore prudent that these countries mainly import intermediate goods that are used in the production sector as opposed to importing consumption imports. Perhaps these countries should pursue protectionist policies to prevent dumping of unnecessary consumption goods into these countries. They must protect infant industries so as to avoid accumulating external debt by importing goods that they can produce domestically.

The countries export primary commodities whose prices are determined in the international market. Why have these countries continued to export primary commodities that can also be exported as finished products? For instance, why are countries like Ghana and Kenya still exporting cocoa and coffee beans instead of exporting refined and patented cocoa and coffee, respectively? Exporting primary products is a disadvantage to these countries since they end up running huge trade deficits. In fact, empirical results in the previous chapter suggest that if countries want to reduce foreign debt, they must increase their exportables. It is therefore wise for these countries to change from exporting primary products to exporting finished goods.

The foregoing suggests that African countries have a flawed external debt sourcing and management process. For these countries to manage and forestall debt accumulation, they must adjust their borrowing patterns. These countries also face serious governance issues that impede any attempts to resolve the accumulation of unsustainable debts. As ways of proffering solutions to this bad debt sourcing and management process, the next two sections identify appropriate thresholds for sustainable foreign borrowing as well as analyze the impact of governance on external debt.

4.3 Threshold Levels for Sustainable Debt

The theoretical literature suggests that foreign borrowing has a positive impact on investment and growth up to a certain threshold level; beyond this level, however, its impact is adverse, giving rise to a "Laffer curve" type relationship between external debt, on the one hand, and investment and per capita income growth on the other (Claessens, 1990). The threshold level for debt sustainability under the HIPC initiative is the debt-export ratio of 150 percent and debt-revenue ratio of 250 percent. In their empirical study, Patillo *et al* (2002) compute debt threshold levels by assuming that the HIPC initiative will halve country's debt levels. They used the year 2000 debt ratios as their benchmark values. They find that debt negatively affects per capita growth when debt-exports ratio is 160-170 percent and debt-GDP ratio is 35-40 percent.

Most recently, Manasse and Roubini (2009) suggest that the sufficient predictor variables for external debt include among others the total external debt/GDP ratio, short-term debt reserves ratio, real GDP growth, public external debt/fiscal revenue ratio, external financial requirements (current account balance plus short-term debt as a ratio of foreign reserves); exchange rate overvaluation; and exchange rate volatility. A relatively "safe" country type is described by a handful of economic prerequisites: low total external debt (below 49.7 percent of GDP); low short-term debt (below 130 percent of reserves); low public external debt (below 214 percent of fiscal revenue); and an exchange rate that is not excessively over-appreciated (overvaluation below 48 percent). They identify three types of risks which include solvency (or debt un-sustainability), illiquidity and macro-exchange rate risks. The debt un-sustainability risk is characterized by external debt in excess of 49.7 percent of GDP, together with monetary or fiscal imbalances, as well as by large external financing needs that signal illiquidity as an element of debt un-sustainability. Liquidity risks are identified by moderate debt levels, but have short-term debt in excess of 130 percent of reserves coupled with political uncertainty and tight international capital markets. The macro-exchange rate risk arises from the combination of low growth and relatively fixed exchange rates. They however suggest that unconditional thresholds, for example debt-output ratios, are of little value *per se* in assessing the probability of default. One country may be heavily indebted but have a negligible probability of default, while a second may have only moderate values of debt ratios while running a considerable default risk. The reason is because the joint effects of short maturity, political uncertainty, and relatively fixed exchange rates make a liquidity crisis in the latter much more likely than a solvency crisis in the former, particularly if the

large external debt burden goes together with monetary stability, a large current account surplus, and sound public finances.

In contrast, Caliari (2006) points out that the indicators used to establish the debt thresholds are poor proxies of how an economy is faring and, particularly, how well a government is meeting its revenue needs to achieve human development goals. His arguments is that the HIPC Initiative has been heavily criticized for relying mainly on debt-to-export and debt-service-to-export ratios as indicators to measure sustainability. He finds that export revenue does not necessarily correlate with growth, poverty reduction rates or, more importantly, fiscal revenue. In addition, the chosen thresholds, being fixed numerical thresholds, are unable to capture the possible variations in country situations. Caliari's recommendation is that human development imperatives should take precedence over debt payments. In fact, debt sustainability assessments should be geared to ensure that debtor countries are able to fulfill the financing requirements to meet both the human development and the millennium development goals.

From the foregoing literature, it is evident that the most commonly used debt indicators are the debt ratio, debt service ratio, debt-GDP ratio, international reserves to debt ratio, international reserves to debt service ratio, and interest payments to net export earnings. In view of the fact that most African countries are still battling with debt service problems even though they have achieved debt sustainability thresholds envisaged by the HIPC initiative, there is need to identify threshold levels that will lead to better debt management. HIPC threshold levels are very high given that these countries are grappling with weak macroeconomic and institutional structures. From the information in Table 1.5 (in chapter 1), notice that even though under the HIPC initiative a debt-GNP level of below 250% is deemed sustainable, the poorest of the poorest countries like Zambia and Tanzania had achieved that threshold level in 1995 when these countries were grappling with debt service problems and were asked to reschedule their debts. In fact, most countries had debt-GNP ratios of below 100%.

An interesting observation from Table F3 (appendix F) is that Malawi, which is at the decision point and has received 90 percent debt relief, has not achieved HIPC's debt-export ratio of 150 percent. In fact, Easterly (2002) posits that debt relief does not even bring a reduction in debt, as poor country governments borrow anew until they again become heavily indebted. A related argument is provided by Ferrarini (2008) who posits that full debt cancellation falls short of

representing a long-term solution in the event of a renewed build-up of unsustainable debt burdens, as the HIPC Initiative has amply demonstrated. As pointed out by Manasse and Roubini (2009), existing literature suggests several factors that are at the core of attempting to predict sovereign default: measures of solvency, such as public and external debt relative to the capacity to pay; and liquidity measures such as short-term external debt and external debt service, possibly as a ratio of foreign reserves or exports. These variables will be used in this study's empirical models.

Going by Manasse and Roubini's thresholds, African countries are battling with both liquidity and solvency risks. It is therefore paramount that workable thresholds are identified that can be used as benchmarks for debt borrowing and management. This paper contributes to the literature by computing workable debt sustainability ratios for African countries.

4.3.1 Empirical Model for External Debt Thresholds

To identify appropriate threshold levels for external debt, I estimate regression models in which the debt ratios are regressed against different threshold levels. I compare three regions; Latin America, East Asia and Africa. Africa is represented by the countries in my sample study, Latin America is represented by Argentina, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Uruguay and Venezuela while East Asia is represented by South Korea, Indonesia, Malaysia, Philippines and Thailand. These are middle income countries that have managed to sustain their external debts.

In selecting Latin America and East Asia, several factors were put into consideration. First, East Asian countries used their external borrowing to pursue export-promoting policies that are not laissez-faire. The Latin American countries, like African countries, did not use the foreign borrowing to develop a resource base in tradable goods, especially export industries that are adequate for future debt servicing. Exports grew more rapidly in East Asia than Latin America and Africa and indeed export growth in East Asia greatly outstripped GDP growth. Second, Africa and Latin America overvalued their exchange rates and encouraged capital flight. Sachs (1985) argues that foreign borrowing mainly went to the private sector's accumulation of foreign assets, rather than an increase in export capacity. East Asia on its part devalued its currency to

promote its export sector. Third, both Africa and Latin America's terms of trade deteriorated faster than East Asia's terms of trade.

Data for debt indicators for the three regions ranges from 1970 to 2007. The threshold levels range from 0 to above 200 percent. Each threshold level is coded 1 for the respective threshold and 0 otherwise. Data source is World Bank's global development fund and world development indicators. The threshold levels mainly serve as independent variables. The debt-GDP ratio and the debt-exports ratio capture debt sustainability whilst short-term debt to international reserves ratio and the debt service to exports of goods and services capture liquidity.

Generally, let $\mathbb{N}$ denote the number of countries and let $\mathbb{Y}_{it}$ be the observation for the debt indicators. Further, let $\mathbb{X}_{it}$ be the dummies for different threshold levels and $\mathscr{b}_j$ be regression coefficients where j represents the number of thresholds. The empirical model to be estimated is given by:

$$\mathbb{Y}_{i,t} = \mathscr{b}_0 + \mathscr{b}_j \mathbb{X}_{i,t} + \varepsilon_{i,t}\,,\ \forall_i = 1, \cdots, \mathbb{N}. \tag{61}$$

The signs and significance of the $\mathscr{b}_j$ coefficients permit one to determine the direction of the effect of the threshold on the debt indicator. A negative significant value implies that the debt indicator falls when the countries' debt is at that particular threshold and vice versa. To estimate the above equation I use the generalised least squares fixed effects method. This is because the Breusch and Pagan Lagrangian multiplier test for random effects shows that the individual effects are correlated with the other regressors in the model.

4.3.2 Results and Discussion

The table below reports the results for the regression of different debt indicators against different threshold levels for the three regions: Africa, Latin America and East Asia.

Table 7: Threshold Levels for External Debt Indicators

	Africa				Latin America				East Asia			
Thresholds (Percent)	Log (ETD/GDP)	Log (EDT/XGS)	Log (SETD/RES)	Log (TDS/XGS)	Log (ETD/GDP)	Log (EDT/XGS)	Log (SETD/RES)	Log (TDS/XGS)	Log (ETD/GDP)	Log (EDT/XGS)	Log (SETD/RES)	Log (TDS/XGS)
Intercept	-0.006 (-0.03)	-0.467 (-9.13)***	0.373 (1.16)	-0.114 (-1.05)	0.203 (5.20)***	-0.239 (-5.55)***	0.050 (1.07)	-0.037 (-1.35)	0.308 (2.05)**	-0.421 (-2.34)**	-0.425 (-2.22)**	-0.541 (-2.80)***
<20	-1.058 (-5.29)***	-0.476 (-7.49)***	-1.616 (-4.88)***	-1.004 (-9.11)***	-0.991 (-24.24)***	(dropped) [a]	-1.253 (-18.72)***	-0.824 (-26.88)***	-0.463 (-2.98)***	(dropped) [a]	-0.682 (-3.22)***	-0.821 (-4.23)***
>20 - 40	-0.553 (-2.77)***	(dropped)[a]	-0.885 (-2.65)***	-0.421 (-3.78)***	-0.725 (-18.15)***	-0.335 (-4.35)***	-0.609 (-10.65)***	-0.494 (-17.40)***	-0.388 (-2.56)**	-0.291 (-1.54)	-0.431 (-2.17)**	-0.512 (-2.63)***
>40 - 60	-0.357 (-1.79)*	0.220 (3.58)***	-0.677 (-2.05)**	-0.212 (-1.76)*	-0.521 (-13.17)***	(dropped) [a]	-0.364 (-6.61)***	-0.299 (-10.40)***	-0.196 (-1.30)	-0.255 (-1.37)	-0.442 (-2.31)**	-0.405 (-1.93)*
>60 - 80	-0.202 (-1.01)	0.371 (6.08)***	-0.603 (-1.82)*		-0.376 (-9.55)***	0.112 (2.21)**	-0.193 (-3.41)***	-0.134 (-4.17)***	-0.100 (-0.66)	-0.319 (-1.73)*	-0.378 (-1.89)*	-0.120 (-0.45)
>80 - 100	-0.084 (-0.42)	0.403 (6.67)***	-0.413 (-1.32)		-0.269 (-6.48)***	0.236 (4.47)***	-0.083 (-1.47)		-0.039 (-0.25)	-0.116 (-0.63)	-0.294 (-1.43)	
>100 - 120	0.027 (0.14)	0.535 (7.67)***	-0.362 (-1.08)		-0.170 (-4.04)***	0.289 (5.53)***	(dropped) [a]		(dropped) [a]	0.045 (0.25)	-0.275 (-1.34)	
>120 - 150	0.100 (0.52)	0.611 (10.05)***	-0.260 (-0.77)		-.092 (-2.03)**	0.398 (8.84)***	0.075 (1.33)		0.299 (1.40)	0.184 (1.00)	-0.280 (-1.39)	
>150 - 200	0.174 (0.87)	0.719 (12.71)***	-0.168 (-0.51)		(dropped) [a]	0.510 (11.45)***	0.239 (3.73)***		0.207 (1.13)	0.200 (1.09)	-0.317 (-1.57)	
>200	0.315 (1.55)	1.022 (19.49)***	0.540 (1.69)*		(dropped) [a]	0.713 (16.30)***	0.425 (7.56)***		0.925 (5.62)***	0.437 (2.39)**	0.059 (0.31)	
Observations	415	416	374	393	378	377	374	378	190	189	186	183
Overall R-Square	0.8434	0.8947	0.754	0.5902	0.9226	0.7902	0.7750	0.8364	0.6246	0.4924	0.4535	0.3916
F (H0: all coefficients = 0)	13.52***	14.60***	2.87***	7.28***	4.08***	16.02***	3.93***	5.31***	53.28***	14.01***	1.40	2.94***

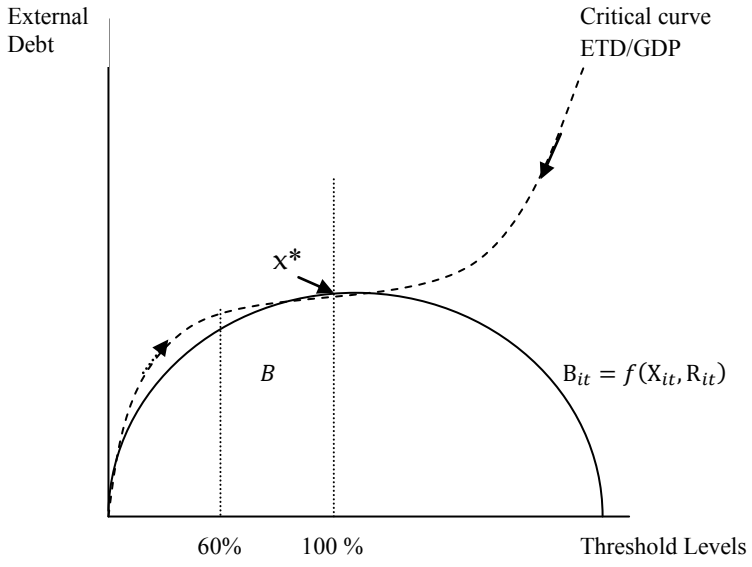
The table contains fixed effects estimates of different threshold levels. The column headings are logarithms of external debt to GDP ratio (ETD/GDP), external debt to exports ratio (ETD/XGS), short term external debt to international reserves (SETD/RES) and total debt service to exports of goods and services (TDS/XGS). The asterisk ***, ** and * indicate significance levels of 1%, 5% and 10% respectively. The t-stats are in parentheses. [a]These thresholds did not have data and were therefore dropped from the regression.

The debt-GDP ratio falls if either a country's GDP rises faster than debt or if external debt falls while GDP remains unchanged. External debt level of less that 60 percent of GDP is sustainable for Africa whilst in Latin America, a debt-to-GDP ratio of less than 150 percent is sustainable. For East Asia, the significant debt sustainability threshold is the debt-GDP ratio of below 40%. African countries' debt sustainability result is within Manasse and Roubini's ratio of 49.7 percent. What these results imply is that when African countries contract debt; they should ensure that the debt does not exceed 60 percent of GDP. The debt sustainability level for Latin America would be insolvent for both African and East Asian countries. On debt-exports ratio, the sustainable level for Africa is a debt ratio of less that 20 percent of export earnings whereas in Latin America, a debt ratio that is less than 40 percent of export earnings is sustainable. Given that exports are used to repay the debt, African countries should not exceed a debt-exports ratio of above 20 percent. For East Asia, the debt-exports threshold is 60-80 percent. These thresholds are far much below HIPC initiative's debt-exports ratio of 150 percent and Patillo *et al*'s (2001) threshold of 160-170 percent.

On liquidity, short-term debt to reserve ratio should not exceed 80 percent for all the three regions. This ratio is low as compared to the ratio suggested by Manasse and Roubini of about 130 percent. For Africa and Asia, a liquidity threshold of 130 percent has an insignificant negative effect on debt accumulation whilst in Latin America; the same threshold has an insignificant positive effect on debt accumulation.

The dynamics of the optimal debt threshold level for Africa can be presented in the diagram below where, x* represents the optimal threshold debt level.

Figure 4.1: Threshold Level for Debt-GDP Ratio for Africa



Beyond the threshold level of 100 percent[24], external debt rises faster than the gross domestic product and therefore external debt becomes unsustainable. Any additional borrowing beyond the threshold level may render the borrower insolvent. What this means is that countries whose debt exceeds this level should readjust their borrowing plans and reduce their debt to levels below 100 percent of GDP. The curve $B_{it} = f(X_{it}, R_{it})$ represents the boundary within which a country can borrow. The variables B_{it}, X_{it} and R_{it} represent foreign debt, export earnings and foreign reserves, respectively. The area below the boundary curve ($area\ B$) captures the wealth of the country. This curve illustrates that debt is a function of the resources X_{it} and R_{it} that are used to repay the debt such as foreign reserves and export earnings. The area below the curve represents the feasible area; that is, an area where export earnings and international reserves are rising faster than debt. External debt should therefore not exceed a country's resources that are allocated for its repayment. In fact, Semmler and Sieveking (2000) demonstrate that there is for every initial resource stock a critical level of debt, below which debt may be steered to zero but above which debt tends to infinity, no matter how the rate of consumption and extraction is chosen[25]. From the Figure above, beyond x* the country should reduce foreign borrowing, otherwise external debt becomes explosive. When the country reduces foreign borrowing, external debt returns to the optimal point. The debt function B_{it} implies that a country's debt should not exceed its wealth.

[24] For debt-exports ratio, the critical threshold is a debt ratio of 40% of exports for Africa.
[25] In their model they assume the country exploits a renewable resource to service its debt.

To determine the impact of the above mentioned thresholds on the countries' wealth, I re-estimate equation 30 (in chapter three) which shows equilibrium in the goods market. In this estimation, I use a panel data of the sampled 11 African countries. In this equation I include the debt-GDP ratio, terms of trade, relative interest rate, exchange rate and exports-to-imports ratio as the explanatory variables in addition to exports, consumption imports and investment imports. The debt-GDP ratio enters into the equation instead of government spending. The assumption here is that countries finance their budget deficits through foreign borrowing and seniorage. Additionally, from estimations in chapter three, government spending is statistically insignificant in determining GDP in most of the sampled countries. The ratio of the price index of exports over price index of imports captures the terms of trade. Terms of trade measures the effect of volatility in commodity prices. Relative interest rate is captured by the ratio of the world interest rate over the domestic interest rate. The USA lending rate is used to capture the world interest rate. The ratio measures the direction of portfolio capital flow from or to the domestic economy and is expected to have a negative sign. The intuition here is that an increase in the relative interest rate implies that capital flows out of the domestic economy, hence GDP falls. In fact, empirical literature in chapter two provides evidence that capital outflow depresses GDP. The model takes the same format as equation 61. The dependent variable in this model is the log of GDP.

Data for estimation is divided into the two threshold levels: the period before the threshold and the period after the threshold. The results for this estimation are presented in the table below. The Breusch and Pagan Lagrangian multiplier test for random effects show that the individual effects are correlated with the other regressors in the model. The random effects model is not therefore favoured because it produces biased estimators that violate one of the Gauss-Markov assumptions. In fact, random effect method is invalid given that some regressors are correlated with the unobserved heterogeneity term. For this reason, I report the results for the fixed effects model.

