MEASUREMENTS, DETERMINANTS AND CONSEQUENCES OF CAPITAL FLIGHT IN SUB-SAHARAN AFRICAN COUNTRIES

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Abstracts

Contrary to the theory of capital movement, capital is flying from capital scarce developing countries to capital abundant developed countries. The Study therefore attempts to investigate the capital flight issue in fourteen Sub-Saharan African countries. More specifically this study aims to; examine the size and magnitude of capital flight using alternative methods of measurement, Analyze the economic factors responsible for capital flight and Assess the consequences of capital flight on the domestic economy using econometric technique.

As found out that the size of capital flight is very large for fourteen sub-Saharan African countries especially for Nigeria, Ethiopia and Cote d' Ivoire. Using a panel cointegration technique it is observed that the factors determining capital flight are many and vary from long-to short run. Moreover it is shown econometrically that capital flight has a negative impact on the sample countries.

From the estimate it can be inferred that policy makers in sub Saharan African countries must pay more attention on their foreign capital utilization, exchange rate policy, domestic credit policy and over all economic policies that aim at accelerating growth if these countries are to benefit from capital flight reversal.

Key Words: Capital Flight; Sub-Saharan Africa; Panel cointegration; Portfolio selection

ACKRONYMS

SSA	Sub Saharan Africa
GDP	Gross Domestic Product
WDI	World Development Indicators
NEPAD	New Partnership for Africa's Development
SILIC	Severely Indebted Low-Income Countries
ODA	Official Development Assistance
IMF	International Monetary Fund
ECM	Error Correction Model

CHAPTER I: INTRODUCTION

1.1. Background of the study

Most Sub-Saharan African countries have experienced declines in their measure of economic performance. According to WDI (2002), various social and economic indicators also show the deterioration of the living standard in the sub continent. To reverse these situations, in late 1970s and 1980s, African countries started to accept large amount of private loans at higher interest rates that leads to the deterioration of their ability to service the debt and the African debt crisis explodes since then. More recently, the external debt of a group of 41 countries in the world, referred to as heavily indebted poor countries – 32 of which are classified as severely indebted - has been receiving more attention. Most of the severely indebted low-income countries that have been having problems in managing their debt – service obligations are in Sub-Saharan Africa.[1] Nowadays, it has become a common practice for these countries governments to work hard on getting debt cancellation from creditor countries, even though, to some extent the 'doctrine of odious debt' [2] could probably be applicable due to " capital flight" issue. Such individual attempts in getting debt cancellation is now being coordinated in the form of reports by different committees like NEPAD, Commission for Africa etc as a voice of African Countries. In addition to this, in the 1990s, the ratio of investment to GDP in Sub Saharan Africa hovered around 17 percent of GDP, well below the ratios attained in the developing countries of Latin America (20 – 22 %) and Asia (27 – 29%).

These accumulations of external debt and low level of investment in Sub-Saharan African Countries are attributed to many factors and in many instances accompanied by substantial

[1] The severely indebted low-income countries of SSA are Burundi, Central African Republic, cote d' ivory, equatorial Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Mali, Mauritanian, Mozambique, Niger, Nigeria, Rwanda, Sao tome and Principe, sierra Leone, Somalia, Sudan, Tanzania, Uganda, Zaire, and Zambia.

[2] 'An interest, which a creditor possesses in a debt, must, in order to constitute a acquired right protected by international law, be an interest in funds utilized for other purposes is debt intrinsically "hostile to the interests of the territory" (O'Connell, 1967, p. 459) as cited in Ndikumana and Boyce, 1998).

"Capital Flight."[3] Massive capital outflows from a number of developing countries have contributed to the foreign exchange scarcity that has arrested economic development in much of the Third World during the 1980s (Lessard and Williamson, 1987).

Some estimates show that the Sub-Saharan African region is a "net creditor" to the rest of the world in the sense that private assets held abroad as measured by accumulated capital flight exceed total liabilities as measured by stock of debt (Boyce and Ndikumana 2002). In addition, Sub-Saharan Africa has a larger share of private wealth held abroad as compared to other developing regions (Collier, Hoeffler, and Pattillo, 2001).