Table 8: Effect of Threshold-Based External Debt on GDP for African Countries (Dependent Variable: GDP)

	ETD/GDP<60%		ETD/GDP>60%	
Variables	1	2	1	2
Intercept	11.044 (38.46)***	10.130 (34.40)***	9.764 (44.96)***	9.257 (76.56)***
Consumption	-0.149 (-0.73)	-0.151 (-0.84)	-0.082 (-0.57)	-0.137 (-1.66)
Exports	0.261 (0.85)		-0.202 (-0.79)	
Consumption Imports	-0.546 (-3.47)***		0.746 (2.97)***	
Imported Investments	-0.294 (-2.98)***	-0.354 (-3.98)***	0.115 (2.17)**	-0.030 (-0.99)
Terms of Trade	-0.792 (-7.27)***	-0.956 (-9.62)***	0.007 (0.16)	0.017 (0.66)
Relative Interest Rate	-0.413 (-3.70)***	-0.371 (-3.64)***	-0.123 (-1.85)*	0.138 (3.44)***
Exports to imports ratio		0.931 (6.43)***		0.264 (4.73)***
Exchange Rate	-0.267 (-7.59)***	-0.276 (-7.70)***	0.124 (4.31)***	0.165 (9.42)***
Lagged Inflation	-0.230 (-2.02)**	-0.262 (-2.49)**	0.115 (1.42)	-0.037 (-0.76)
Debt to GDP Ratio	0.127 (1.57)	0.024 (0.33)	-0.300 (-1.90)*	-0.060 (-0.72)
Observations	187	183	183	175
F(H0: u_i = 0	9.86***	9.05***	21.05***	26.99***

The asterisk ***, ** and * indicate significance levels of 1%, 5% and 10% respectively. The t-stats are in parentheses.

Column (1) presents results when exports and consumption imports are included in the model whilst column (2) presents results when the ratio of exports to imports is included in the model. The results confirm that high levels of external debt negatively affect GDP while low levels of external debt increase GDP. When the debt-GDP ratio is low, the variables have the expected signs. At this level, relative interest rate negatively affects GDP. This is because foreign interest rate is higher than the domestic interest rate and consequently capital flows out of the country. Capital outflow has a detrimental effect on GDP. Terms of trade provide an interesting result, in the sense that they negatively affect GDP at low levels of debt. This can be explained by the fact

that these countries mainly export primary commodities and so when the terms of trade improve, they suffer from the "Dutch disease" and hence GDP falls. Another interesting result is that at low debt levels, a depreciation of the exchange rate has a negative effect on GDP[26] in line with conventional theory. Another important finding is that both consumption and investment imports negatively and significantly affect GDP at low levels of external debt. Expectedly, macroeconomic instability (inflation rate) has a negative and significant effect on GDP at low threshold levels.

At high levels of external debt (above the threshold level) macroeconomic dynamics are distorted in these countries. The negative and significant value of the debt to GDP ratio on GDP implies that at high levels of debt, the countries' GDP is below its expected value by 0.30 percent. This result provides evidence that a high external debt retards the economy. The terms of trade improve but this improvement should be carefully interpreted because external debt depresses growth. Literature in chapter two provides evidence that African countries experienced import strangulation during high debt periods. With import strangulation and stagnant exports, the terms of trade improve but that does not translate into an improvement in the net GDP. Another puzzling result is that both consumption and investments imports positively and significantly contribute towards GDP. In addition, a depreciation of the exchange rate increases GDP at high levels of debt. It appears that beggars-thy-neighbor policy works in Africa only when the countries are caught in high external debt trap.

Turning to the model with exports to consumption imports ratio (column 2 of Table 4.2), at low debt levels, all the variables have the expected signs. The ratio of exports to consumption imports has a positive and significant sign. Exports to imports ratio increases when either exports increase faster than imports or when imports fall. A 1 percent rise in the ratio of exports to consumption imports leads to about 0.90 percent increase in GDP. At high levels of debt, the ratio of exports to consumption imports also has a positive and significant effect on GDP. However, its impact is expectedly smaller in the sense that a 1 percent increase in the ratio leads to about 0.30 percent increase in GDP. In fact, its effect at a high debt level is a third of the effect at a low debt level.

[26] The variables used in this analysis are denominated in US$ (and exchange rate expressed in local currency per unit of US$), unlike the analysis in chapter three where variables were denominated in local currency.

The literature has identified poor governance as a main impediment to debt sustainability in African countries. These countries cannot sustain the above mentioned ratios if governance issues are not addressed. In fact, Manasse *et al* (2003) argue that institutional factors affect policy credibility as well as a government's ability to pursue policies consistent with a sustainable debt path. Therefore, the next section analyzes the impact of institutional infrastructure (both legal and political) on debt sustainability.

4.4 External Debt Sustainability and Governance

Crucial institutions and governance structures play important roles in debt sustainability. Chauvin and Kraay (2005) show that debt relief in 62 developing countries during 1989–2003 neither improved the institutional quality nor raised the levels of FDI or economic growth. Easterly (2002) finds that highly indebted poor countries became highly indebted mainly because of poor policies, not because of external shocks or wars. He concludes that official lenders did not adhere to prudential rules and that the IMF and the World Bank provided far more financing to HIPCs throughout 1979–1997 than to other developing countries of similar income levels, although the policies in many HIPCs have been worse.

I follow Kaufman, Kraay and Mastruzzi (2008) in defining governance as the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them. The six dimensions of governance include voice and accountability, political stability and absence of violence, government effectiveness, rule of law, regulatory quality and control of corruption.

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and a free media. Political stability and absence of violence captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means. Government effectiveness captures the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. Regulatory quality captures perceptions of the ability

of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of the society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Finally, control of corruption captures the perceptions of the extent to which public power is exercised for private gain.

Instead of using the six governance indices in my analysis, I grouped them into two broad variables; political and legal. The political variable is computed as the average of voice and accountability, government effectiveness and, political stability and absence of violence whilst the legal variable is computed as the average of the rule of law, control of corruption and regulatory quality. The aim of this section is to identify the role that governance plays in debt management.

Data on governance was downloaded from the World Bank's world governance indicators. The scores lie between 2.5 and -2.5 with higher scores indicating better outcomes (for details on computation of the indices see Kaufmann *et al*, 2008). Data for governance indices ranges from 1996 to 2007.

4.4.1 Empirical Analysis

To capture the effect of governance on debt sustainability, I estimate equation 38 (in chapter three) but I exclude the risk premium. The risk premium is excluded because the estimation results for the risk premium (in chapter three) are statistically insignificant and therefore it is not necessary to include the variable in the current analysis. In this analysis, I use the debt-to-GDP and the short-term debt to international reserves ratio as the dependent variables instead of using the deviation of external debt from its steady state. I also add as part of the explanatory variables institutional variables such as political and legal; and macroeconomic variables such as inflation rate, terms of trade and the relative interest rate which capture both a country's ability to pay and willingness to pay.

I present an empirical equation using the format for equation 61 and in this case, $\mathbb{X}_{it}$ represent the ratio of exports earnings to GDP, ratio of consumption imports to GDP, ratio of imported investments to GDP, inflation rate, exchange rate, terms of trade, relative interest rate, growth rate in GDP and institutional variables such as political environment and legal environment. Inflation

rate enters as a policy variable and is used to capture macroeconomic instability. The dependent variables are represented by $\mathbb{Y}_{it}$. The equation is thus:

$$\mathbb{Y}_{i,t} = \mathscr{b}_0 + \mathscr{b}_j \mathbb{X}_{i,t} + \varepsilon_{i,t}\,,\ \forall_i = 1, \cdots, \mathbb{N}.$$

I also compare three regions in this section; East Asia, Latin America and Africa. The countries are the same as the ones in part 4.3. I run four panel regressions: all the 26 countries, East Asian countries, Latin American countries and African countries. Most of the variables have the expected signs. Summary statistics and the correlation matrix are reported in Tables F2 and F3 respectively, in Appendix F.

4.4.2 Results and Discussion

Table 4.3 below shows the results for the regressions of debt sustainability and liquidity indicators against policy and institutional variables. There is a strong correlation between the legal and political variables and so I enter the two variables in different models. Column (1) reports results for the model when the legal variable is entered, Column (2) reports the results when the political variable is entered while column (3) reports the results when all variables are entered into the model. To determine the appropriate method to use for this analysis, I carry out the Hausman specification test. Where the null hypothesis is accepted, I report results for the random effects variable because the random effects method is favoured to the fixed effects method and *vice versa*. On the other hand, where the null hypothesis is rejected, I report the results for the fixed effects model. In some cases, I carry out the Breusch and Pagan Lagrangian multiplier test for random effects to determine whether the individual effects are correlated with the other regressors in the model.

Table 4.9: Random and Fixed Effects Estimation for Debt Sustainability and Liquidity Indicators, with a Focus on Governance

	Africa						Latin America					
Dependent Variable	ETD/GDP ratio			SETD/RES ratio			ETD/GDP ratio			SETD/RES ratio		
	1[a]	2[a]	3[b]	1[b]	2[b]	3[b]	1[b]	2[b]	3[b]	1[b]	2[b]	3[b]
Intercept	-0.589 (-2.18)**	-0.644 (-2.63)***	-0.679 (-2.89) ***	-0.570 (-1.16)	-0.773 (-1.65)	-0.454 (-0.93)	-0.421 (-2.73)***	-0.478 (-3.17)***	-0.466 (-2.91) ***	-0.299 (-1.04)	-0.378 (-1.37)	-0.472 (-1.62)
Lag inflation	0.171 (1.04)	0.119 (0.74)	0.252 (1.78) *	0.483 (1.53)	0.379 (1.20)	0.442 (1.41)	0.285 (3.62)***	0.285 (3.65)***	0.286 (3.64) ***	0.246 (1.68)*	0.262 (1.83)*	0.252 (1.76) *
Exports	-0.708 (-2.15)**	-0.839 (-2.57)***	-1.183 (-4.44) ***	-1.667 (-2.62)***	-1.864 (-2.89)***	-1.845 (-2.90) ***	0.321 (0.98)	0.363 (1.20)	0.336 (1.03)	-0.364 (-0.60)	-0.525 (-0.95)	-0.308 (-0.52)
Consumption Imports	1.087 (3.68)***	1.153 (3.96)***	2.044 (7.22) ***	0.810 (1.45)	0.874 (1.55)	0.878 (1.58)	1.568 (2.60)***	1.730 (2.82)***	1.717 (2.77) ***	1.381 (1.23)	1.854 (1.65)	1.956 (1.73) *
Lag GDP growth	-0.191 (-1.87)*	-0.191 (-1.92)*	-0.284 (-2.09) **	-0.257 (-1.35)	-0.291 (-1.55)	-0.206 (-1.08)	0.007 (0.10)	0.002 (0.02)	0.004 (0.05)	-0.106 (-0.77)	-0.098 (-0.74)	-0.119 (-0.88)
Log Investment	-0.079 (-0.17)	-0.139 (-0.30)	0.619 (-1.11)	1.773 (2.00)**	1.835 (2.07)**	1.410 (1.56)	0.003 (0.27)	0.001 (0.11)	0.001 (0.12)	-0.047 (-2.60)***	-0.052 (-2.91)***	-0.053 (-2.95) ***
Relative Interest Rate	0.179 (2.20)**	0.161 (2.02)**	0.136 (1.71) *	0.465 (2.97)***	0.437 (2.78)***	0.447 (2.88) ***	-0.165 (-3.14)***	-0.162 (-3.15)***	-0.164 (-3.12) ***	0.066 (0.68)	0.053 (0.56)	0.070 (0.73)
Terms of Trade	0.035 (0.59)	0.027 (0.48)	-0.056 (-1.15)	0.119 (1.02)	0.110 (0.94)	0.110 (0.95)	-0.057 (-1.49)	-0.057 (-1.51)	-0.056 (-1.45)	-0.021 (-0.30)	-0.004 (-0.06)	-0.015 (-0.21)
Exchange Rate	0.026 (0.66)	0.161 (2.02)**	0.046 (2.47) **	0.095 (1.17)	0.091 (1.12)	0.092 (1.15)	0.013 (1.76)*	0.014 (1.82)*	0.014 (1.82) *	0.018 (1.29)	0.020 (1.46)	0.020 (1.44)
Legal	-0.047 (-0.45)		0.125 (0.91)	0.179 (0.89)		0.590 (1.93) *	-0.084 (-1.08)		-0.022 (-0.22)	-0.064 (-0.44)		0.178 (0.99)
Political		-0.152 (-1.93)*	-0.294 (-3.01) ***		-0.075 (-0.46)	-0.433 (-1.77) *		-0.122 (-1.49)	-0.108 (-1.04)		-0.304 (-2.02)**	-0.419 (-2.21) **
Observations	115	115	115	115	115	115	111	111	111	111	111	111
Overall R-Square	0.2808	0.3862	0.4863	0.0185	0.0042	0.0298	0.1066	0.0863	0.0883	0.0090	0.0002	0.0048
Specification Test	0.20[c]	0.32[c]	65.92[d]	12.98[d]	17.69[d]	5.63[d]	85.79[c]	185.83[c]	118.91[c]	39.81[d]	202[c]	147.93[c]

[a] Is the random effects results. [b] Is the fixed effects results. [c] Is the Hausman test statistic. [d] Is the Breusch and Pagan Lagrangian multiplier statistic.
The column headings are logarithms of external debt to GDP ratio (ETD/GDP) and short-term external debt to international reserves (SETD/RES).
The asterisk ***, ** and * indicate significance levels of 1%, 5% and 10%, respectively. The t-stats are in parentheses.

Continuation of Table 4.3

	East Asia						All 26 Countries					
Dependent Variable	ETD/GDP ratio			SETD/RES ratio			ETD/GDP ratio			SETD/RES ratio		
	1[b]	2[b]	3[b]	1[b]	2[b]	3[b]	1[b]	2[b]	3[b]	1[b]	2[b]	3[b]
Intercept	-0.523 (-0.82)	-0.177 (-0.30)	-0.539 (-0.82)	-0.500 (-0.55)	0.071 (0.09)	-0.549 (-0.61)	-0.651 (-4.19)***	-0.653 (-4.25)***	-0.695 (-4.41) ***	0.078 (0.26)	0.039 (0.13)	-0.075 (-0.24)
Lag inflation	0.162 (0.62)	0.078 (0.30)	0.165 (0.62)	0.354 (1.01)	0.279 (0.81)	0.430 (1.24)	-0.047 (-1.17)	-0.055 (-1.35)	-0.056 (-1.38)	0.061 (0.87)	0.042 (0.59)	0.043 (0.61)
Exports	0.112 (0.19)	0.323 (0.54)	0.094 (0.15)	-1.470 (-1.81)*	-1.357 (-1.72)*	-1.763 (-2.17) **	-0.715 (-2.95)***	-0.754 (-3.09)***	-0.755 (-3.10) ***	-0.920 (-2.23)**	-1.020 (-2.47)***	-1.037 (-2.51) ***
Consumption Imports	-1.170 (-1.97)*	-1.314 (-2.21)**	-1.170 (-1.95) *	0.707 (0.89)	0.389 (0.50)	0.656 (0.84)	0.858 (3.71)***	0.862 (3.74)***	0.858 (3.72) ***	0.384 (0.95)	0.396 (0.98)	0.419 (1.04)
Lag GDP growth	-0.216 (-1.51)	-0.147 (-1.07)	-0.222 (-1.49)	0.031 (0.15)	0.279 (0.81)	-0.004 (-0.02)	-0.040 (-0.69)	-0.038 (-0.66)	-0.041 (-0.72)	-0.026 (-0.25)	-0.023 (-0.23)	-0.037 (-0.36)
Log Investment	0.886 (1.71)*	1.076 (2.08)**	0.864 (1.60)	-0.697 (-1.01)	-0.659 (-0.96)	-1.035 (-1.47)	0.010 (0.88)	0.009 (0.85)	0.010 (0.88)	-0.029 (-1.55)	-0.30 (-1.60)	-0.029 (-1.60)
Relative Interest Rate	-0.090 (-1.06)	-0.094 (-1.08)	-0.089 (-1.03)	-0.117 (-0.98)	-0.089 (-0.73)	-0.083 (-0.70)	0.060 (1.42)	0.060 (1.41)	0.064 (1.50)	0.062 (0.87)	0.062 (0.87)	0.070 (0.97)
Terms of Trade	0.598 (3.43)***	0.543 (3.15)***	0.598 (3.39) ***	0.664 (2.86)***	0.559 (2.49)**	0.654 (2.88) ***	0.200 (3.72)***	0.196 (3.69)***	0.207 (3.84) ***	0.079 (0.88)	0.077 (0.87)	0.096 (1.07)
Exchange Rate	0.054 (0.58)	-0.026 (-0.34)	0.060 (0.59)	0.027 (0.21)	-0.049 (-0.51)	0.097 (0.75)	0.029 (0.57)	0.026 (0.53)	0.047 (0.91)	-0.187 (-1.70)*	-0.176 (-1.67)*	-0.122 (-1.07)
Legal	0.217 (1.50)		0.237 (1.26)	0.162 (0.82)		0.400 (1.66)	0.016 (0.25)		0.104 (1.18)	-0.029 (-0.27)		0.190 (1.27)
Political		0.080 (0.79)	-0.022 (-0.17)		-0.116 (-0.82)	-0.286 (-1.66)		-0.054 (-0.92)	-0.119 (-1.48)		-0.172 (-1.75)**	-0.289 (-2.15) **
Observations	55	55	55	53	53	53	284	284	284	280	280	280
Overall R-Square	0.1984	0.1473	0.2118	0.3969	0.7121	0.4463	0.0955	0.1462	0.1415	0.0892	0.1221	0.1147
Specification Test	0.53[d]	226.61[c]	1.11[d]	51.52[c]	0.28[c]	8.59[c]	332.94[d]	353.61[d]	276.32[c]	378.67[d]	390.12[d]	388.04[d]

[a] Is the random effects results. [b] Is the fixed effects results. [c] Is the Hausman test statistic. [d] Is the Breusch and Pagan Lagrangian multiplier statistic.
The column headings are logarithms of external debt to GDP ratio (ETD/GDP) and short-term external debt to international reserves (SETD/RES).
The asterisk ***, ** and * indicate significance levels of 1%, 5% and 10%, respectively. The t-stats are in parentheses.

Given that most of the signs and significance of variables do not change after separating the legal and political variable, I report the results in column (3). The results for Africa have the predicted signs for most of the variables. A rise in export earnings, growth rate in GDP and a stable political environment improve both the debt sustainability and liquidity of these countries. Specifically, using debt sustainability indicator, a 1 percent increase in export earnings reduces debt-GDP ratio by about 1.18 percent. Likewise, a 1 percent increase in the growth rate of GDP leads to a fall in debt-GDP ratio by about 0.28 percent. An improvement in the political environment reduces debt-GDP ratio by 0.29 percent. Using the liquidity indicator, a 1 percent increase in exports leads to about 1.85 percent decrease in short-term debt to international reserves ratio whilst a more stable political environment reduces short-term debt to reserve ratio by 0.43 percent. On the other hand, consumption imports, the relative interest rate, the exchange rate, terms of trade and the inflation rate worsen both the debt sustainability and the liquidity level. In particular, a 1 percent increase in consumption imports increases debt as a percentage of GDP by about 2 percent. Investment imports significantly worsen the liquidity level and insignificantly affect debt sustainability. Liquidity falls because imported investments are financed using foreign reserves. The positive relationship between external debt and the relative interest rate implies that when foreign interest rate increases, it increases the cost of borrowing. Consequently, foreign debt increases. Alternatively, the increase in foreign interest rate encourages capital flight and this leads to flight driven external debt. Macroeconomic instability (inflation rate) significantly increases debt un-sustainability whilst terms of trade insignificantly affects both debt sustainability and liquidity ratios in Africa.

In Latin America, inflation and consumption imports significantly contribute towards debt un-sustainability and illiquidity. Specifically, an increase in inflation worsens both liquidity and debt sustainability by about 0.3. Similarly, a 1 percent increase in consumption imports worsens both liquidity and debt sustainability by about 2 percent. In view of the fact that these countries do not mainly import capital for investments, an increase in the gross fixed capital formation improves the liquidity ratio. Unlike in Africa where the relative interest rate increases debt to GDP ratio, in Latin America, it reduces the debt to GDP ratio. A stable political environment also improves debt sustainability in these countries. In East Asia, terms of trade play a significant role in increasing debt un-sustainability and illiquidity. Exports only significantly improve liquidity by about 1.76.

4.4.3 Further Assessment of Governance on Debt Management

In analyzing the relative impact of exports and imports *vis-à-vis* the institutional and policy variables on debt sustainability and liquidity, I follow Asiedu (2006). I selected imports and exports because they play a significant role in determining both debt sustainability and liquidity levels of African countries. Note that exports improve debt sustainability and liquidity whilst imports worsen both liquidity and debt sustainability. I use Latin America and Asia (countries that have managed to sustain their external debt burdens) as the benchmark regions. Columns (1) and (2) of Table 4.4 report the average values of the institutional and policy variables for Africa and Latin America. Column (3) reports the estimated coefficients for all countries combined (see Table 4.3). Columns (4) and (5) show the equivalent effect of a change in policy and institutional environment on exports and imports, respectively.

Table 10: Estimated Equivalent Effect of a Change in Institutional and Policy Variables *vis-à-vis* Exports and Consumption Imports for Africa and Latin America

	Africa	Latin America	Estimated Coefficient [a]	Equivalent Effect on	
				Exports [b] %	Consumption Imports [c] %
ETD/GDP					
Political	-0.547	-0.086	0.119	7.27	-6.39
Legal	-0.551	-0.111	0.104	6.06	-5.33
GDP growth	0.082	0.092	0.041	0.05	-0.05
Relative Interest Rate	0.544	0.385	0.064	-1.35	1.19
Exchange Rate	0.830	-0.675	0.047	-9.37	8.24
SETD/RES					
Political	-0.547	-0.086	0.289	12.85	-31.80
Legal	-0.551	-0.111	0.190	8.06	-19.95
GDP growth	0.082	0.092	0.037	0.04	-0.09
Relative Interest Rate	0.544	0.385	0.070	-1.07	1.30
Exchange Rate	0.830	-0.675	0.122	-17.71	43.82

[a] These are the absolute values of the estimated coefficients for political and legal variables from columns (5) and (6) of Table 4.3.
[b] The equivalent effect of a change in the political environment from the level of Africa to that of Latin America is given by (-0.547+0.086)*0.119/-0.755, where -0.755 is the estimated coefficient for exports for all the 26 countries.
[c] The equivalent effect of a change in the legal environment from the level of Africa to that of Latin America is given by (-0.551+0.111)*0.104/0.858, where 0.858 is the estimated coefficient for consumption imports for all the 26 countries.

On debt sustainability, the results show that an improvement in the political environment of Africa to that of Latin America has the same effect as increasing exports by about 7.3 percent and reducing consumption imports by about 6.4 percent. Likewise, an improvement in the legal system from that of Africa to that of Latin America is similar to increasing exports by about 6 percent and reducing consumption imports by about 5.3 percent. An increase in growth rate of GDP from that of Africa to that of Latin America has the same effect as increasing exports by and reducing consumption imports by about 0.05 percent. The increase in exports and fall in consumption imports translates into a fall in debt as a percentage GDP and hence, GDP improves. An interesting scenario from Table 4.4 is that of the exchange rate. Latin American countries overvalued their exchange rates and therefore an appreciation of the exchange rate from the level of Africa to that of Latin America is comparable to reducing exports by about 9.4 percent and increasing imports by about 8.2 percent. An overvaluation of the exchange rate causes an external imbalance that leads to debt accumulation especially if debt is denominated in foreign currency. It discourages promotion of the export sector that services external debt.

On liquidity, the results show that an improvement of the political environment from that of Africa to that of Latin America is comparable to an increase in exports of about 12.9 percent and a decrease in imports of about 32 percent. Similarly, an improvement in the reliability of the legal system from the one of Africa to that of Latin America has the same effect as an increase in exports by about 8 percent and a decrease in imports by about 20 percent. An improvement of the growth rate in GDP from that of Africa to that of Latin America is similar to an increase in exports of about 0.04 percent and a decrease in consumption imports of about 0.09 percent. An appreciation of the exchange rate is similar to reducing exports by about 18 percent and increasing consumption imports by about 44 percent. In terms of liquidity, an overvalued exchange rate has a far more detrimental effect on the export sector.

Table 4.5 shows the equivalent effect of a change in policy and institutional variables on exports and imports for Africa relative to East Asia. As in Table 4.4, columns (1) and (2) report the average values of the institutional and policy variables for Africa and Asia. Column (3) reports the estimated coefficients for all countries combined (see Table 4.3). Columns (4) and (5) show the equivalent effect of a change in policy and institutional environment on exports and imports, respectively.

Table 11: Estimated Equivalent Effect of a Change in Policy and Institutional Variables *vis-à-vis* Exports and Consumption Imports for Africa and East Asia

	Africa	East Asia	Estimated Coefficient [a]	Equivalent Effect on	
				Exports [b] %	Consumption Imports [c] %
ETD/GDP					
Political	-0.547	-0.021	0.119	8.29	-7.30
Legal	-0.551	0.030	0.104	8.00	-7.04
GDP growth	0.082	0.117	0.041	0.19	-0.17
Relative Interest Rate	0.544	0.718	0.064	1.47	-1.30
Exchange Rate	0.830	4.255	0.047	21.32	-18.76
SETD/RES					
Political	-0.547	-0.021	0.289	14.66	-36.28
Legal	-0.551	0.030	0.190	10.65	-26.35
GDP growth	0.082	0.117	0.037	0.12	-0.31
Relative Interest Rate	0.544	0.718	0.070	1.17	-2.91
Exchange Rate	0.830	4.255	0.122	40.29	-99.73

[a] These are the absolute values of the estimated coefficients for institutional and policy variables from regressions of all countries combined that are reported in Table 4.3.
[b] The equivalent effect of a change in political environment from the level of Africa to that of Latin America is given by (-0.547+0.021)*0.119/-0.755, where -0.755 is the estimated coefficient for exports for all the 26 countries.
[c] The equivalent effect of a change in political environment from the level of Africa to that of Latin America is given by (-0.551-0.030)*0.104/0.858, where 0.858 is the estimated coefficient for consumption imports for all the 26 countries.

The results above show that a change in the political environment in Africa to that of East Asia is similar to increasing exports by about 8.29 percent and reducing imports by about 7.3 percent. Similarly, an improvement in the legal system from that of Africa to that of East Asia is similar to increasing exports by about 8 percent and reducing consumption imports by about 7 percent. One of the major reasons as to why Asian countries managed their debt is their export promotion and exchange rate management policies. If African countries depreciate their exchange rate to the level of Asia, exports increase by about 21.32 percent and consumption imports reduce by about 19 percent.

Using the liquidity model, a stable political environment (similar to that of Asia) is the same as an increase in exports by about 15 percent and a fall in imports by about 36.3 percent. An improvement in the reliability of the legal system from the level of Africa to that of East Asia is equivalent to increasing exports by about 11 percent and reducing imports by about 26.4 percent.

Additionally, a depreciation of the exchange rate from that of Africa to that of East Asia is the same as increasing exports by 40.3 percent and reducing consumption imports by about 100 percent. Africa's depreciation of the currency to East Asia's level has a more positive effect in terms of promoting exports.

4.5 Effective Debt Management Strategies

From the analysis above, African countries should not exceed a debt-GDP ratio of more than 60% and short-term debt to international reserves ratio of above 80%. External debt to GDP ratio is explosive beyond the debt-GDP ratio of 100%. The results imply that beyond this level, African countries must reduce foreign borrowing since it exceeds the country's wealth.

Exports and a stable political environment promote both debt sustainability and liquidity for African countries. On the other hand consumption and investment imports worsen liquidity and debt sustainability. Since countries must import capital for investment purposes, they should reduce import of consumption goods and boost imports of investment goods. Investment goods are necessary if they export finished goods instead of primary goods.

For African countries to appropriately manage their debts, they should adopt some of the reasoned policies pursued by East Asian countries especially the export promotion policies. But these policies can only be effective if countries adopt better governance and exchange rate management strategies. What clearly comes out of the analysis in Tables 4.4 and 4.5 is that a stable political and legal environment plays a key role in determining the level of exports and consumption imports in Africa. Indeed, a stable political environment and an effective legal system play a key role in boosting exports which in turn reduces external debt.

CHAPTER FIVE: CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

Theoretical literature and empirical evidence suggest that certain level or nature of external debt burden tends to be associated with low investment and low economic growth. Most empirical literature on external debt has concentrated on the debt overhang hypothesis, crowding out effect, debt sustainability and default, and debt repudiation. This study contributes to the literature in two broad aspects: first, I developed a dynamic stochastic general equilibrium model of external debt burden and second, I identified strategies for better debt sourcing and management. Before developing the model, I reviewed debt crises effects on African countries. The next section looks at some of the identified sources and effects of external debt on African countries. Section 5.3 recaps key features of the structural model and how empirical data from African countries fitted the model. Section 5.4 highlights the main thrusts of reasoned guides laid out for sourcing and managing external debt in a sustainable manner. Finally, section 5.5 flags the policy derivations from the entire work and areas needing further research attention.

5.2 Sources and Effects of External Debt Burden in Africa

In this chapter, I reviewed the sources of external debt and its effects on African countries. African countries started amassing external debt after the oil price shocks of the 1970s when members of OPEC increased the oil price. The increase in oil price resulted in a slow-down in growth and dampened exports from Africa, thus worsening the terms of trade. The OPEC members deposited their oil earnings in Western banks which in turn loaned the money to African countries along with developing countries from other regions of the World. These loans are the major source of Africa's debt problems because they were simply consumed and did not generate the returns needed to service them. The loans were also invested in projects that turned out to be helplessly unproductive as evidenced by the more than 3000 "white elephants" in Africa. Another source of Africa's debt problems is the structural weaknesses of its economies. Most of these countries mainly export primary commodities whose returns are too low to repay their external debt. In the post-1989 period, Africa's debt burden increased as a result of decline in the terms of trade, uncontrolled fluctuations in export earnings, higher international interest rates, realignment of exchange rates and lender-favored rescheduling and refinancing of external debt.

The build-up of external debt had pervasive effects on African countries. Its servicing led to debt overhang problems, crowding out effect, and exposed countries to risks of default and erosion of credit worthiness. Excessive stock of external debt retarded economic growth and hampered the socio-economic development of African countries. Crowding out of investment and expenditure on health care and education has had an adverse effect on physical and social infrastructure of these countries. With reduced growth and increased debt service commitments, countries landed into debt management problems because they did not have the capacity to generate income that could sustain the debt.

Policies have been put in place to address Africa's debt problems. Rescheduling and refinancing formed part of policies that have been pursued by Bretton Woods institutions to address Africa's debt problems. But rescheduling merely postponed debt service payments while at the same time they increased debt burden by imposing draconian "market-related" interest rates. Structural adjustment programmes (SAPs) have been pursued as debt management solutions. They were meant to forestall state intervention and patronage which were considered to be the central causes of economic downtown. However, SAPs failed because countries were either not committed to reforms or the reforms were structurally ill-advised. Then highly indebted poor countries (HIPC) initiative came into force in 1996 when SAPs failed to address Africa's debt problem. The HIPC initiative faces some major challenges that hinder it from effectively addressing Africa's debt burden. First, its voluntary nature has contributed to low participation by non-Paris club official bilateral creditors. Second, a number of commercial creditors and distressed debt funds are engaging in litigation cases against some HIPCs. Third, some HIPCs are unable to accomplish the reforms required by the initiative for them to qualify for full debt cancellation. Without a doubt, efforts pursued to find solutions to Africa's indebtedness can be adjudged as inadequate and for this reason, this study sought to identify workable solutions for Africa's debt burden. The process of identifying these solutions began with the development of an external debt model for small open economies, such as Africa's.

5.3 Macroeconomic Model of External Debt Burden

The dynamic stochastic general equilibrium (DSGE) model I developed has similar characteristics with the basic real business cycle models. In developing the model, I assume that the economy relies on import for capital formation and has imperfect access to international financial markets. I

also assume that the economy is populated by identical consumers who maximize a utility function with three augments: domestic goods, imported goods and money balances. Households are also assumed to hold their financial wealth in the form of cash balances, domestic bond, foreign debt and capital stock. Firms on their part produce domestic goods, export some of the goods to the foreign market and import intermediate inputs since they do not have the capacity to produce investment goods. In this model, I add the evolution of external debt. External debt balances into an arbitrage condition between exports and imports. In addition, monetary authorities in this model economy control the monetary base following the McCallum (1994) rule but money supply is driven by inflation and output gap following the Taylor rule.

The model is estimated for 11 African countries: Côte d'Ivoire, Ghana, Kenya, Malawi, Nigeria, Senegal, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. In general, most of the estimated parameters had the expected signs and were significantly different from zero. The results show that consumption is more sensitive to changes in interest rates in South Africa than all the other sampled countries. Another finding is that African countries have backward looking expectations because of incomplete and inefficient markets. Importantly, the exchange rate and consumption imports positively and significantly contribute towards external debt accumulation whilst exports reduce foreign debt. Additionally, lagged inflation gap negatively affects money supply whilst lagged output gap positively affects money supply. Turning to the goods market, consumption constitutes the highest percentage of GDP while government spending constitutes a small fraction of GDP.

A number of simulations were performed to determine whether shocks contribute towards business cycles in Africa. The simulations show that all persistent shocks converge to the steady state equilibrium after about 40 years for most of the sampled countries. Monetary policy shock increases external debt, imported investments, consumption imports and interest rates. On the other hand, Inflation, output, exports, exchange rate and consumption fall after a monetary policy shock. A favourable commodity price shock leads to indebtedness of most African countries; this may be explained by African countries having to borrow more to buy higher priced intermediate production inputs whose prices incorporate the higher price of primary products: i.e., the seemingly unfavourable terms of trade of African countries. Imported investments increase after commodity price shock in most of the countries but this increase does not translate into an increase

in output which implies that countries invested in projects that have low returns. The shock also leads to an appreciation of the exchange rate which in turn hurts exports and creates a current account deficit. The World interest rate shock leads to a fall in external debt, imported investments, output, exports and the exchange rate.

5.4 Strategies for Better Debt Sourcing and Management

In this chapter, I computed threshold levels for sustainable debt accumulation for African countries. I compared Africa's thresholds with those of East Asia and Latin America. I selected the two regions on the basis of the fact that they have successfully managed their external debt better than has the African region. The results reveal that each region has its own debt threshold level. Africa's debt sustainability is a debt to GDP ratio of below 60% while Latin America is a debt-GDP ratio of below 150%. This shows that Latin America's external debt threshold is unsustainable for African countries. On liquidity, the threshold level for all the regions is a short-term debt to reserves ratio of below 80%. These threshold levels are below those suggested by IMF and World Bank. To ascertain the impact of these thresholds on GDP for African countries, I ran regressions of GDP against debt for the two threshold levels. Expectedly, the result shows that at low debt levels, external debt positively contributes towards GDP but at high debt levels, debt has a negative effect on GDP. This reinforces simulation results of the previous chapter on the structural model, that a high external debt level also distorts macroeconomic dynamics of African countries.

Countries cannot achieve the aforementioned thresholds without pursuing proper governance policies. In order to come up with appropriate strategies for debt management, the impact of governance was assessed. Results show that a stable political environment leads to both debt sustainability and liquidity. Exports and growth rate in GDP also lead to debt sustainability and liquidity in Africa. Conversely, high relative interest rate leads to debt un-sustainability and illiquidity whilst high consumption imports and exchange rate increase illiquidity.

Given that proper governance is essential in determining solvency and liquidity, I analyzed the relative effect of a change in institutional variables, from the level of Africa to Latin America and East Asia, on exports and consumption imports. The results show that exports increase in Africa when both political and legal environments improve to levels of Latin America and East Asia.

Latin America and East Asia have pursued different exchange rate management with Latin American countries overvaluing their currencies whilst East Asian countries undervalued their currencies. Results also show that if African countries overvalue their currencies to levels of Latin American countries, exports would fall whilst consumption imports would increase. On the other hand, if they devalued their currencies to levels of East Asian countries, exports would increase and consumption imports would fall.

5.5 Main Contributions of the Study

Most African countries are riddled with unsustainable debts which depress investments and growth. To mitigate the effects of unsustainable debts, this study develops a macroeconomic model of external debt for African countries.

The literature does not provide clearly defined thresholds for sustainability of external debt. This study adds to the literature by computing appropriate thresholds for external debt for African countries.

5.6 Policy Implications and Areas for Further Research

A few policy implications can be derived from this study. First, it is essential that countries pursue export promotion strategies so that they are at a comparable level with the successful East Asian countries. They should also emulate East Asian countries and adopt better exchange rate management strategies. Consumption imports that lead to indebtedness of these countries should be discouraged. Instead, countries should import investment goods that can be used in the production sector, particularly for adding value to primary products before exportations. This would contribute in reversing the unfavourable terms of trade of African countries. Further, it will not only increase GDP but also boost exports which are necessary for debt repayments. Second, when countries borrow off-shore, they should ensure that the borrowed funds do not exceed the threshold levels identified in this work. In this way, countries will avoid getting into a debt trap. Third, countries should cushion themselves against external shocks, especially the shocks that affect these economies. The surplus from a favourable commodity price shock should translate into investment in projects that earn foreign exchange as well as improve the growth rate in GDP. Fourth, there is need to seriously address governance issues in these countries, particularly stability in the political environment. A stable political environment is essential for improved

export earnings and reduced consumption imports which in turn translate into a trade surplus. In turn, the trade surplus would lead to a reduction in the debt burden.

It is worth pointing out a number of areas that necessitate further research. In this study, external debt is mainly driven by exports, imports and fluctuations in exchange rates. It is a well known fact that most of these countries borrow from multilateral institutions to finance their budget deficits. There is need to incorporate budget deficit into the model and analyze the role of fiscal policy in debt accumulation. Another area that has attracted little research is the war torn countries of Africa that amassed huge external debts from purchase of military equipment. The war torn African countries spent more than 10 percent of GDP on *military imports* whilst expenditure on education and health only constituted less than 5 percent of GDP. It will be interesting to extend this study in that direction by using the model I developed in chapter three. Finally, in this study, financial flows were not incorporated in the model. A model that incorporates both capital inflows and outflows forms another area for further study.

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APPENDIX A

Capital Stock Calculations

Initial capital stocks are estimated by using a combination of both the steady-state method following King and Levine (1994) and the perpetual inventory formula by Limam and Miller (2004). The steady state method is used to compute the initial capital stock whilst the perpetual inventory method is used to generate the time series of capital stocks. The steady state method assumes that at the steady state the capital-output ratio is constant, which implies that $\partial K_t/K_t = \partial Y_t/Y_t$. The steady state capital output ratio for country *j* is given as:

$$\tilde{\kappa}_j = \tilde{\imath}_j/(\delta + \tilde{v}_j), \quad \text{(A1)}$$

where $\tilde{\kappa}_j$ is the country's capital-output ratio and δ is the depreciation rate of physical capital. Capital-output ratio dictates the size of the effect of the rate of investment on economic growth. The steady state investment rate for country *j* is $\tilde{\imath}_j$ and $\tilde{v}_j$ is the steady state growth rate of country *j* over the period 1970 to 2006. The steady state investment rate is the average investment rate for the entire period. The steady state growth rate is the weighted average of the country's growth rate and the world growth rate. The formula for the steady state growth rate is given by:

$$\tilde{v}_j = \lambda v_j + (1 - \lambda) v_w, \quad \text{(A2)}$$

where v_w is the world growth rate over the period 1970 to 2006 and λ is the mean reversion of growth rates. King and Levine (1994) and Limam and Miller (2004) used $\lambda = 0.25$ and $v_w = 0.04$. In my study, I computed each country's mean reversion of growth rates by running a simple regression of $\Delta v_j = \lambda(v_j - v_w)$. The mean reversions of growth rates ranged between 0.74 for South Africa and 0.96 for Malawi. Using $\lambda = 0.25$ gives higher values for initial capital stocks for African countries while country specific mean reversions of growth rates give lower initial capital stocks. A higher mean reversion of growth rate implies that the steady state growth rate for country *j* is mainly driven by the domestic growth rate and not the world growth rate. This may be the case for African countries since their growth rates are not necessarily driven by the world growth rate.