According to a recent estimate done in 2002, for every dollar of external borrowing in the region, roughly 80 cents flowed back as capital flight in the same year. Capital flight also exhibits a high degree of persistence in the sense that past capital flight is correlated with current and future capital flight (Boyce and Ndikumana, 2002).

The magnitude of capital flight from developing countries usually indicates a serious breakdown in domestic policies. Cline (1995) claims that it is largely with in the power of debtor countries to limit capital flight by adopting appropriate domestic policies on interest rates, the exchange rate, capital account convertibility, and fiscal balances. Furthermore it is argued that the main sources of financial flows for growth in the developing world are direct foreign investment and the reversal of capital flight (Husain and Underwood, 1991).

Thus, this paper assesses the Capital flight issue and its effect on the Sub-Saharan African countries' economy in view of its importance, if it is reversed, for these countries and lost opportunities due to flight capital.

[3] Capital flight is that part of outflow of resident capital which is motivated by economic and political uncertainty.

1.2. Statement of the problem

In their developmental process, developing countries are usually net foreign borrowers. By supplementing domestic savings with external resources, a more desirable path can be attained. Often, however, residents of these countries place their wealth abroad simultaneously with their search for external finance. The issue of such type of behavioral phenomenon is the concern of policy makers in these developing countries. Capital flight largely escapes domestic taxation, and is therefore an impediment to the country's ability to make future debt repayments. Moreover, capital flight imposes a constraint on the already poor and low economic growth by exacerbating the unavailability of domestic sources of investment financing. Given its possible disruptive effects on domestic investment, the foreign exchange market and public finances, capital flight thus becomes a serious policy concern. Considering the magnitude and causes of flight provides a basis for choosing the appropriate policy response.

In Sub-Saharan African countries the protracted period of political and economic instability, has increased the probability of substantial capital flight, which could in turn hinder economic growth by lowering the accumulation of investable capital in these countries' economies. Moreover, lack of appropriate economic policies, like exchange rate, taxation, interest rate, investment etc, is likely to encourage capital flight from Sub-Saharan African countries by increasing the probability of financial risks in asset holdings.

Even though the theoretical expectation as far as the capital mobility issue is concerned is that it flows from areas or economies where capital is relatively abundant/cheap and the rate of return on capital is low to those economies where capital is relatively scarce and the rate of return on capital is high, Sub-Saharan African countries are reported to be a "net creditor" to the rest of the world rather than being a "net debtor" from the rest of the world, (Ndikumana & Boyce, 2001).

In this paper, therefore, attempts are made to measure the size and magnitude of capital flight for the period 1980 – 2003 using three definitions that have emerged in the literature. This helps to answer questions related to the episode of capital flight and its current status in Sub-Saharan African countries. The sample period of the study represents a significant extension of previous studies of capital flight done on Sub-Saharan African countries. This is to investigate the capital flight problem in the recent past. In addition to this, for proper policy prescription, an econometric, i.e. panel data; investigation of the determinants of capital flight from the region is employed. This is based on the standard theoretical portfolio selection model[4]. Finally this study also examines the possible impact of capital flight on selected Sub-Saharan African countries in the sample using the lost opportunity approach and econometric analysis.

[4] See chapter 3 for detail analysis of portfolio selection model.

1.3. Objectives of the study

Despite the importance of reversing past capital flight to Sub Saharan African countries and avoiding further placement of private capital in foreign currency abroad, domestic capital is still fleeing out of the reach of the home economy. Thus, the purpose of this study is to analyze the issue of capital flight from Sub Saharan African countries, i.e., to see weather capital flight is reversed or not in the recent past, its determinants and consequences in these economies.

Specifically, this study aims to:

- Examine the size and magnitude of capital flight for the period 1980-2003; using alternative methods of measurement.
- Analyze the economic, mainly macroeconomic, and other factors responsible for capital flight for the sample period 1981 - 2001[5];
- Assess the consequences of capital flight on the domestic economy for the sample period 1981 - 2001;

[5] The sample period is limited to 1981 – 2001because of data problem on some of the variables involved in the analysis of capital flight determinants & its consequences.

1.4. Testable hypothesis

The methods and the models adopted in this study help in measuring estimates of capital flight and explain the causes as well as consequences of it in the context of Sub Saharan African countries.