To compute the initial capital stock for country *j*, I used the real gross domestic product of 1970 as an estimate of initial output. To calculate initial capital stock $K_{j(70)}$, the steady state capital-output ratio, $\tilde{\kappa}_j$ is multiplied by the initial output in 1970, $Y_{j(70)}$ and thus $K_{j(70)} = \tilde{\kappa}_j Y_{j(70)}$. To generate a time series of capital stocks for the remaining years I use Limam and Miller's perpetual inventory formula, which is given by:

$$K_t = \sum_{i=0}^{t-1}(1-\delta)^i I_{t-i} + K_0(1-\delta)^t \ , \qquad \text{(A3)}$$

where $K_0 \equiv K_{70}$ and I_{t-i} is the previous period's gross fixed capital formation. I use a depreciation rate of capital of 7% in line with Benhabib and Spiegel (1994) and King and Levine (1994).

APPENDIX B

Simplified Equations

$$\tilde{c}_{m_t} = \kappa_1 \tilde{c}_t - \kappa_2 \tilde{c}_{t-1} + \kappa_3 \tilde{q}_t + \kappa_4 \tilde{c}_{m_{t-1}} + \kappa_3 \left(\xi_{c_{mt}} - \xi_{c_t}\right) \quad \text{(B1)}$$

$$\tilde{r}_t = \acute{\eta}_1 \tilde{c}_t - \acute{\eta}_2 \tilde{c}_{t-1} - \acute{\eta}_3 (\tilde{m}_t - \tilde{p}_t) + \left(\xi_{m_t} - \xi_{c_t}\right) \quad \text{(B2)}$$

$$\tilde{c}_t = \acute{\alpha}_1 \tilde{c}_{t+1} + \acute{\alpha}_2 \tilde{c}_{t-1} - \acute{\alpha}_3 (\tilde{r}_t - \tilde{\pi}_{t+1}) + \acute{\alpha}_3 \left(\xi_{c_t} - \xi_{c_{t+1}}\right) \quad \text{(B3)}$$

$$\tilde{\imath}_t^m = \acute{\varepsilon}_1 \tilde{\imath}_{t+1}^m + \acute{\varepsilon}_2 \tilde{\imath}_{t-1}^m + \acute{\varepsilon}_3 \tilde{\mathrm{p}}_{\mathrm{kt}} + \acute{\varepsilon}_4 \tilde{\mathrm{k}}_{\mathrm{t}} - \acute{\varepsilon}_5 \tilde{q}_t + \acute{\varepsilon}_6 \xi_{xt} + \acute{\varepsilon}_7 \xi_{y_t} \quad \text{(B4)}$$

$$\tilde{p}_{k_t} = \acute{\upsilon}_1 \tilde{p}_{k_{t+1}} - \acute{\upsilon}_2 \tilde{q}_t + \acute{\upsilon}_3 \tilde{k}_t + \acute{\upsilon}_4 (\tilde{r}_t - E\tilde{\pi}_{t+1}) - \acute{\upsilon}_5 \xi_{x_t} - \acute{\upsilon}_6 \xi_{y_t} \quad \text{(B5)}$$

$$\tilde{q}_t = \acute{\omega}_1 \tilde{q}_{t+1} - \acute{\omega}_1 \tilde{\pi}_t - \tilde{r}_t + \acute{\omega}_1 \tilde{b}_{t-1}^f - \acute{\omega}_1 \tilde{x}_t - \acute{\omega}_2 \tilde{\rho}_t - \acute{\omega}_3 \xi_{xt}, \quad \text{(B6)}$$

$$\tilde{y}_t = \vartheta_1 \tilde{c}_t + \vartheta_2 \tilde{g}_t + \vartheta_3 \tilde{x}_t - \vartheta_4 (\tilde{c}_{mt} + \tilde{\imath}_t^m) \quad \text{(B7)}$$

$$\tilde{x}_t = \ddot{\Upsilon}_1 \tilde{q}_t + \ddot{\Upsilon}_2 \tilde{y}_t^f \quad \text{(B8)}$$

$$\tilde{b}_t^f = \Omega_1 \tilde{b}_{t-1}^f - \Omega_2 \tilde{x}_t + \Omega_3 (\tilde{e}_t - \tilde{p}_t) + \Omega_4 \tilde{c}_{mt} + \Omega_5 \tilde{p}_t^f + \Omega_6 \tilde{\rho}_{t-1} - \Omega_7 \xi_{xt} \,. \quad \text{(B9)}$$

$$\tilde{\pi}_t = \eth_1 \tilde{\pi}_{t+1} - \eth_2 \tilde{\pi}_{t-1} - \eth_3 \tilde{y}_t - \eth_4 \tilde{q}_{t-1} \quad \text{(B10)}$$

$$\tilde{m}_t = \alpha_1 \tilde{m}_{t-1} + \alpha_2 \tilde{\pi}_{t-1} + \alpha_3 \tilde{y}_{t-1} - \alpha_4 \tilde{q}_{t-1} - \alpha_5 \tilde{\pi}_t - \alpha_6 \tilde{y}_t + \xi_{mt} \quad \text{(B11)}$$

where $\acute{\alpha}_1 = \frac{1}{1-\gamma_c}, \acute{\alpha}_2 = \frac{\gamma_c}{1-\gamma_c}, \kappa_1 = \frac{\sigma}{\theta}, \kappa_2 = \frac{\sigma\gamma_c}{\theta}, etc.$

The equations above can be separated according to whether or not they have expectations. Separating the equations with expectations from the ones with no expectations, we have the following:

Equations with no expectations:

$$0 \approx \kappa_1 \tilde{c}_t - \tilde{c}_{m_t} - \kappa_3 \tilde{q}_t - \kappa_2 \tilde{c}_{t-1} + \kappa_4 \tilde{c}_{m_{t-1}} + \kappa_3 \left(\xi_{c_{mt}} - \xi_{c_t}\right), \quad \text{(B12)}$$

$$0 \approx \acute{\eta}_1 \tilde{c}_t - \acute{\eta}_3 (\tilde{m}_t - \tilde{p}_t) \ - \tilde{r}_t - \acute{\eta}_2 \tilde{c}_{t-1} + \left(\xi_{m_t} - \xi_{c_t}\right), \quad \text{(B13)}$$

$$0 \approx \vartheta_1 \tilde{c}_t + \vartheta_2 \tilde{g}_t + \vartheta_3 \tilde{x}_t - \vartheta_4 (\tilde{c}_{mt} + \tilde{\imath}_t^m) - \tilde{y}_t, \quad \text{(B14)}$$

$$0 \approx \ddot{\Upsilon}_1 \tilde{q}_t - \tilde{x}_t + \ \ddot{\Upsilon}_2 \tilde{y}_t^f, \quad \text{(B15)}$$

$$0 \approx a_1 \tilde{m}_{t-1} + a_2 \tilde{\pi}_{t-1} + a_3 \tilde{y}_{t-1} - a_4 \tilde{q}_{t-1} - \tilde{m}_t - a_5 \tilde{\pi}_t - a_6 \tilde{y}_t + \xi_{mt}, \quad \text{(B16)}$$

$$0 \approx \Omega_1 \tilde{b}_{t-1}^f - \tilde{b}_t^f - \Omega_2 \tilde{x}_t + \Omega_3 (\tilde{q}_t - \tilde{p}_t) + \Omega_4 \tilde{c}_{mt} + \Omega_5 \Delta \tilde{\rho}_t - \ \Omega_6 \xi_{xt} \, . \quad \text{(B17)}$$

Equations with expectations:

$$0 \approx \acute{\alpha}_1 \tilde{c}_{t+1} - \tilde{c}_t + \acute{\alpha}_2 \tilde{c}_{t-1} - \acute{\alpha}_3 (\tilde{r}_t - \tilde{\pi}_{t+1}) + \acute{\alpha}_5 \xi_{c_t}, \quad \text{(B18)}$$

$$0 \approx \acute{\epsilon}_1 \tilde{\imath}_{t+1}^m - \ \tilde{\imath}_t^m + \ \acute{\epsilon}_2 \tilde{\imath}_{t-1}^m + \acute{\epsilon}_3 \tilde{\mathrm{p}}_{\mathrm{kt}} + \acute{\epsilon}_4 \tilde{\mathrm{k}}_{\mathrm{t}} - \acute{\epsilon}_5 \tilde{q}_t - \ \acute{\epsilon}_6 \xi_{xt} - \acute{\epsilon}_7 \, \xi_{y_t}, \quad \text{(B19)}$$

$$0 \approx \acute{\upsilon}_1 \tilde{p}_{k_{t+1}} - \ \tilde{p}_{k_t} + \acute{\upsilon}_2 \tilde{q}_t - \acute{\upsilon}_3 \tilde{k}_t - \ \acute{\upsilon}_4 (\tilde{r}_t - E \tilde{\pi}_{t+1}) + \acute{\upsilon}_5 \xi_{x_t} + \acute{\upsilon}_6 \xi_{y_t}, \quad \text{(B20)}$$

$$0 \approx \acute{\omega}_3 \tilde{q}_t - \acute{\omega}_1 \tilde{q}_{t+1} + \acute{\omega}_1 \tilde{\pi}_t + \tilde{r}_t - \acute{\omega}_1 \tilde{b}_{t-1}^f + \acute{\omega}_1 \tilde{x}_t + \acute{\omega}_2 \tilde{\rho}_t \ + \acute{\omega}_3 \xi_{xt}, \quad \text{(B21)}$$

$$0 \approx \eth_1 \tilde{\pi}_{t+1} - \tilde{\pi}_t + \eth_2 \tilde{\pi}_{t-1} + \eth_3 \tilde{y}_t + \eth_4 \tilde{q}_{t-1}. \quad \text{(B22)}$$

APPENDIX C

Solving the Matrix Quadratic Equation

To solve the matrix quadratic equation for $\boldsymbol{P}$, I follow Uhlig (1999) and McCandless (2008), and write:

$$\boldsymbol{TP}^2 - \boldsymbol{UP} - \boldsymbol{V} = 0 \tag{C1}$$

where $\boldsymbol{T} = (\boldsymbol{F} - \boldsymbol{JC}^{-}\boldsymbol{A})$, $\boldsymbol{U} = (\boldsymbol{JC}^{-}\boldsymbol{B} - \boldsymbol{G} + \boldsymbol{KC}^{-}\boldsymbol{A})$ and $\boldsymbol{V} = \boldsymbol{KC}^{-}\boldsymbol{B} + \boldsymbol{H}$.

Equation (C1) can be solved by turning it into a generalized eigenvalue and eigenvector problem. A generalized eigenvalue λ and eigenvector s of a matrix Ξ with respect to a matrix Θ, is defined to be a vector and a value satisfying

$$\lambda\Theta s = \Xi s\,. \tag{C2}$$

A standard eigenvalue problem is obtained, if Θ is an identity matrix. The generalized eigenvector problem can be reduced to a standard one, if Θ is invertible, by calculating standard eigenvalues and eigenvectors for $\Theta^{-1}\Xi$. To solve the quadratic matrix equation (C1), I define the 2×2 matrices Ξ and Θ as

$$\Xi = \begin{bmatrix} \boldsymbol{U} & \boldsymbol{V} \\ \boldsymbol{I} & \vec{0} \end{bmatrix}, \tag{C3}$$

and

$$\Theta = \begin{bmatrix} \boldsymbol{T} & \vec{0} \\ \vec{0} & \boldsymbol{I} \end{bmatrix}, \tag{C4}$$

where $\boldsymbol{I}$ is an $n \times n$ identity matrix and $\vec{0}$ is an $n \times n$ matrix of zeros only. If s is a generalized eigenvector and λ is the corresponding generalized eigenvalue of Ξ with respect to Θ, the s can be written as $s' = [\lambda x', x']$ for some $x \in \mathbf{R}$. The solution to the matrix quadratic equation is

$$\boldsymbol{P} = \Psi\Lambda\Psi^{-1} \tag{C5}$$

where Λ is a matrix of eigenvalues on the diagonal and takes the form

$$\Lambda = \begin{bmatrix} \lambda_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \lambda_n \end{bmatrix}. \quad \text{(C6)}$$

and Ψ is the corresponding matrix of eigenvectors. The solution to $\boldsymbol{P}$ is stable if and only if $|\lambda_i| < 1 \; for \; all \; i = 1, \ldots, n.$

If $n = 1$, then the solution to $\boldsymbol{P}$ is given by $\boldsymbol{P}_{1,2} = \frac{U \pm \sqrt{U^2 + 4TV}}{2T} \;\; if \; \boldsymbol{T} \neq 0 \; and \; \boldsymbol{P} = -\frac{V}{U} \; if \; \boldsymbol{T} = 0$.

APPENDIX D

The following are matrices **P, Q, R,** and **S** for all the sampled countries. I did not simulate price of capital when preparing impulse response functions because the price of capital is not a state variable. The column for price of capital (column 4 in matrices **P** and **Q**) has zero entries for most of the countries which confirms that the price of capital is not a state variable. I included price of capital as a state variable so that matrix **C** can be inverted. The solution to the matrices has real roots for all the countries except Uganda which has both real and complex roots. In the simulations for Uganda, I used the real roots. In some countries, the eigenvalues for matrix **P** are greater than zero, but these values did not affect the stability of the impulse response functions since the eigenvalues of the principal diagonal are all smaller than unity.

The variables for the columns in matrices **P** and **R** are $[\tilde{m}_t, \tilde{b}_t^f, \tilde{\imath}_t^m, \tilde{p}_{k_t}, \tilde{\pi}_t]$, respectively whilst the variables for the columns in matrices **Q** and **S** are $[\rho_{r^*}, \rho_m, \rho_x]$, respectively. Likewise, the variables for the rows in matrices **P** and **Q** are $[\tilde{m}_t, \tilde{b}_t^f, \tilde{\imath}_t^m, \tilde{p}_{k_t}, \tilde{\pi}_t]$, respectively whilst those for the rows in matrices **R** and **S** are $[\tilde{c}_{m_t}, \tilde{r}_t, \tilde{y}_t, \tilde{x}_t, \tilde{c}_t, \tilde{q}_t]$, respectively.

Côte d'Ivoire

$$\mathbf{P}=\begin{bmatrix} 0.5805 & -0.1268 & -0.0001 & -0.2776 & 0.1997 \\ -0.0686 & -0.4945 & -0.0011 & -0.6965 & -0.2295 \\ 0.4636 & -9.7027 & -0.1349 & -12.6269 & -3.9487 \\ 0.0036 & 0.8127 & -0.0010 & 0.8441 & 0.2745 \\ 0.0543 & 1.4937 & -0.0002 & 1.0413 & 0.3482 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} 0.1545 & 1.0246 & 0.1388 \\ 0.6397 & 0.1076 & 0.9020 \\ 5.2570 & -2.0006 & 7.3897 \\ -0.3572 & 0.1380 & -0.4666 \\ -0.5258 & -0.0894 & -1.5762 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} 0.0352 & -0.1502 & -0.0003 & -1.4492 & -0.4175 \\ -0.0414 & 0.3516 & -0.0022 & -0.0647 & -0.0029 \\ 0.0976 & 0.9327 & 0.0022 & 0.8710 & 0.3797 \\ 0.0106 & 0.4118 & -0.0011 & 1.8299 & 0.5783 \\ 0.1919 & 0.7192 & -0.0048 & 0.2796 & 0.0912 \\ 0.0160 & 0.6240 & -0.0016 & 2.7725 & 0.8762 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 1.1098 & -0.2340 & 0.1245 \\ -0.1868 & 0.4182 & -0.4840 \\ -0.6939 & -0.3666 & -1.0257 \\ -0.9058 & 0.0737 & -0.4637 \\ -0.3396 & -0.7919 & -1.0077 \\ -1.3725 & 0.1116 & -0.7026 \end{bmatrix}$$

Ghana

$$\mathbf{P}=\begin{bmatrix} 0.6351 & 0.0043 & -0.0007 & 0 & 0.2056 \\ 0.6707 & 0.6092 & -0.0007 & 0 & 0.1794 \\ 0.2906 & -1.2279 & -0.1851 & 0 & -0.0359 \\ -0.0567 & 0.0255 & 0.0001 & 0 & -0.0119 \\ 0.2632 & -0.1901 & 0.0039 & 0 & -0.1040 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} 0.0051 & 1.0644 & 0.0085 \\ -0.8007 & 0.4938 & -0.0385 \\ -0.0696 & 0.1727 & 0.8751 \\ 0.0777 & 0.1064 & 0.1558 \\ -0.0176 & -0.4359 & -0.0319 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} 0.5858 & -0.4946 & 0.0007 & 0 & 0.1082 \\ 0.0937 & -0.2482 & -0.0005 & 0 & 0.0394 \\ 0.2529 & -0.1134 & 0.0048 & 0 & 0.1023 \\ -0.5222 & 0.4978 & -0.0015 & 0 & -0.0538 \\ 0.4085 & -0.2565 & -0.0009 & 0 & 0.1417 \\ -0.7794 & 0.7429 & -0.0022 & 0 & -0.0804 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 0.0079 & -0.1847 & 0.1465 \\ -0.2081 & -0.0276 & 0.0125 \\ -0.1298 & -0.4243 & -0.0287 \\ 0.5215 & -0.1057 & -0.1853 \\ -0.2143 & -0.5493 & 0.0172 \\ 0.7784 & -0.1578 & -0.2766 \end{bmatrix}$$

Kenya

$$\mathbf{P}=\begin{bmatrix} 0.5651 & -0.1387 & -0.0002 & 0.1194 & 0.7288 \\ -0.0115 & 0.9754 & -0.0001 & -0.6015 & -0.0818 \\ -0.0147 & -3.1441 & -0.1917 & 0.4541 & 0.2759 \\ 0.0052 & 0.2844 & 0 & 0.1853 & 0.0163 \\ 0.0178 & 0.7182 & 0.0006 & -0.7082 & -0.3995 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.0032 & 1.0846 & -0.0352 \\ 0.2958 & 0.1842 & 0.2204 \\ -0.2532 & 1.0646 & 5.1194 \\ -0.1043 & -0.0174 & -0.0582 \\ 0.1705 & -0.2258 & 0.2573 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} -0.0208 & -1.1405 & -0.0004 & -1.6923 & -0.0980 \\ -0.0065 & 0.4741 & -0.0003 & -0.6625 & 0.0341 \\ 0.0222 & 0.6236 & 0.0008 & -0.5748 & 0.0712 \\ 0.0184 & 0.7970 & 0.0001 & 0.7912 & 0.0773 \\ 0.0444 & 0.9533 & -0.0007 & -1.3398 & 0.1440 \\ 0.0633 & 2.7481 & 0.0005 & 2.7281 & 0.2667 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 1.2280 & 0.3107 & 1.7795 \\ 0.0568 & 0.5755 & 0.3239 \\ 0.0241 & -0.3807 & 0.1873 \\ -0.4058 & -0.2876 & -0.9387 \\ 0.1156 & -0.7557 & 0.6575 \\ -1.3994 & -0.9918 & -3.2369 \end{bmatrix}$$

Malawi

$$\mathbf{P}=\begin{bmatrix} 0.1918 & 0.1186 & -0.0002 & -0.0208 & 0.0464 \\ 0.0412 & 0.7663 & -0.0002 & -0.3875 & 0.7027 \\ -0.0021 & 3.6837 & -0.1692 & -0.8533 & 1.8299 \\ 0.0056 & -0.5856 & 0.0002 & 0.1727 & -0.3524 \\ 0.0581 & -0.5675 & 0.0008 & 0.2443 & -0.6113 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.0253 & 0.9631 & 0.0026 \\ -0.7692 & -1.0719 & 0.6002 \\ -2.3870 & -1.9260 & -0.5013 \\ 0.4029 & 0.6267 & 0.3121 \\ 0.5550 & 0.5875 & -0.3682 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} 0.1871 & -0.0152 & 0.6548 & -0.0008 & -0.1576 \\ 0.1951 & -0.0622 & -0.4114 & -0.0004 & -0.2433 \\ 0.1700 & 0.0891 & -0.4205 & 0.0012 & -0.2096 \\ -0.0508 & 0.0311 & -0.4231 & 0.0002 & 0.0282 \\ 0.2930 & 0.1464 & -0.5208 & -0.0010 & -0.3388 \\ -0.1954 & 0.1197 & -1.6273 & 0.0010 & 0.1085 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 0.8358 & 0.5186 & -0.7416 \\ 0.2712 & 0.6303 & -0.3199 \\ 0.2402 & 0.3642 & -0.2504 \\ -0.1093 & -0.1680 & 0.3030 \\ 0.4119 & 0.6413 & -0.5211 \\ -0.4204 & -0.6460 & 1.1654 \end{bmatrix}$$

Nigeria

$$\mathbf{P}=\begin{bmatrix} 0.6045 & 0.0932 & -0.0016 & 0.3240 & 0.5678 \\ 0.1956 & 1.0018 & -0.0012 & -2.3594 & 1.9348 \\ 0.0766 & 1.5808 & -0.2072 & -0.2693 & 0.7843 \\ 0.0137 & -0.0690 & 0.0008 & -0.0997 & -0.0254 \\ 0.0076 & -0.1668 & 0.0052 & 0.0114 & -0.5663 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} 0.1918 & 1.3236 & -0.4515 \\ -1.2609 & -2.3476 & 2.4732 \\ -0.1282 & 0.0116 & 0.1488 \\ -0.1064 & -0.0019 & 0.4736 \\ -0.0321 & -0.0137 & 0.0580 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} -0.0236 & 0.0244 & -0.0051 & 1.6757 & -0.6385 \\ -0.0688 & -0.5555 & -0.0036 & 1.3717 & -0.6645 \\ 0.0200 & -0.1417 & 0.0067 & -0.1395 & 0.0413 \\ 0.0502 & -0.1966 & 0.0021 & -0.6422 & 0.2623 \\ 0.2183 & -1.1508 & -0.0088 & 3.1791 & -1.0991 \\ 0.1477 & -0.5782 & 0.0062 & -1.8889 & 0.7714 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 1.3520 & 1.3565 & -2.1529 \\ 0.5203 & 1.4848 & -1.5277 \\ -0.1145 & -0.1747 & 0.2227 \\ -0.3842 & -0.6316 & 0.9016 \\ 1.2479 & 1.8596 & -3.5960 \\ -1.1300 & -1.8576 & 2.6516 \end{bmatrix}$$

Senegal

$$\mathbf{P}=\begin{bmatrix} 0.3285 & -0.2337 & -0.0007 & -0.1133 & 0.3852 \\ -0.0443 & 0.6098 & -0.0019 & 0.0198 & -0.0264 \\ 0.1701 & -4.4143 & -0.1952 & -2.9492 & -1.3697 \\ 0.0548 & 1.2191 & -0.0010 & 0.7371 & 0.3563 \\ 0.0872 & 1.1321 & 0.0016 & -0.1008 & 0.0550 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} 0.0781 & 1.0647 & 0.0009 \\ 0.1285 & 0.1118 & -0.4451 \\ 1.6078 & 0.0120 & 0.6430 \\ -0.3450 & 0.3594 & 0.8363 \\ 0.1708 & -0.2817 & -0.7645 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} -0.0267 & -0.8859 & -0.0005 & -1.3062 & -0.5135 \\ -0.0279 & 0.3827 & -0.0019 & -0.2788 & -0.1148 \\ 0.1081 & 0.5717 & 0.0037 & -0.0339 & 0.1542 \\ 0.0872 & 1.1980 & -0.0007 & 1.3285 & 0.6139 \\ 0.1065 & 0.3229 & -0.0024 & -0.3537 & 0.0347 \\ 0.1503 & 2.0656 & -0.0012 & 2.2905 & 1.0585 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 1.1047 & -0.4641 & -1.1248 \\ 0.0262 & 0.1284 & -0.5612 \\ -0.1015 & -0.4035 & -0.4140 \\ -0.6691 & 0.2674 & 0.9795 \\ 0.0614 & -0.5132 & -0.6163 \\ -1.1536 & 0.4611 & 1.6888 \end{bmatrix}$$

South Africa

$$\mathbf{P}=\begin{bmatrix} 0.2398 & 0.0330 & 0.0000 & 0 & 0.5231 \\ 0.0014 & 0.1279 & 0.0002 & 0 & -0.0364 \\ -0.0006 & -0.1686 & -0.1839 & 0 & 0.0114 \\ 0.0000 & 0.0223 & 0.0000 & 0 & -0.0009 \\ 0.0018 & -1.0298 & 0.0002 & 0 & -0.0530 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.0001 & 1.1644 & 0.0271 \\ -0.3879 & -1.2181 & 0.0490 \\ -0.1963 & 0.9966 & 1.3499 \\ -0.0150 & 0.0712 & 0.2404 \\ -0.1142 & -1.6711 & 0.1684 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} -0.0001 & -0.2115 & -0.0001 & 0 & 0.0288 \\ -0.0011 & -0.1243 & -0.0002 & 0 & 0.0394 \\ 0.0024 & -0.9852 & 0.0004 & 0 & 0.3431 \\ 0.0002 & 0.1075 & 0.0000 & 0 & -0.0054 \\ 0.0027 & -1.1282 & -0.0017 & 0 & 0.3868 \\ 0.0004 & 0.2987 & 0.0001 & 0 & -0.0150 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 0.3779 & 0.1073 & 0.2320 \\ -0.0393 & 0.7386 & 0.0243 \\ -0.3097 & -2.0928 & 0.1597 \\ 0.0738 & -0.1689 & -0.1582 \\ -0.3575 & -2.3125 & 0.2221 \\ 0.2049 & -0.4690 & -0.4395 \end{bmatrix}$$

Tanzania

$$\mathbf{P}=\begin{bmatrix} 0.8126 & -0.1036 & -0.0003 & 0 & 0.7109 \\ -0.3005 & 0.1631 & -0.0016 & 0 & -0.1661 \\ -2.4644 & 1.0575 & -0.1955 & 0 & -1.8038 \\ 0.0076 & -0.0537 & 0.0000 & 0 & 0.0033 \\ 0.2778 & 1.1996 & 0.0012 & 0 & 0.1691 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} 0.0308 & 1.0385 & 0.1183 \\ 0.2604 & 0.0635 & 0.6449 \\ 0.6727 & 0.3994 & 2.3565 \\ -0.0032 & -0.0001 & 0.1115 \\ -0.1259 & -0.1309 & -1.3205 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} -0.1144 & 1.1738 & -0.0021 & 0 & 0.0361 \\ -0.1088 & 0.7184 & -0.0021 & 0 & 0.0410 \\ 0.3376 & 0.9547 & 0.0025 & 0 & 0.4928 \\ 0.3534 & -1.5459 & 0.0018 & 0 & 0.1826 \\ 0.2854 & 1.2929 & -0.0042 & 0 & 0.5066 \\ 0.3800 & -1.6623 & 0.0019 & 0 & 0.1963 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 0.4786 & 0.2145 & -0.6379 \\ -0.1604 & 0.4818 & -0.6436 \\ -0.2810 & -0.3451 & -1.0819 \\ -0.1002 & -0.5719 & 0.6231 \\ -0.2841 & -0.3507 & -1.1430 \\ -0.1077 & -0.6149 & 0.6700 \end{bmatrix}$$

Uganda

$$\mathbf{P}=\begin{bmatrix} 0.7154 & 0.3847 & -0.0080 & 0 & 0.2472 \\ 0.0051 & 0.1944 & -0.0067 & 0 & 0.0010 \\ 1.4184 & 6.4041 & -0.1832 & 0 & 0.2047 \\ -0.0124 & 2.2357 & -0.0373 & 0 & 0.6007 \\ -0.2987 & -1.3858 & 0.0334 & 0 & -0.3258 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.1961 & 1.2750 & -0.2662 \\ -0.2507 & 0.2900 & 0.4634 \\ -4.4620 & 5.2770 & -4.4632 \\ 0.6137 & -0.2936 & -1.5200 \\ 1.2734 & -1.6049 & 0.8641 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} 0.5952 & 3.0921 & -0.0361 & 0 & 0.5406 \\ 0.1722 & 1.3337 & -0.0244 & 0 & 0.3443 \\ -0.3744 & -2.5889 & 0.0558 & 0 & -0.0667 \\ -0.2184 & -1.8387 & 0.0170 & 0 & -0.2295 \\ 0.7672 & 1.8900 & -0.0354 & 0 & 0.6041 \\ -0.5459 & -4.5967 & 0.0425 & 0 & -0.5737 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} -0.4746 & 1.2224 & -2.3435 \\ -0.4373 & 0.6481 & -1.1628 \\ 1.3449 & -1.8920 & 1.7779 \\ 0.5530 & -0.7821 & 1.3394 \\ -0.6747 & 0.5829 & -1.5935 \\ 1.3825 & -1.9552 & 3.3485 \end{bmatrix}$$

Zambia

$$\mathbf{P}=\begin{bmatrix} 0.0040 & -0.2654 & 0.0005 & 0 & 0.1574 \\ -0.0002 & 0.6689 & -0.0012 & 0 & 0.0655 \\ -0.0001 & 0.2458 & -0.1865 & 0 & 0.0855 \\ -0.0001 & 0.1058 & -0.0004 & 0 & 0.0493 \\ 0.0007 & -0.3031 & 0.0040 & 0 & -0.4287 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.2198 & 0.7144 & 0.1783 \\ -0.5869 & -0.6878 & -0.0400 \\ -0.0733 & 2.0011 & 5.9041 \\ 0.0748 & 0.2246 & 0.3411 \\ -0.0895 & -0.7102 & -0.1664 \end{bmatrix}$$

$$\mathbf{R}=\begin{bmatrix} 0.0007 & -0.5483 & 0.0007 & 0 & -0.0721 \\ -0.0002 & -0.3615 & -0.0008 & 0 & 0.0717 \\ 0.0008 & -0.2764 & 0.0047 & 0 & 0.1405 \\ -0.0001 & 0.2285 & -0.0007 & 0 & 0.0926 \\ 0.0019 & -0.8068 & -0.0012 & 0 & 0.2191 \\ -0.0003 & 0.6529 & -0.0020 & 0 & 0.2647 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 0.1017 & -0.8749 & 0.2436 \\ -0.1993 & -0.1834 & 0.0383 \\ -0.1534 & -0.7428 & -0.1610 \\ 0.1854 & 0.2758 & -0.1378 \\ -0.4862 & -1.7490 & 0.1701 \\ 0.5291 & 0.7879 & -0.3936 \end{bmatrix}$$

Zimbabwe

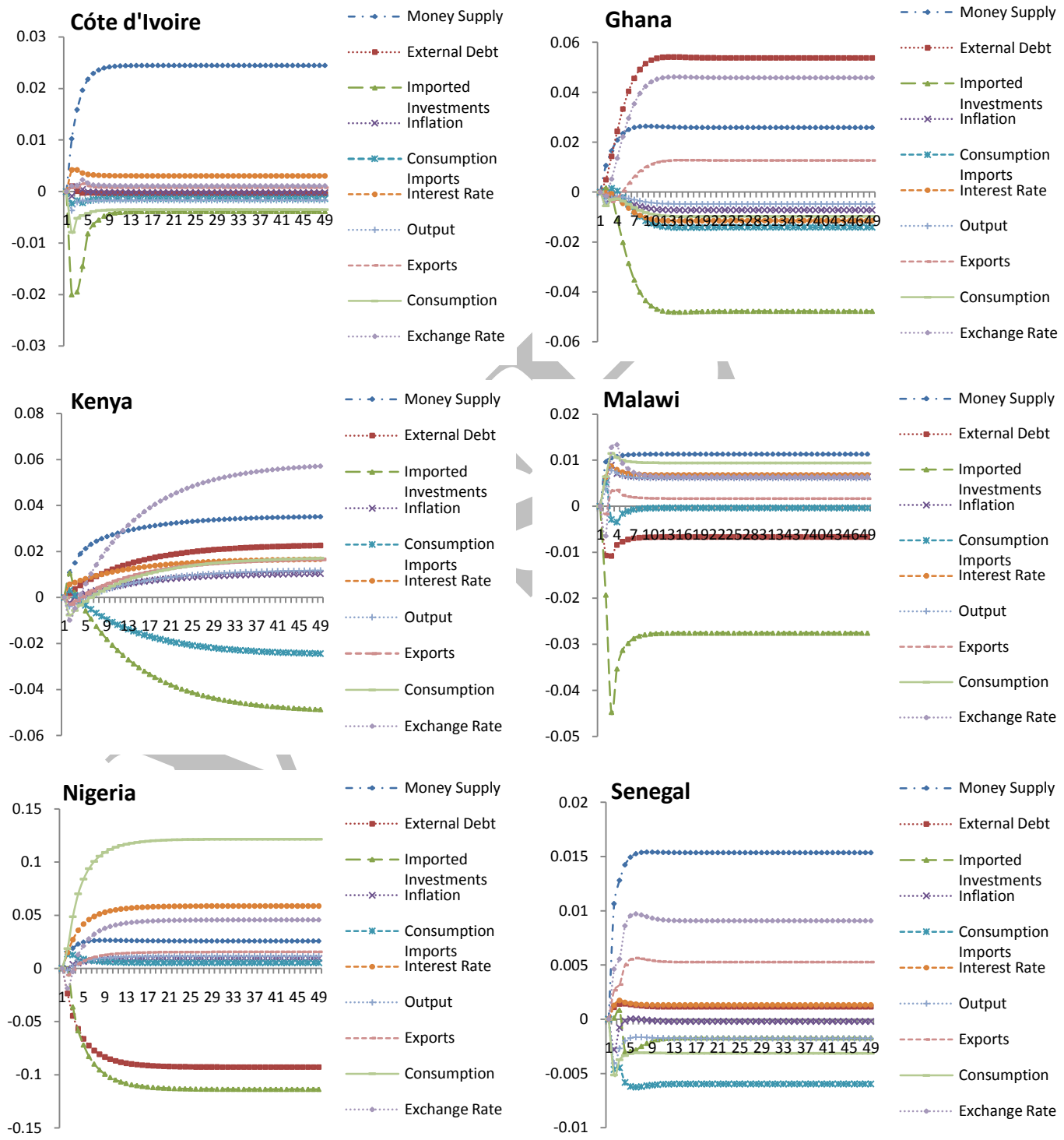
$$\mathbf{P}=\begin{bmatrix} 0.9312 & 0.0155 & -0.0007 & 0 & 0.2787 \\ -0.0506 & 0.6004 & 0.0026 & 0 & -0.0950 \\ -0.3242 & -3.4093 & -0.1717 & 0 & 0.0363 \\ 0.0255 & 0.1358 & -0.0019 & 0 & 0.0474 \\ 0.0558 & 0.4357 & 0.0060 & 0 & -0.2534 \end{bmatrix} \quad \mathbf{Q}=\begin{bmatrix} -0.0211 & 0.9790 & -0.0063 \\ 0.5522 & 2.1905 & -0.0220 \\ 1.9377 & 11.8633 & -0.5878 \\ -0.6375 & -1.3773 & 0.6995 \\ -0.3180 & -2.7287 & -0.0348 \end{bmatrix}$$

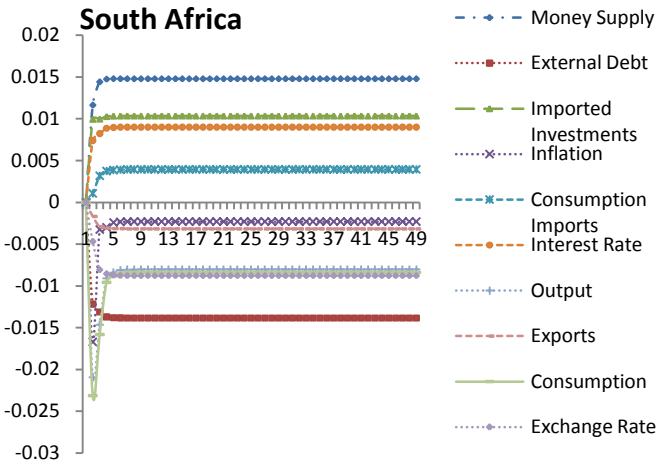
$$\mathbf{R}=\begin{bmatrix} -0.0681 & -0.6471 & 0.0009 & 0 & -0.0197 \\ 0.0355 & 0.2844 & -0.0005 & 0 & 0.0166 \\ 0.0519 & 0.3989 & 0.0064 & 0 & 0.0158 \\ 0.0820 & 0.7262 & -0.0011 & 0 & 0.0267 \\ 0.0429 & 0.2903 & -0.0005 & 0 & 0.0190 \\ 0.1782 & 1.5788 & -0.0023 & 0 & 0.0580 \end{bmatrix} \quad \mathbf{S}=\begin{bmatrix} 1.1491 & 2.8422 & 0.1025 \\ -0.2902 & -1.3262 & -0.0558 \\ -0.3655 & -2.6288 & -0.0282 \\ -0.7307 & -3.6817 & -0.1200 \\ -0.2963 & -2.3667 & -0.0570 \\ -1.5885 & -8.0037 & -0.2609 \end{bmatrix}$$

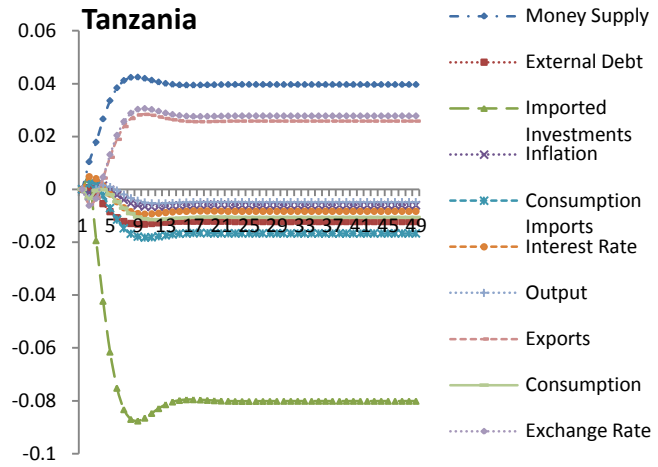
APPENDIX E

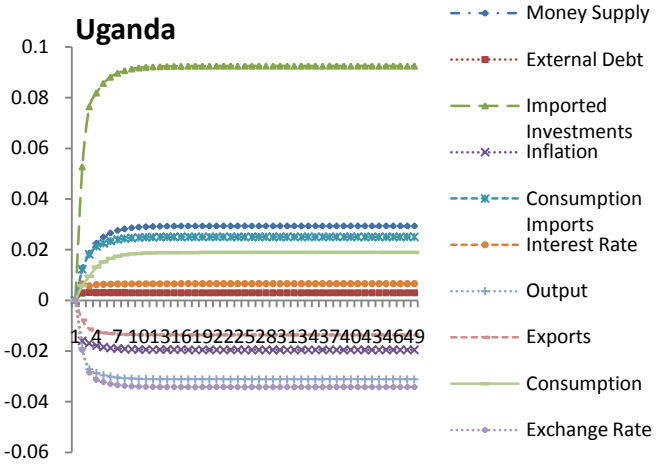
The Figures below present the impulse response functions of a permanent shock to monetary policy, world commodity price and world interest rate.