Thus, given the objectives stated above, this study hypothesizes that: -

- There is huge capital flight from Sub-Saharan African countries during the sample period and hence; they could be "net creditor" to the rest of the world.
- Both rate of return and risk differentials determines capital flight from Sub-Saharan Africa and,
- Capital flight affects Sub-Saharan African economies negatively and could be showed econometrically,

1.5. Significance of the study

This paper is expected to have relevance in understanding the capital flight problem well in Sub-Saharan African countries, which is a halfway journey towards the solution for reversing the flight. It also adds value to the already existing stock of knowledge regarding capital flight determinants and consequences and more specifically on Sub-Saharan African countries. This is done in terms of investigating new variables that can potentially determine capital flight and by creating links with other variables that determine economic growth in these countries specifically with capital instability.

Moreover, the paper gives a policy direction that deem necessary for solving or minimizing the problem and achieve their economic growth for target nations in Sub-Saharan African countries.

1.6. Scope and Limitation of the study

Due to the severity of the problem and huge economic growth volatility, the paper concentrates only on Sub-Saharan African countries than assessing all African countries. Similarly due to reliable data unavailability, the study focuses only on 14 Sub-Saharan African countries out of 49 of them. These are Benin, Burundi, Cote d' Ivoire, Kenya, Ethiopia, Gabon, Mali, Niger, Nigeria, Senegal, Sudan, Rwanda, Tanzania and Zimbabwe. This is also with the assumption that addressing the problem well with data on these selected Sub-Saharan African countries will also help solving the problem of other non- Sub-Saharan African countries to a larger extent, though country specific factors could explain well the incidence of capital flight, most of the determinants are similar. And this study pays much

attention on the determinants of capital flight and its impact on the domestic economy of Sub-Sahara African countries.

Moreover, of all the methods of capital flight measurement Tanzi's latent variable estimation, Cuddington's and Dooley's approaches can not be employed as no or very less data is available on these selected Sub Saharan African Countries for all the sample period to employ the use of these methods.

1.7. Organization of the Paper

In order to address the above focus areas, this study is organized as follows. In Chapter 2 review is made on related capital flight literatures specifically on definition and methods of measurement, determinants and consequences of capital flight both from theoretical as well as empirical aspects. In Chapter 3 types and sources of data is discussed, identification of methods of capital flight measurement and model specification of determinant variables and its consequences is made. Chapter 4 of the paper is concerned with analysis of the collected data and reporting the estimation results. In addition in this chapter extensive discussion and interpretation of the results is made. Chapter five concludes the study by drawing policy implications.

CHAPTER II: LITERATURE REVIEW

2.1. Introduction

The literatures on the issue of capital flight have been highly pronounced in the 1980s and 1990s by different authors in the field. This was especially the case for developing countries of Sub Saharan Africa, Asian, East Europe as well as Latin American countries. Moreover, their contribution for this most critical issue is quite important.

The rest of this chapter is organized as follows. In section 2.2, the literatures on capital flight that includes issues of definition and measurement is discussed. In section 2.3 determinants as well as consequences of capital flight are widely assessed. Section 2.4 concludes the chapter.

2.2. Definition and Measurement of Capital Flight

2.2.1. Theoretical Definition and Measurement

Economic principles do not guide us to a unique or natural definition of the term "capital flight." The definitions of capital flight found in the literatures can be grouped in to two (Cumby and Levich, 1987). The first type doesn't distinguish between "normal" capital flows and capital flight and seeks to measure the acquisition of net foreign assets, or some subset of these claims, by the private sector. The second type attempts to make the distinction between "normal" capital and flight capital by measuring the stock of foreign claims that does not generate income that is reported in the balance of payments accounts.

Capital flight, according to some analysts view, is a symptom of sick society, the cause of the heavily indebted countries inability to recover from their debt problems and a pejorative description of natural, economically rational responses to portfolio choices and have confronted wealthy residents of some debtor countries in recent years.

Some other economists, like Varman-Schneider (1991) cited in Alam et al (1995), poses the question " why is it when an American puts money abroad it is called foreign investment and when an Argentinean does the same it is called Capital Flight? Why is it that when an American company puts 30% of its equity abroad it is called Strategic Diversification and when a Bolivian businessman puts only 4% abroad it is called Lack of Confidence?"