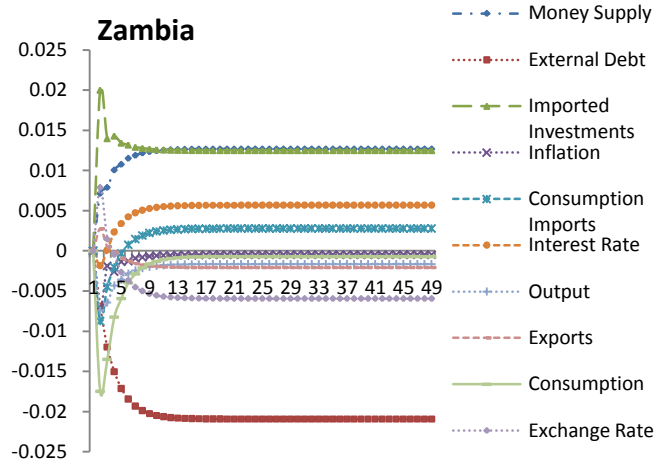
Figure E1: Permanent Shock to Monetary Policy




South Africa
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Tanzania
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Uganda
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
1 4 7 10131619222528313437404346 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zambia
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

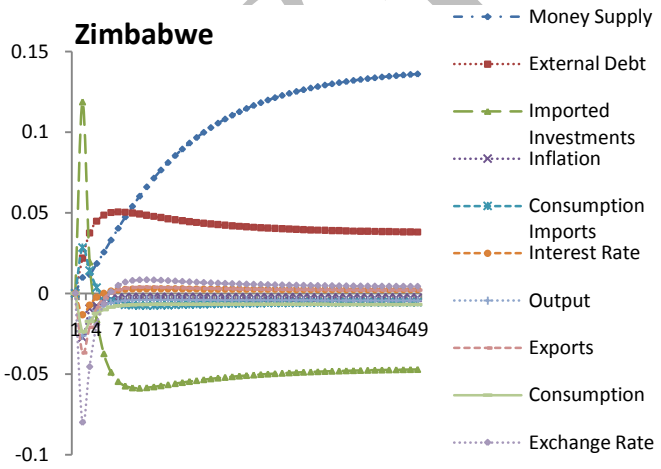
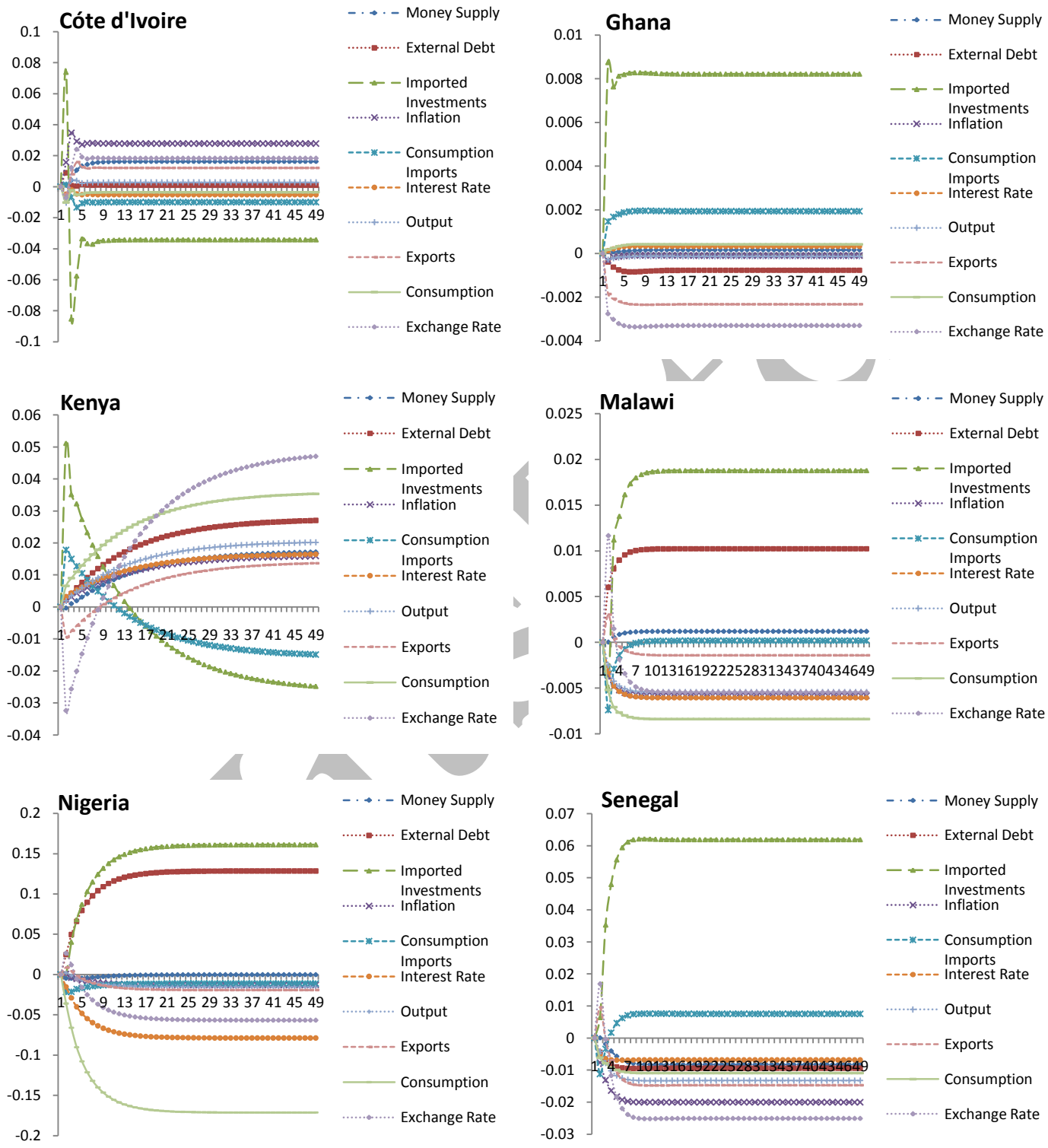
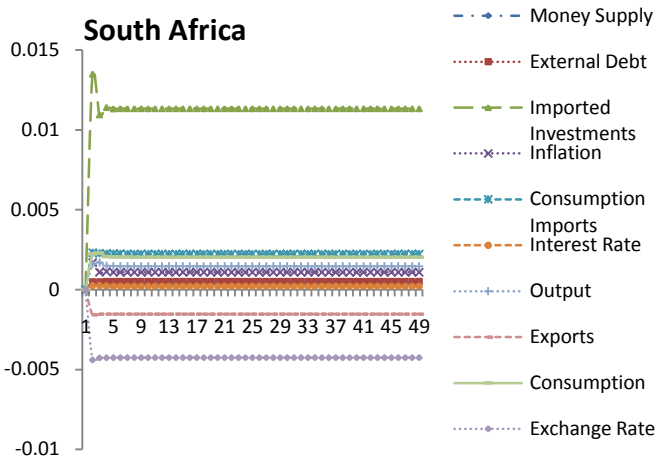
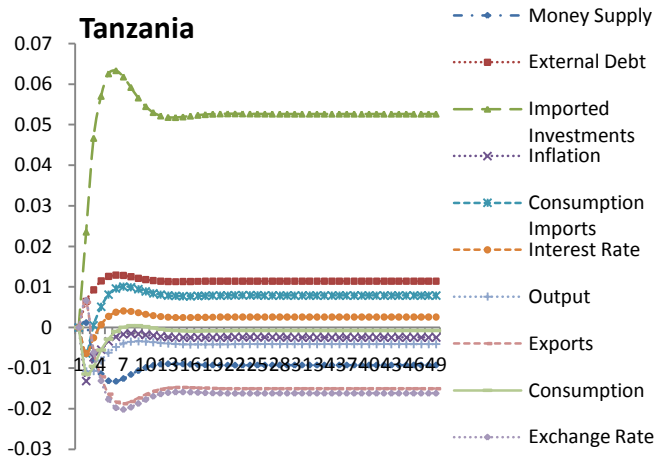
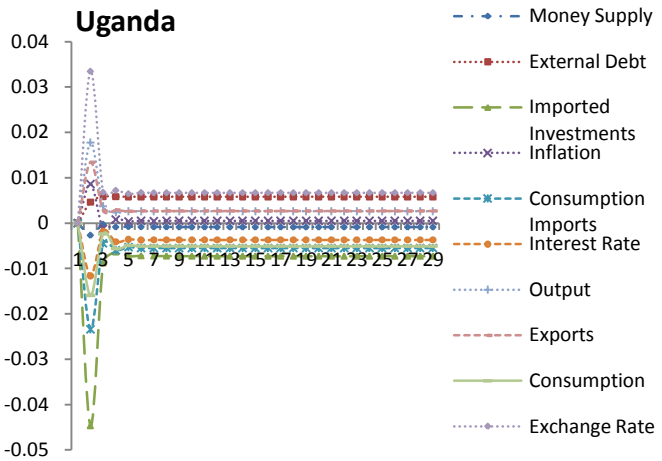

Zimbabwe
0.15
0.1
0.05
0
-0.05
-0.1
1 4 7 10131619222528313437404346 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

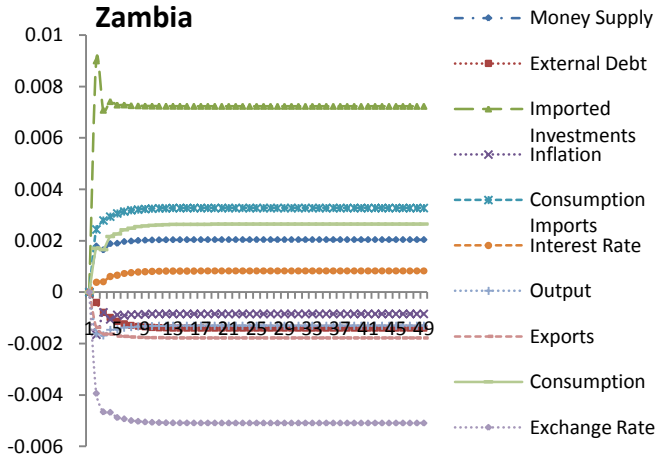
Figure E2: Permanent Shock to World Commodity Price




South Africa
0.015
0.01
0.005
0
-0.005
-0.01
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Tanzania
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Uganda
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zambia
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

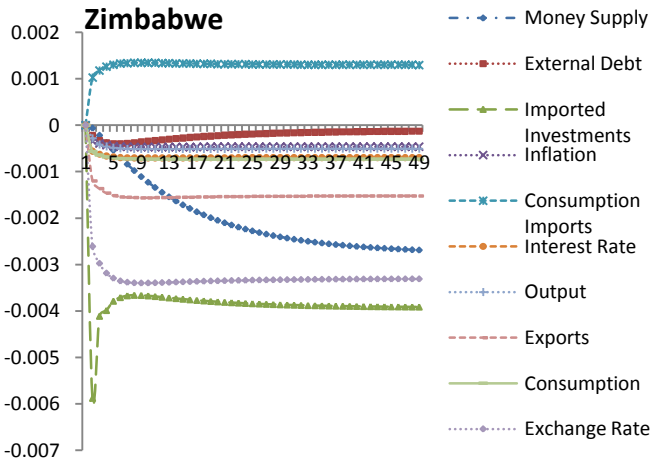
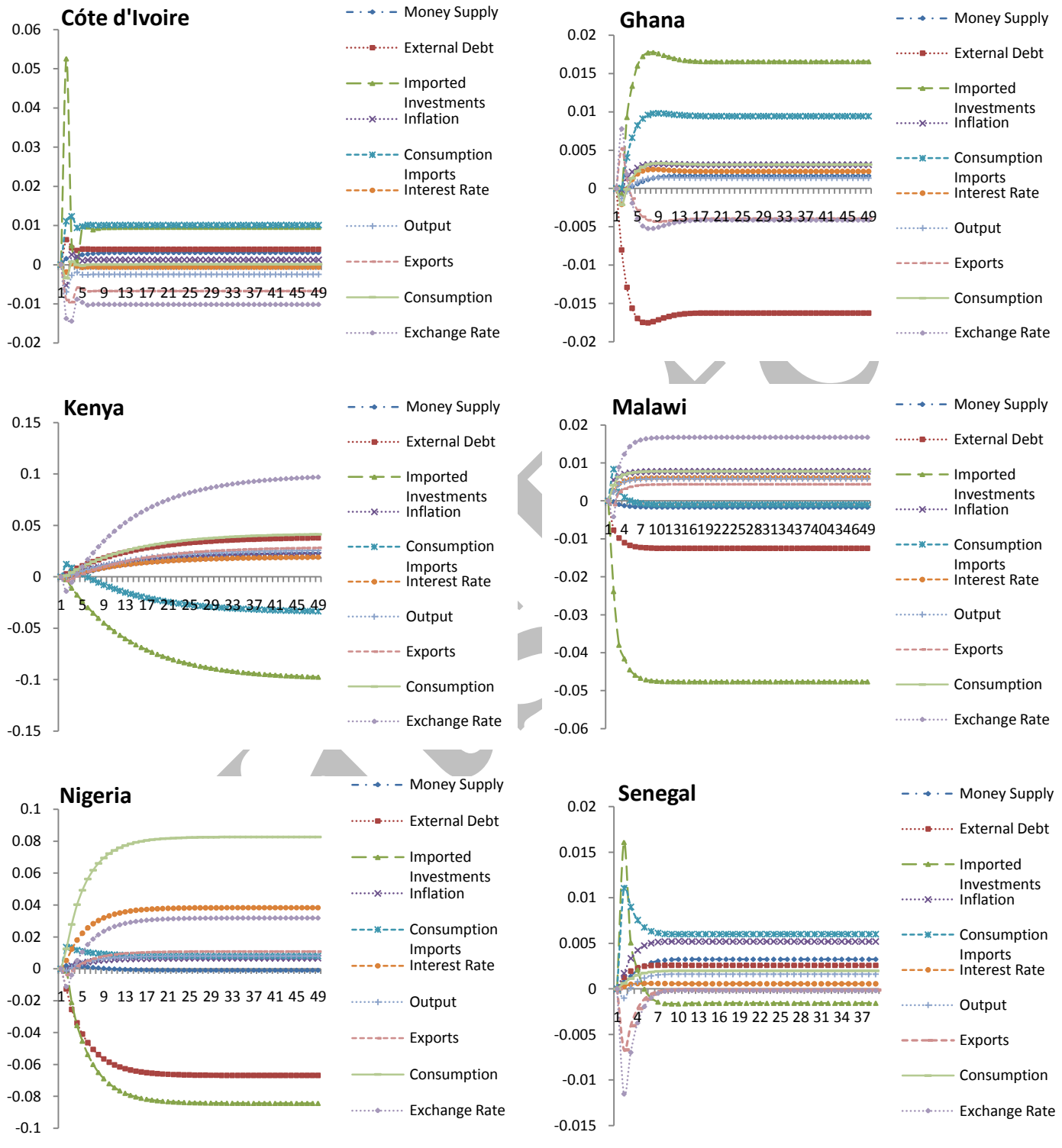
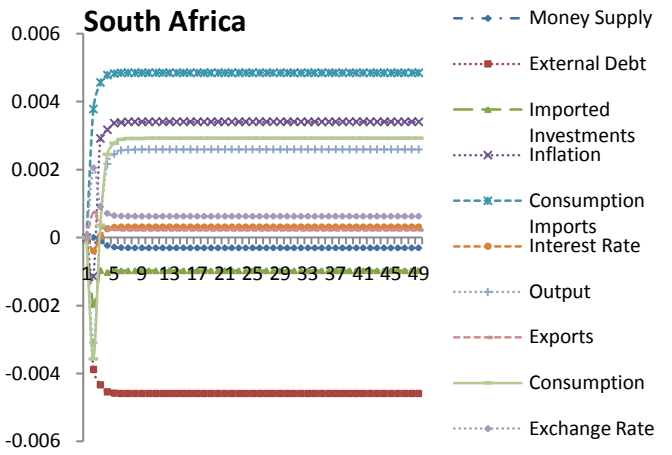
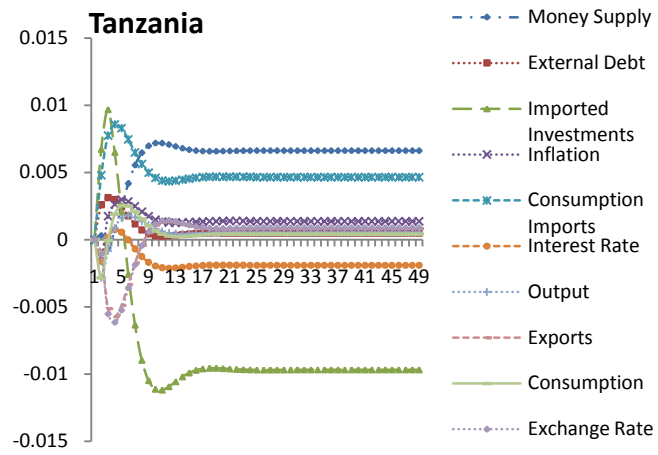
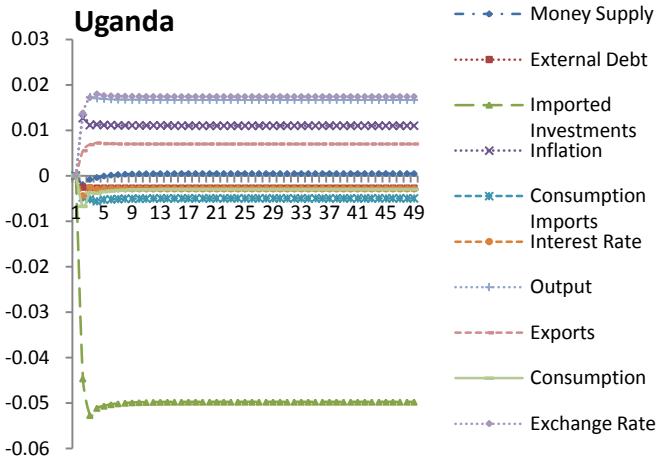

Zimbabwe
0.002
0.001
0
-0.001
-0.002
-0.003
-0.004
-0.005
-0.006
-0.007
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

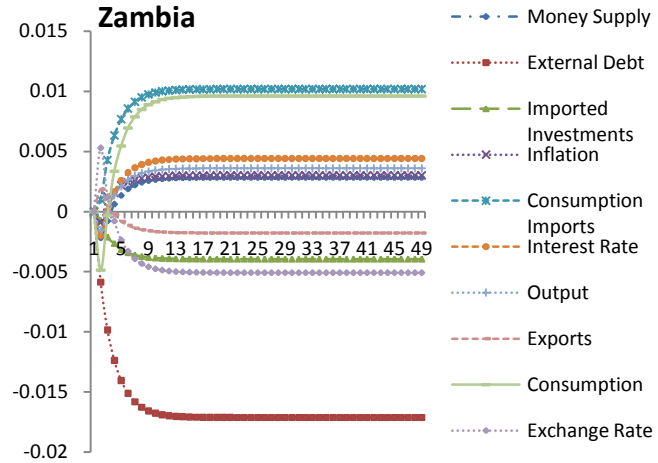
Figure E3: Permanent Shock to World Interest Rate

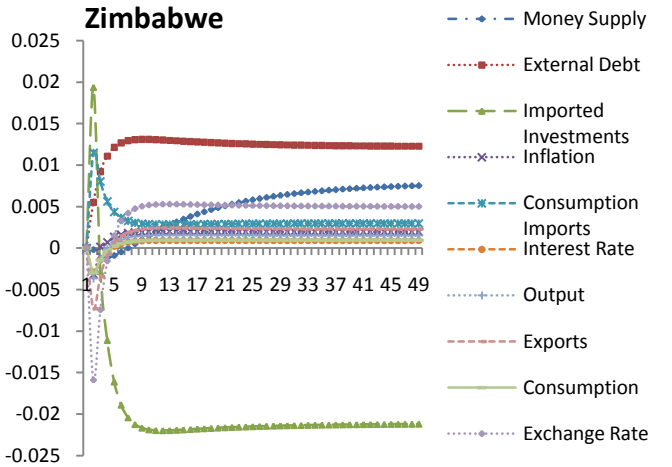



South Africa
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Tanzania
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Uganda
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zambia
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate


Zimbabwe
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
1 5 9 13 17 21 25 29 33 37 41 45 49
Money Supply
External Debt
Imported
Investments
Inflation
Consumption
Imports
Interest Rate
Output
Exports
Consumption
Exchange Rate

APPENDIX F

Table F1: Relative Volatility

Country	GDP	Inflation	Interest Rate	External Debt	Consumption	Imported Investments	Consumption Imports	Money Supply	Exchange Rate	Exports
Côte d'Ivoire	0.072189	0.731247	0.164346	1.538572	0.541842	2.490435	1.457937	1.451883	2.117511	2.117511
Ghana	0.106536	1.646655	0.440424	3.809266	0.906032	2.601618	3.238426	1.747916	3.088261	3.088261
Kenya	0.082605	0.788197	0.333963	1.072405	1.283966	1.295817	1.094292	1.03702	0.980897	0.980897
Malawi	0.082797	1.553148	0.626581	2.752612	1.750716	2.910299	2.015435	1.047465	1.873643	1.873643
Nigeria	0.119839	1.343144	0.213027	3.851184	1.249543	2.406963	2.12677	1.5028	2.496741	2.496741
Senegal	0.064026	2.187799	0.128651	3.119795	0.984741	1.919439	2.018774	1.162387	2.43498	2.43498
South Africa	0.032477	0.87816	0.74659	9.604335	0.898174	2.354405	3.049789	1.574222	2.794932	2.794932
Tanzania	0.123219	0.379105	0.726122	2.167409	1.09432	1.622753	2.029281	0.924362	1.86877	1.86877
Uganda	0.266722	1.298993	0.162495	1.495467	1.145732	1.693842	1.439536	0.919887	1.374105	1.374105
Zambia	1.697241	0.955365	0.521522	1.269325	1.005059	0.23739	0.968259	1.152829	1.575521	1.575521
Zimbabwe	0.972514	0.734592	0.478756	0.97132	1.007017	1.003591	1.372723	1.80039	1.367768	1.367768
Mean	**0.329106**	**1.136037**	**0.412952**	**2.877426**	**1.078831**	**1.866959**	**1.891929**	**1.301924**	**1.997557**	**1.997557**
Median	**0.106536**	**0.955365**	**0.440424**	**2.167409**	**1.007017**	**1.919439**	**2.015435**	**1.162387**	**1.873643**	**1.873643**
Standard deviation	**0.52641**	**0.522346**	**0.228794**	**2.466292**	**0.299612**	**0.797852**	**0.735597**	**0.323958**	**0.656455**	**0.656455**
Minimum	**0.032477**	**0.379105**	**0.128651**	**0.97132**	**0.541842**	**0.23739**	**0.968259**	**0.919887**	**0.980897**	**0.980897**
Maximum	**1.697241**	**2.187799**	**0.74659**	**9.604335**	**1.750716**	**2.910299**	**3.238426**	**1.80039**	**3.088261**	**3.088261**
Monetary Policy Shock	0.002354	0.848787	1.31628	2.809377	2.019015	5.654687	1.773335	4.18923	3.317159	1.893262
World Commodity Price Shock	0.002087	1.092427	0.75673	1.161436	1.259786	8.692964	2.21764	0.816632	4.186273	2.20678
World Interest Rate Shock	0.001855	1.07565	0.98185	2.814414	1.757304	5.15187	2.874229	0.657485	3.845703	1.358911

GDP values are the standard deviations of GDP. Relative volatility is calculated as the standard deviation of the variable divided by the standard deviation of GDP. The shocks were computed using 50 simulations and only 37 simulations were used to prepare the relative volatility. The 37 simulations tally with the years that were used in the data.

Table F2: Comovement with GDP

Country	Inflation	Interest Rate	Consumption	External Debt	Imported Investments	Consumption Imports	Money Supply	Exports	Exchange Rate
Côte d'Ivoire	0.048121	-0.3112	0.739651	0.295912	0.700591	0.804439	0.760499	0.855736	0.492541
Ghana	-0.1191	0.205502	0.942384	0.663723	0.754571	0.77181	0.778067	0.788917	0.692167
Kenya	-0.33193	-0.42454	0.92457	-0.13192	0.690899	0.379665	0.678246	-0.071	-0.11156
Malawi	-0.66245	-0.41035	0.396678	-0.04137	-0.07493	0.32186	0.234424	0.42059	-0.24037
Nigeria	0.117082	0.461994	0.455668	0.232055	0.630127	0.755677	0.604835	0.880819	0.396651
Senegal	-0.27037	-0.02755	0.93673	0.637702	0.564019	0.621684	0.604759	0.715439	0.362443
South Africa	-0.23646	0.092816	0.759308	-0.25272	0.671415	0.712665	0.638412	0.373833	-0.24753
Tanzania	0.196701	-0.02448	0.900699	0.438875	0.728959	0.810431	0.363683	0.736437	0.80681
Uganda	-0.36066	-0.74419	0.500717	0.551325	0.301782	0.884122	0.720668	0.829201	0.535196
Zambia	0.1123	-0.07371	0.8998	0.775589	0.819041	0.891971	0.666204	0.927486	0.855564
Zimbabwe	-0.05634	0.173387	0.998335	0.825421	0.985502	0.703547	0.415228	0.699926	0.859392
Mean	**-0.1421**	**-0.09839**	**0.768595**	**0.363144**	**0.615634**	**0.69617**	**0.58773**	**0.650672**	**0.400118**
Median	**-0.1191**	**-0.02755**	**0.8998**	**0.438875**	**0.690899**	**0.755677**	**0.638412**	**0.736437**	**0.492541**
Standard deviation	**0.258974**	**0.345533**	**0.218901**	**0.37422**	**0.28365**	**0.188112**	**0.174938**	**0.297823**	**0.422938**
Minimum	**-0.66245**	**-0.74419**	**0.396678**	**-0.25272**	**-0.07493**	**0.32186**	**0.234424**	**-0.071**	**-0.24753**
Maximum	**0.196701**	**0.461994**	**0.998335**	**0.825421**	**0.985502**	**0.891971**	**0.778067**	**0.927486**	**0.859392**
Monetary Policy Shock	0.857936	0.078427	0.974336	-0.04458	-0.34888	-0.07027	-0.26466	0.198	0.186964
World Commodity Price Shock	0.912536	0.338455	0.703664	0.421327	-0.48279	-0.43169	0.053218	0.563927	0.564355
World Interest Rate Shock	0.8783	0.691327	0.774791	-0.31562	-0.62894	-0.11051	0.109745	0.345045	0.379818

Comovement is calculated as the correlation of the variable to GDP. The shocks were computed using 50 simulations and only 37 simulations were used to prepare the comovement. The 37 simulations tally with the years that were used in the data.

Table F3: Debt Indicators for Selected African Countries (1970 - 2006)

	Côte d'Ivoire					Ghana					Kenya					Malawi				
Year	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP
1970	1.9738	351.63	314.32	17.318	8.1085	5.3903	421.79	1342	60.239	25.807	3.9966	289.11	217.23	38.158	29.782	2.641	182.74	463.05	55.657	46.54
1971	2.2373	298.4	575.13	24.143	10.201	6.0301	371.21	1266.6	58.098	22.47	4.2522	296.03	291.26	40.369	27.997	3.221	183.38	476.85	61.802	41.657
1972	2.7243	321.19	665.13	25.902	11.032	3.4188	467.35	580.95	63.428	28.442	3.7378	232.72	287.71	44.931	27.579	3.9357	206	484.75	72.957	43.257
1973	3.176	261.86	976.76	36.27	15.503	3.3684	267.38	389.38	78.675	30.643	4.8841	219.98	362.46	63.267	33.759	5.7593	211.24	322.38	91.095	48.355
1974	4.8925	291.67	1623.7	42.11	18.355	3.3039	252.75	748.42	76.252	26.201	7.0503	240.49	596.37	83.276	38.812	6.2447	182.44	296.22	101.11	44.161
1975	9.4632	240.83	1425.2	97.416	23.29	6.3767	302.87	499.46	82.084	26.155	14.936	325.97	744.05	127.6	39.585	6.9563	195.76	439.16	107.04	44.015
1976	11.265	317.22	2392.3	91.466	25.741	5.8088	282.25	629.06	79.721	25.773	14.811	335.42	542	130.66	42.979	6.963	196.46	1179	117.51	46.115
1977	10.927	273.91	1364.9	92.574	33.764	3.7151	246.34	587.4	104.53	33.441	20.451	544.91	315.51	104.08	36.91	10.42	288.73	518.25	215.25	56.918
1978	15.317	249.42	842.08	124.28	45.389	7.4141	311.96	391.43	128.2	34.912	13.975	262.66	589.36	140.82	40.985	19.715	244.97	771.35	281.12	62.564
1979	20.111	257.2	2810.2	144.94	55.146	8.8849	346.67	319.63	110	31.901	18.372	275.46	407	167	43.645	17.471	183.73	879.05	258.67	63.195
1980	38.659	205.45	16245	205.03	96.846	13.105	299.29	425.31	115.5	31.534	21.029	189.28	628.69	164.31	46.616	27.776	165.11	1092.6	263.69	67.056
1981	52.576	185.21	22909	279.24	102.08	14.237	173.69	573.28	184.82	36.444	26.966	201.18	1228.2	179.48	47.096	36.035	168.9	1516.7	258.67	66.366
1982	54.146	171.94	39780	315.12	112.14	15.537	173.26	472.18	207.66	36.775	30.483	210.77	1357.4	206.62	52.364	35.021	189	3031.2	321.37	73.272
1983	49.937	168.27	24139	349.01	115.35	30.386	232.83	571.88	348.52	41.06	33.774	240.03	892.72	237.94	60.682	29.258	176.81	4396	323.24	72.948
1984	37.55	144.12	44775	281.78	114.37	21.561	196.55	448.16	317.98	44.408	34.795	250.26	847.4	211.14	56.716	31.06	234.36	1452.9	257.68	72.835
1985	34.825	147.11	50089	301.9	123.7	23.545	182.56	406.34	331.65	49.803	38.665	260.7	1003.2	260.21	68.143	39.835	244.35	2077	369.66	90.224
1986	35.448	168.11	30987	307.28	142	28.296	205.26	440.18	341.05	47.954	35.606	265.72	1035.5	241.96	63.582	53.685	278.79	3906.8	425.72	97.768
1987	38.399	231.22	44596	381.06	168.98	45.754	355.11	990.34	362.2	64.72	39.765	237.29	1964.3	332.62	72.551	37.424	266.11	2354.6	441.99	115.52
1988	32.387	219.95	46531	402.02	164.19	56.288	433.2	984.85	316.83	58.834	38.988	235.66	1959.5	307.06	69.524	30.883	257.89	900.47	397.68	98.43
1989	33.227	185.37	45142	457.64	177.16	50.193	395.13	755.72	366.05	62.763	36.637	251.31	1859.8	304.39	71.191	30.903	239.78	1335.7	454.65	88.583
1990	35.438	197.01	81678	484.46	208.5	38.132	348.47	1207.3	391.11	63.445	35.409	237.25	2988	315.9	82.126	29.31	284.19	1095.6	344.11	82.775
1991	37.861	193.39	62472	537.76	219.56	27.242	275.59	645.11	385.72	62.981	32.612	224.7	5135.2	337.9	91.426	24.676	277.88	1054.6	319.05	75.496
1992	32.078	205.16	85195	513.05	224.61	27.14	272.95	1029.9	374.23	66.096	31.138	257.37	8671.3	320.47	83.909	24.859	295.9	3861.1	392.82	94.895
1993	33.223	214.76	97085	579.23	231.41	24.339	260.89	885	377.43	76.691	27.129	238.34	1628.3	305.28	123.64	22.378	271.54	2949	522.07	88.144
1994	35.172	272.24	7858.8	491.75	209.38	24.351	309.19	740.08	364.92	93.762	32.943	267.6	1211.3	266.3	99.665	22.396	297.3	4233.4	569.41	170.93
1995	23.112	248.41	3572.4	417.53	212.34	23.958	408.48	683.59	340.72	85.094	30.411	302.15	1902.1	245.77	80.796	24.912	276.48	1946.4	472.3	160.13
1996	26.526	267.06	3222.9	376.73	203.62	25.007	331.66	622.15	325.55	83.571	27.547	306.34	878.13	224.06	56.564	15.89	269.01	1025.8	415.3	101.31
1997	26.188	260.84	2524.2	300.63	153.99	29.547	363.03	924.87	334.55	82.979	21.892	306.45	797.08	215.5	49.293	14.373	280.6	1524.8	375.82	83.531
1998	25.668	193.93	1736.1	275.55	139.87	18.484	314.29	1381.8	243.86	84.438	22.938	337.05	871.46	236.23	48.42	14.844	346.5	940.89	417.97	139.28
1999	26.783	234.65	2089.2	243.41	122.1	16.865	281.78	1200.5	254.86	83.269	25.436	399.12	817.95	237.79	50.208	13.96	369.97	1095.9	523.2	154.36
2000	22.613	189.32	1817.4	269.02	116.43	15.608	289.91	1979.9	245.77	122.87	20.944	416.79	684.4	217.86	48.419	13.35	297.95	1097.3	573.78	155.14
2001	13.32	246.73	1140.1	249.26	111.33	11.361	311.6	1687.2	257.73	119.47	15.572	438.67	518.4	177.61	42.512	9.4477	296.07	1254.2	533.44	150.56
2002	13.854	269.02	632.82	196.48	114.86	6.7737	197.45	1094.5	264.87	113.02	16.024	458.11	573.68	185.23	46.602	7.6483	211.37	1740.4	603.03	108.32
2003	8.6371	403.81	934.66	184.03	120.72	13.852	513.06	515.14	230.96	99.328	15.5	436.04	463.44	183.88	46.087	8.2034	225.16	2432	609.43	127.78
2004	4.9848	689.7	781.09	168.03	128.92	6.8718	283.46	403.9	199.99	79.657	7.5837	418.76	455.32	147.27	42.996	12.186	241.63	2564	694.65	130.56
2005	3.5221	604.61	904.61	137.01	116.86	6.9909	296.47	355.44	166.44	62.898	9.2298	589.06	357.31	110.21	34.249	15.534	323.04	1923.4	653.25	111.49
2006	2.9236	533.02	713.32	139.27	120.46	4.9294	305.19	140.91	60.278	25.144	6.4343	454.11	270.45	98.51	29.068	17.713	395.43	614.64	177.87	27.574

	Nigeria					Senegal					South Africa					Tanzania				
Year	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP
1970	0.587	344.16	374.36	79.326	6.669	1.6512	508.55	658.73	20.461	14.24	..	..	30.208	7.8216	1.7878	2.3036	245.08	326.86	68.948	2.9532
1971	0.57	313.97	222.34	96.54	10.459	2.4324	384.57	619.09	21.289	14.507	..	..	74.83	12.845	2.9428	2.8867	231.92	1984.4	360.98	13.907
1972	0.5943	302.75	276.87	80.352	8.8131	2.355	285.42	419.89	21.603	12.647	..	..	36.841	11.942	3.1636	3.3552	213.44	1192.1	370.98	13.709
1973	1.4954	598.53	285.62	73.706	11.732	5.466	491.04	1653.1	26.696	13.546	..	..	20.103	6.8149	1.8241	4.3457	222.21	1236.7	419.9	14.368
1974	1.2192	460.46	32.943	30.063	7.5693	6.4678	270.12	4193.9	42.998	15.984	..	..	19.853	7.2868	2.1008	5.3696	219.75	4107.4	433.45	14.559
1975	1.52	594.11	29.779	33.119	6.0736	5.8389	217.79	1121.5	48.379	15.614	..	..	40.228	11.27	3.2427	8.5474	214.23	3660.4	571.81	15.331
1976	2.2187	903.79	25.449	20.227	3.6845	5.9573	238.69	1624.5	54.71	18.073	..	..	71.453	14.93	4.2953	6.4222	185.82	2459.4	436.07	13.497
1977	1.038	265.3	72.566	35.105	8.7315	6.4732	263.21	1741.2	69.244	27.064	..	..	77.223	12.805	3.9579	8.318	188.79	1252.2	537.65	12.203
1978	1.2822	224.87	250.94	71.283	13.938	15.339	357.18	3765.7	120.85	34.539	..	..	51.66	9.0368	3.0039	16.895	270.25	4435.6	708.41	5.7763
1979	2.1729	152.36	105.85	53.245	13.213	16.587	300.2	3302.1	126.55	34.792	..	..	19.915	5.4658	1.983	14.354	238.23	6276.9	612.54	4.9347
1980	4.1437	126.65	83.85	47.305	13.896	28.655	273.65	5854.5	162.75	42.054	..	..	9.815	2.6628	0.9593	21.152	201.15	26221	698.74	4.6695
1981	9.1806	154.91	273.98	84.6	19.06	17.14	192.81	8274.4	156.64	52.592	..	..	23.37	4.2154	1.1732	22.06	201.03	30919	719.82	3.9723
1982	16.181	167.23	621.44	147.2	24.057	12.779	157.83	7538.5	192.59	59.813	..	..	31.01	5.952	1.5271	28.646	179.46	128543	1169	3.8555
1983	23.56	181.84	1402.6	369.11	50.245	11.328	154.96	8908.3	201.71	74.724	..	..	32.216	5.6507	1.4213	33.427	224.96	35354	1397.2	4.4134
1984	32.901	209.78	1061.5	424.59	63.055	16.713	162.2	17398	227.41	81.211	..	..	62.818	7.8762	1.8519	25.711	218.92	26890	1428	5.0681
1985	32.732	257.12	985.44	407.66	65.627	20.813	210.46	17610	281.17	86.4	..	..	65.132	6.5028	1.8425	39.853	316.86	56905	2085.2	4.4297
1986	37.998	254	1645.4	642.88	109.9	26.145	222.07	15596	281.89	77.106	..	..	49.118	5.2363	1.3927	35.086	256.16	8023	1098.7	5.9924
1987	14.126	170.9	1937.6	432.73	123.8	32.377	239.78	17369	337.7	80.083	..	..	32.153	4.073	1.0704	39.184	229.21	17321	1379.9	8.7221
1988	30.355	145.58	3174.9	560.7	129.65	31.356	243.28	17411	314.21	78.094	..	..	47.884	3.7666	0.9205	31.924	212.12	7735.2	1185.5	117.86
1989	24.664	140.19	1475.8	386.4	126.33	28.62	201.49	10700	246.2	66.732	..	..	35.317	2.8937	0.6206	32.953	289.85	10796	1088.4	132.41
1990	22.581	154.75	809.9	270.41	117.44	19.914	253.55	16967	230.62	65.665	..	..	29.268	2.7177	0.6749	32.894	291.07	3347.5	1185.8	151.55
1991	21.949	141.41	716.7	329.83	122.75	20.885	254.23	15293	241.25	63.899	..	..	23.855	2.8153	0.6323	39.947	336.93	3217	1278.2	132.35
1992	28.715	200.4	2426.2	210.03	88.714	13.44	309.22	16719	236.49	61.354	..	..	25.873	2.8794	0.6359	40.124	374.3	2037.7	1141.3	144.96
1993	12.505	163.49	1873.6	305.47	143.94	9.3804	305.16	25807	281.68	67.002	..	..	53.101	5.0979	1.1724	26.814	196.91	3337.3	862.64	159.39
1994	17.948	166.34	2006.6	334.91	139.85	17.13	290.28	1938.8	270.4	95.373	9.3676	470.01	657.72	69.966	15.961	18.942	273.63	2182	748.11	160.63
1995	13.837	200.36	1994.7	273.86	121.29	16.844	326.53	1440.8	233.16	80.261	9.541	396.53	568.11	71.355	16.781	17.924	269.81	2746.6	572.22	141.22
1996	14.008	229.99	725.43	184.8	88.973	19.126	224.6	1313.3	247.54	74.738	11.584	459.02	1112.8	71.229	18.124	18.92	261.73	1678.5	519.32	113.71
1997	7.7909	245.74	365.69	174.72	78.541	17.484	276.43	985.41	264.97	81.45	17.233	769.6	424.22	66.577	16.983	13.458	354.86	1110.8	550.91	89.929
1998	11.324	238.45	415.08	281.12	94.247	20.731	301.25	950.95	262.57	80.992	12.166	491.79	449.39	68.626	18.432	20.091	231.24	1219.8	619.65	87.186
1999	6.9068	231.95	515.56	227	83.758	14.497	311.21	984.4	240.04	77.023	12.071	526.67	318.91	67.278	17.951	19.096	254.16	987.14	645.06	88.623
2000	8.1725	244.65	310.46	126.33	68.187	14.336	293.11	943.23	231.84	77.197	9.7727	519.88	322.78	62.929	18.71	12.785	269.44	711.43	516.86	76.34
2001	12.187	302.66	291.56	150.42	64.67	12.341	323.58	820.66	213.11	75.253	11.344	506.26	315.33	62.648	20.299	8.3473	320.49	539.93	341.75	66.148
2002	7.6289	436.24	402.76	161.77	51.552	11.689	298.71	644.89	218.1	77.061	12.285	612.67	321.09	64.462	22.637	5.5001	253.34	447.5	346.82	70.111
2003	5.7438	386.69	467.97	120.11	51.289	10.338	312.58	395.07	185.92	63.997	5.7532	422.81	336.31	55.006	16.455	4.0789	228.24	342.96	310.31	67.987
2004	4.2716	305.74	219.53	98.119	43.125	11.827	452.57	284.34	138.91	49.092	3.9832	371.38	182.13	44.318	12.551	4.4419	228.46	339.99	289.95	68.758
2005	15.784	177.38	77.46	42.457	19.758	9.7703	352.81	324.54	186.41	44.491	4.5479	381.69	150.79	43.751	12.832	4.35	262.49	380.53	256.95	55.128
2006	..	1787.9	18.249	12.3	5.31	8.925	259.45	145.06	88.951	20.862	6.6898	461.75	138.9	43.459	13.826	3.434	233.88	187.66	128.68	29.905