Based on the above discussion, there are different definitions of capital flight used in the literatures. The broadest definition of capital flight is the one employed by the World Bank (1985) and Erbe (1985). It is also used in many studies. This measure takes inflows of capital in the form of increases in external debt and net foreign direct investment and subtracts from these inflows the current account deficit and the increase in official reserves. The difference between these inflows and the extent to which they are used to finance the current account deficit and an increase in reserves is taken to reflect an increase in net foreign claims by the private sector. This increase in net foreign assets is the measure of capital flight adopted. This method is sometime referred as the 'indirect method'. (Cumby and Levich, 1987)

The capital flight definition adopted by Morgan Guaranty (1986) also measures capital flight as a modified version of an 'indirect method' discussed above. In addition to the current account deficit and the increase in official reserves, Morgan Guaranty (1986) also subtracts the increase in the short-term foreign assets of the banking system from total capital inflows. The Morgan definition then does not consider acquisition of foreign assets by banks to be capital flight, while acquisition of foreign assets by other agents is considered to be capital flight.

Cline (1986) critiques the capital-flight definition adopted by Morgan and discusses adjustments to the Morgan calculations. He argues that income from tourism and border transactions should be excluded from current account earnings since these earnings are beyond the control of foreign exchange-control authorities, and thus should not be counted when calculating capital flight. In addition, he argues that reinvested investment income should not be considered as capital flight since this income is also beyond the control of the authorities and that if residents do not repatriate income from capital held abroad, this

should not be considered additional flight of capital. If they are not under control, then they can go out as capital flight.

Cuddington (1986) takes a different approach to measuring capital flight. His focus is on short-term capital flows, which he believes to be typical meaning of capital flight, rather than all private-sector acquisition of external claims. Capital flight, defined to consist of acquisition of short-term external assets by the non-bank private sector, is calculated by adding the errors and omissions to selected short-term capital items that are chosen individually for each country he considers. He chooses to consider only short-term capital since he is examining "hot money," funds that respond quickly to changes in expected returns or to changes in risk. Presumably, these are also the funds that potentially will be the quickest to return to the country when conditions change.

Dooley (1986) and Khan and Ul Haque (1987) define capital flight as those external assets held by the private sector that do not generate income recorded in the balance of payments accounts of the country. Dooley (1986) measures the stock of external claims by summing identified capital flows in the balance of payments accounts and making two adjustments to capture unreported capital flows. The first of these is to add the errors and omissions. The second adjustment Dooley (1986) carries out is based on a comparison of the World Bank data on the stock of external debt and external borrowing reported in the balance of payments accounts. He argues that if both sources report borrowing accurately, one ought to be able to match closely the change in the stock of debt reported by World Bank with the net flows of new borrowing reported in the balance of payments accounts. However, in many countries, the annual change in the stock of external debt as reported by the World Bank is considerably larger than flows reported in the balance of payments accounts, suggesting that part of the increase in external debt goes unrecorded in the balance of payments accounts. In this case where a discrepancy arises, the unrecorded increase in external liabilities must correspond to an underestimate of balancing transactions. Dooley (1986) assumes that all the underestimated balancing transactions consist of private sector acquisition of foreign assets. He therefore adds the difference between each year's change in external debt as reported by the World Bank and the increase in external debt as recorded by the balance of payments accounts to his estimate of the increase in private sector foreign

assets. He then computes a market interest rate for each country's assets and calculates the stock of external assets that would give rise to the level of investment income recorded in the balance of payments accounts at this market interest rate. The difference between the two measures of external assets is his measure of capital flight.

Unlike the studies discussed above, Dooley (1986) and Khan and Ul Haque (1987) attempt to distinguish capital flight from "normal" capital flows that correspond to ordinary portfolio diversification and business activities of domestic residents. The data required for capital flight measurement and the summary of the above-discussed methods of measurement as discussed in Cumby and Levich (1987) are presented in the following table.