Source: World Bank's Global Development Fund, 2009. South Africa's debt data is extracted from the Reserve Bank of South Africa. RES stands for International Reserves. The other acronyms are as defined in the tables 2.3 to 2.5 in chapter two. Africa in this study means countries referred to as Sub-Saharan African countries.

	Uganda					Zambia					Zimbabwe					Africa				
Year	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP	TDS/XGS	TDS/RES	ETD/RES	ETD/XGS	ETD/GDP
1970	2.7335	199.67	267.74	45.868	12.042	5.8789	245.88	158.01	63.287	45.48	0.7789	205.49	390.96	19.196	12.332	4.9579	20.939	224.23	53.093	10.621
1971	2.8835	204.32	640.19	52.331	12.162	7.0305	232.31	299.95	66.477	51.857	0.8463	183.96	571.99	19.357	10.947	5.4761	26.652	322.42	66.247	13.168
1972	2.8945	211.48	494.3	54.028	11.919	9.8271	314.04	550.47	73.319	50.381	0.9561	196.39	225.37	18.294	8.172	5.2005	20.718	257.37	64.603	13.459
1973	7.438	525.7	602.93	53.238	10.314	31.2	408.99	495.49	83.722	42.333	1.3803	289.67	104.1	18.588	6.5717	6.4919	24.904	233.78	60.941	13.679
1974	4.191	343.28	1205.8	60.703	9.6271	10.542	261.47	611.24	93.346	41.094	1.2305	291.21	132.24	18.397	5.46	3.8356	10.702	137.38	49.237	13.14
1975	5.0154	645.39	674.39	62.919	8.8666	12.667	319.5	1013.4	125.34	68.721	0.6248	354.03	144.65	14.688	4.2746	5.1849	14.98	180.39	62.435	14.265
1976	6.3251	1155.3	547.66	75.569	9.9658	13.697	264.91	1638.5	144.16	70.922	0.5514	350.24	128.08	10.737	3.3323	5.298	18.665	228.98	64.995	15.085
1977	4.9051	520.12	637.11	92.029	10.242	20.266	344.47	2477.9	183.18	92.633	0.583	345.54	204.3	19.623	4.5702	5.0981	22.36	332.39	75.783	19.275
1978	6.672	987.97	809.93	127.94	17.636	31.169	339.2	2664.8	270.22	91.511	0.8052	194.74	241.9	42.924	10.251	5.8228	32.206	513.87	92.906	22.649
1979	7.8641	1165.9	2575.7	168.71	27.502	22.071	367.48	1587.9	197.72	90.467	1.173	199.93	129.45	45.049	10.801	6.0871	22.771	309.66	82.778	22.404
1980	17.352	467.51	23017	208.8	55.48	25.228	291.03	1574	199.67	83.533	3.7817	255.47	187.39	45.582	11.763	8.0602	29.085	264.69	73.352	21.956
1981	24.94	381.33	2357	258.19	52.881	35.884	329.88	2530.2	308.16	89.907	6.4245	147.09	355.18	74.977	15.726	10.948	61.699	561.98	99.723	25.033
1982	18.205	222.88	1116.4	251.92	40.156	30.929	243.14	2324.9	339.08	94.494	13.197	129.8	584	118.73	21.915	13.052	82.863	823.85	129.77	29.411
1983	23.401	242.78	947.49	274.42	45.04	29.115	237.77	2729.1	365.72	112.85	36.907	311.42	729.42	160.16	28.226	14.598	93.867	999.94	155.51	35.171
1984	30.337	259.38	1581.9	253.3	29.711	24.981	218.7	6844.9	385.77	138	26.159	195.07	838.51	159.33	34.316	17.152	127.8	1166.3	156.54	38.18
1985	41.676	311.86	4538.8	332.59	35.189	15.724	208.45	2231.4	517.19	199.21	29.044	241.47	698.67	166.13	42.816	18.984	130.85	1273.9	184.83	47.348
1986	40.716	342.05	4872	337.58	36.269	52.077	265.63	7879.1	760.44	338.46	31.137	275.64	828.73	171.54	42.162	16.947	104.71	1302.9	210.86	51.662
1987	47.93	369.84	3545.1	580.22	30.873	18.991	230.71	5850.6	719.32	286.08	32.285	311.52	778.63	174.85	42.787	12.567	76.161	1278.6	210.98	53.444
1988	75.685	464.86	3936.6	728.79	29.817	15.105	244.72	4803.5	535.19	179.52	28.48	299.88	791.15	143.93	34.49	14.002	99.547	1484.1	208.76	51.58
1989	67.632	407.65	15576	790.84	41.622	13.316	312.35	5326.1	459.41	164.06	22.375	250.55	1028.4	143.77	34.031	12.289	79.573	1326.9	204.92	51.862
1990	81.364	402.94	5924.2	1465.6	60.539	14.733	263.04	3431.6	507	209.98	23.145	234.83	1111	161.12	37.328	13.765	70.671	1147.3	223.46	58.529
1991	74.798	327.9	4758.3	1424.2	84.392	46.875	194.71	3616.5	549.86	206.07	23.082	236.46	1177.4	174.25	40.195	13.649	56.461	1018.8	246.28	58.698
1992	59.657	331.9	3125.8	1555	103.29	32.305	208.1	2926	619.31	210.51	32.299	284.21	1019.8	221.92	61.096	12.712	71.385	1292.7	230.2	58.095
1993	51.458	441.09	2085.9	1017.7	94.796	34.043	238.52	3368.2	609.81	197.89	30.999	298.61	676.51	210.77	64.742	9.7876	47.981	1279.1	260.93	65.579
1994	27.499	391.84	1057.2	628.13	85.143	36.048	221.72	2539.3	655.3	203.45	25.204	269.78	766.28	189.13	65.1	14.951	67.974	1283.9	282.41	76.654
1995	19.837	354.6	786.52	529.17	62.701	257.54	478.95	3124.3	685.89	200.07	30.945	267.56	561.91	242.78	70.159	15.933	71.53	1142.5	254.5	72.03
1996	18.202	344.25	702.26	455.99	61.386	24.466	264.7	3170.1	688.98	215.88	30.94	274.69	597.41	242.09	58.28	14.833	65.607	1001.1	226.35	68.077
1997	20.171	367.76	616.89	489.86	62.332	19.372	302.49	2785.5	524.81	170.31	31.937	303.96	1272.6	235.56	57.915	15.542	51.906	725.99	217.38	62.54
1998	20.796	473.09	543.42	534.71	59.863	20.956	289.63	9902.3	712.48	212.23	44.609	457.75	1484.5	217.44	75.804	15.672	49.194	789.95	251.66	68.936
1999	13.811	384.16	458.33	369.26	58.307	16.094	164.75	12898	635.17	187.12	29.356	349.42	899.75	202.5	72.477	14.371	44.751	710.16	228.05	65.003
2000	7.752	282.14	432.76	366.43	56.462	20.799	211.04	2337.4	641.84	176.74	20.159	304.02	1191.2	183.38	51.727	11.705	36.988	578.69	183.13	61.795
2001	4.673	284.94	379.44	347.95	63.886	17.189	323.51	3327.4	567.16	167.83	8.0085	327.93	3005.3	171.48	35.003	12.864	37.707	550.87	187.94	60.475
2002	6.127	279.76	426.1	345.99	64.023	20.667	364.16	1231.7	605.61	177.37	5.167	183.25	2951.7	185.05	17.751	11.783	35.03	564.62	189.92	58.196
2003	7.2144	307.24	420.51	390.82	68.786	42.388	309.68	2744.8	516.65	155.46	2.571	397.95	..	212.87	60.609	7.9012	27.478	559.56	160.9	51.489
2004	6.9671	277.98	363.32	322.47	65.816	21.702	626.37	2211.3	346.9	134.93	6.1739	571.49	..	227.5	101.6	6.2686	18.039	379.54	131.89	43.479
2005	9.3002	479.62	329.34	239.95	47.988	10.871	434.31	960.69	209.1	73.178	11.257	889.81	..	202.77	124.48	9.0446	24.608	262.35	96.427	33.828
2006	4.8183	386.4	69.847	53.148	12.704	3.6576	298.86	307.29	52.346	20.316	4.0533	161.52	..	221.44	..	8.1198	19.042	150.17	64.036	23.282

Source: World Bank's Global Development Fund, 2009. South Africa's debt data is extracted from the Reserve Bank of South Africa. RES stands for International Reserves. The other acronyms are as defined in the tables 2.3 to 2.5 in chapter two. Africa in this study means countries referred to as Sub-Saharan African countries.

Table F4: Summary Statistics

Region	Statistic	Relative Interest Rate	Inflation	Legal	Political	Debt to GDP Ratio	Short-term Debt to Reserves Ratio	Exports to GDP Ratio	Consumption Imports to GDP Ratio	GDP	Imported Investments to GDP Ratio	Terms of Trade	Exports to Imports Ratio	Log of Exchange Rate
Africa	Mean	0.544	0.207	-0.551	-0.547	-0.408	0.064	0.277	0.374	0.082	-1.77	1.149	0.751	0.830
	Standard Error	0.017	0.014	0.036	0.048	0.029	0.045	0.007	0.010	0.009	0.019	0.029	0.012	0.091
	Skewness	1.288	3.491	-0.189	-0.068	-1.135	-0.260	0.772	2.381	0.872	-0.583	2.546	0.020	-0.763
	Kurtosis	5.040	17.636	2.577	2.544	3.915	6.835	5.263	17.446	7.394	3.920	11.339	3.622	2.951
	Observations	418	366	116	116	366	335	366	365	348	417	418	407	418
Latin America	Mean	0.385	0.299	-0.111	-0.086	-0.376	-0.158	0.222	0.226	0.092	-2.147	1.115	1.027	-0.675
	Standard Error	0.018	0.020	0.061	0.054	0.128	0.025	0.006	0.007	0.009	0.187	0.020	0.015	0.187
	Skewness	1.792	1.770	0.856	0.366	-0.087	-2.927	0.757	1.333	-0.879	-3.730	1.093	1.563	-1.451
	Kurtosis	7.052	7.797	3.349	2.252	2.982	25.458	3.314	4.792	8.089	17.172	4.744	6.223	4.507
	Observations	380	347	111	111	347	343	347	347	347	347	380	347	380
East Asia	Mean	0.718	0.083	0.030	-0.021	0.086	-0.739	0.409	0.397	0.117	0.298	0.833	1.017	4.255
	Standard Error	0.0214	0.006	0.067	0.069	0.026	0.025	0.017	0.015	0.010	0.015	0.012	0.012	0.181
	Skewness	0.839	2.861	-0.324	-0.276	0.935	1.171	1.707	1.425	-0.551	5.857	0.232	0.392	0.259
	Kurtosis	4.136	14.274	1.747	1.900	5.440	6.809	5.523	4.320	7.156	41.091	2.644	3.674	1.836
	Observations	190	185	60	60	190	186	190	190	185	190	190	190	190

Table F5: Correlation Matrices

Africa

	Relative Interest Rate	Inflation	Legal	Political	Debt to GDP	Short-term Debt to Reserves	Exports to GDP	Consumption Imports to GDP	GDP	Imported Investments to GDP	Terms of Trade	Exports to Imports	Log of Exchange Rate
Relative Interest Rate	1.0000												
Inflation	-0.3109	1.0000											
Legal	0.0559	-0.1245	1.0000										
Political	0.1084	-0.1695	0.8855	1.0000									
Debt to GDP	-0.0910	0.1170	-0.2939	-0.3726	1.0000								
Short-Term Debt to Reserves	0.0860	0.2639	0.1853	0.0220	0.1585	1.0000							
Exports to GDP	-0.1697	0.0279	-0.3593	-0.3542	0.2439	0.2385	1.0000						
Consumption Imports to GDP	-0.2454	0.0272	-0.1283	-0.1383	0.4650	0.1674	0.7407	1.0000					
GDP	-0.2247	0.4017	-0.1824	-0.1152	-0.1023	-0.0902	0.0441	0.0070	1.0000				
Imported Investments to GDP	0.2645	-0.1706	0.5281	0.5662	-0.1953	0.2070	-0.1958	-0.0890	-0.0803	1.0000			
Terms of Trade	0.2031	0.1047	0.0444	0.1194	0.0034	-0.1511	-0.3088	-0.1120	-0.0364	-0.5034	1.0000		
Exports to Imports	-0.0719	-0.1501	-0.0465	0.0001	-0.3253	0.1331	0.4458	0.1042	-0.0014	-0.1557	-0.0504	1.0000	
Log of Exchange Rate	-0.2064	0.0325	-0.2302	-0.2133	0.2726	0.1582	0.2645	0.1393	0.1026	-0.1004	-0.2957	0.0099	1.0000

Latin America

	Relative Interest Rate	Inflation	Legal	Political	Debt to GDP	Short-term Debt to Reserves	Exports to GDP	Consumption Imports to GDP	GDP	Imported Investments to GDP	Terms of Trade	Exports to Imports	Log of Exchange Rate
Relative Interest Rate	1.0000												
Inflation	0.0819	1.0000											
Legal	-0.5755	-0.1753	1.0000										
Political	-0.3921	-0.1654	0.8857	1.0000									
Debt to GDP	0.2051	0.2073	-0.0260	0.0963	1.0000								
Short-Term Debt to Reserves	0.2406	0.0592	-0.0592	0.0946	0.5367	1.0000							
Exports to GDP	0.3307	0.0794	0.0567	0.1905	0.2853	-0.0892	1.0000						
Consumption Imports to GDP	0.2784	-0.0320	0.0974	0.2004	0.2754	-0.0100	0.7966	1.0000					
GDP	-0.0287	0.2721	-0.0140	-0.0175	0.0497	-0.1618	0.2487	0.0362	1.0000				
Imported Investments to GDP	0.2057	-0.0456	-0.0816	0.0177	0.2543	-0.0353	0.4853	0.7896	-0.0233	1.0000			
Terms of Trade	-0.0547	-0.1291	0.0453	0.2418	0.0508	0.1142	0.0515	0.2129	0.0196	0.4411	1.0000		
Exports to Imports	0.1308	0.1993	-0.2220	-0.1081	0.0908	-0.0928	0.2676	-0.3246	0.3498	-0.3508	-0.1321	1.0000	
Log of Exchange Rate	0.3395	0.0565	-0.0122	-0.0888	0.3196	0.0967	0.4136	0.4163	-0.0126	0.1266	-0.4071	-0.0844	1.0000

East Asia

	Relative Interest Rate	Inflation	Legal	Political	Debt to GDP	Short-term Debt to Reserves	Exports to GDP	Consumption Imports to GDP	GDP	Imported Investments to GDP	Terms of Trade	Exports to Imports	Log of Exchange Rate
Relative Interest Rate	1.0000												
Inflation	-0.4005	1.0000											
Legal	0.7275	-0.4780	1.0000										
Political	0.7055	-0.4924	0.9583	1.0000									
Debt to GDP	-0.7493	0.4354	-0.7801	-0.7144	1.0000								
Short-Term Debt to Reserves	-0.6700	0.3702	-0.7518	-0.6885	0.8519	1.0000							
Exports to GDP	0.4797	-0.3166	0.4299	0.3154	-0.7054	-0.6714	1.0000						
Consumption Imports to GDP	0.4941	-0.3081	0.4411	0.3277	-0.7078	-0.6735	0.9668	1.0000					
GDP	-0.0591	-0.4253	-0.0737	-0.0889	-0.1109	0.0173	0.1334	0.0345	1.0000				
Imported Investments to GDP	0.2726	0.0229	0.5401	0.4790	-0.2846	-0.3253	-0.0767	-0.0022	-0.4110	1.0000			
Terms of Trade	0.0909	-0.2125	0.1120	0.1265	-0.0834	-0.0411	0.1910	0.0060	0.4752	-0.2434	1.0000		
Exports to Imports	-0.0453	-0.1378	-0.0735	-0.0936	-0.0587	-0.0181	0.2820	0.0434	0.4557	-0.3017	0.7649	1.0000	
Log of Exchange Rate	-0.4783	0.3654	-0.4828	-0.4194	0.5943	0.5709	-0.8262	-0.9052	0.1619	-0.0343	0.1382	0.1627	1.0000