Table 1: Summary Presentation of Approach to Measuring Procedure of Capital Flight Estimates

A.	Current Account Surplus
	A 1. Border Travel (Credit)
	A 2. Reinvested Foreign Direct Investment Income
	A 3. Other Investment Income (credit)
B.	Net Foreign Direct Investment
C.	Non bank Private Short-term Capital outflow
D.	Portfolio Investment Abroad: Bonds and Corporate Equities
E.	Banking System's Foreign Assets
F.	Change in Reserves
G.	Net Errors and Omissions
H.	Change in Debt

World Bank (1985) & Erbe (1985)	Capital Flight = H+B+A+F
Morgan Guaranty (1986)	Capital Flight = H+B+A+F+E
Cline (1986)	Capital Flight = Morgan Guaranty excluding A1-3 in A
Cuddington (i)	Capital Flight = -G-C
Cuddington (ii)[6]	Capital Flight = -G-C-D

Source: Cumby and Levich (1987).

[6] This estimate is taken from Varman-Schneider (1991) as cited in Alam, Dowla and Rashid (1995)

Being an unobservable variable, economists and policy makers have found the capital flight process very hard to measure or to analyze. However, Antony and Hallett (1995) shows how techniques specifically developed for measuring 'hidden' or latent variables may be adapted for the capital flight problem. This is: Tanzi's technique which estimates money demand equation in which the determinant are classified in to two-those responsible for 'normal' demand for money balance and for the 'hidden' or illegal demand for money balances. And they conclude that it is considerably easier to measure capital flight than explain it, although economic mismanagement does appear to be a more important cause than export failure or debt burden itself. Latent variable (MIMIC) estimators, which is based on the statistical theory of unobserved variables, which considers the multiple causes and multiple indicators of the unobservable (latent) variable.

Vos (1992), also investigated the issue using Philippines data that capital flight should be measured after making the necessary adjustment on the estimate obtained using Morgan Guarantee's approach for the under recording of workers remittances that are substantial for countries like Philippines. This can be done by comparing the gap between Commercial Bank's recorded remittances with that of estimated actual data remittances from different data sources.

Antony and Hallett (1992) made a good comparison among different methods of capital flight measurement, particularly the 'Cuddington Approach' (CU), World Bank's technique (WB) and Dooley's approach (DL) using econometric techniques by regressing capital flight estimates from one approach on another and then test the significance of the coefficient. In their analysis they concluded that World Bank's technique is larger than Dooley's approach, which is also higher than Cuddington approach, (i.e., WB>DL>CU) in levels and Dooley's approach is larger than World Bank's approach, which is also higher than Cuddington approach, (i.e., DL>WB>CU) in variability. They interpreted their result, as it is possible that they measure different aspects of capital flight and they have partial evidence that the Cuddington and Dooley measures reflect the foreign and domestic financial influence respectively, while the World Bank's measure captures the normal capital flows of a portfolio

choice model. Hence they concluded that alternative estimation methods such as Tanzi (1983)'s Latent variable estimation should be developed[7].

All these methods of measurement are not free from drawbacks, as economic theory does not give an unambiguous definition of capital flight for absolute estimate to be generated. Hence, the *World Bank (1985) or Erbe (1985)* lies very close to the definition of "normal" capital flow as reported in balance of payments statistics, and thus not give an adequately distinct measure of capital flows to justify its use. Moreover, revisions of foreign debt statistics or exchange rate changes on the levels of debt stock will influence the measure directly, and may entail errors of measurement. It also suffers from trade misinvoicing problem. The net bias of the measure is thus ambiguous. The *residual method,* as presented by Dooley (1986), underestimates capital flight, since not all foreign direct investment incomes can be factored in to capital flight. Moreover, since estimates of recorded investment income in the balance of payments statistics are sometimes gathered by applying market rates of return on estimated asset stocks; such computation may differ from actual income. The accuracy of the measure depends on the accuracy of balance of payments data on investment income-if there exists an incentive to underreport capital holdings, the incentive surely transfers to investment income. Selection of an interest rate to capitalize the investment income for the calculation carries further distortionary potential. Lastly, the measure assumes errors and omissions in the balance of payments statistics exclusively capture capital movements. The net bias of the measure is thus ambiguous. The balance of payments approach or Cuddington's methods fails to account for flight in the form of the acquisition of long term financial real assets, leading to an understatement of capital flight. Finally the problems of trade misinvoicing and smuggling are neglected (trade misinvoicing could either under estimate a current account surplus or overestimate a deficit, distorting the "error and omissions" component) in World Bank (1985), Morgan Guaranty (1986) and Cline (1986) approaches. The measure doesn't distinguish between normal and flight capital movements, which might lead to a overstatement of capital flight. The net bias of the measure is thus ambiguous.

[7] See Tanzi's approach above under sub topic 2.2.1

Of all these measures, the one frequently used in the literatures is what is called the broad, or indirect method developed by World Bank (1985) and Erbe (1985) as it is the first method to be used. It also provides a good estimate if the necessary adjustments are made to avoid its limitations. Since each measures has limitations, this paper will proceed by deploying three alternative methods; the World Bank or Erbe approach, Morgan Guaranty's and Cline's methods after making the necessary adjustments on its limitations.[8] Specifically it will adjust debt for exchange rate fluctuation and for trade faking practices as proposed by Ndikumana and Boyce (1998).

There are many mechanisms through which capital is taken out by those engaged in such activity to 'Haven'[9] countries as discussed in Ajayi (1995). These include cash or monetary transfer, in the form of foreign or domestic currency and travelers cheques, bank transfer from a local affiliate of a foreign institution to a designated recipient abroad,[10] transfer of precious metals and collectibles including work of Arts, false invoicing of trade documents, and parallel market as well as commissions and agents' fee. Alam *et al* (1995) also discussed some of the mechanisms through which domestic capital is taken out. These include carry out foreign exchange in a suitcase after buying from a parallel market, by engaging in smuggling, through false invoicing, indenting[11], hundi[12], and by using corrupted government officials. Similarly Walter (1987), identified mechanisms as well as vehicles of capital flight from LDCs in a sense that capital is fleeing from LDCs through transfers via the internationals payments mechanism, cash movements, precious metals and collectibles, false invoicing of trade documents and parallel loans.

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[8] In this study no attempt will be made in estimating capital flight using 'hidden' or 'latent' variable estimation approach,(i.e., Cuddington's and Dooley's approaches) due to lack of relevant data.

[9] Heaven, as defined by Walter (1987), takes the form of national states where capital flight is actually held and provide an attractive range of real and financial assets to foreign-based investors.

[10] This is possible at the market rate where no constraints or restrictions are in place. Transfers can still be possible in the face of exchange controls but possibly at a less favorable rate.

[11] Indentors are, according to Alam et al (1995), sole representative of some foreign suppliers.

[12] The institution hundi emerged after the partition of some Indian sub-continent in 1947as a means of transferring money to departed family members.

2.2.2. Empirical Evidence

In line with the variation in the definition and methods of measurement of capital flight as showed in the review of literatures above the specifically on sub Saharan African countries magnitude defers like wise. In this connection, Ndikumana and Boyce (2002) reported that the total capital flight over the twenty seven year period amounted to US dollar 187 billion for the 30 sub Saharan African countries. If the imputed interest earnings on this asset is added, the total capital flight would raise to US dollar 247 billion. When external debt is deducted from the total stock of capital flight, the net balance would be equal to US dollar 87 billion and hence the region is a " net creditor" to the rest of the world.

The volume of capital flight varies substantially across countries. In terms of absolute magnitude, Angola, Cameroon, Côte d'Ivoire, the Democratic Republic of Congo, and Nigeria have the highest stocks of capital flight. The ratio of capital flight stock to GDP exceeds 200% for eight countries, with a weighted average ratio of 172% for the group. Five of the 30 countries (Benin, Mali, Niger, Senegal, and Togo) exhibit a "negative" stock of flight capital, indicating that their recorded capital inflows exceed recorded uses of foreign exchange. (Ndikumana and Boyce (2002))

In other words, Ndikumana and Boyce (2002) estimated that for every dollar of external borrowing in the region, roughly 80 cents flowed back as capital flight in the same year. Capital flight also exhibits a high degree of persistence in the sense that past capital flight is correlated with current and future capital flight.

Schineller (1997) also found out as he expected, the central government surplus is negatively, and significantly related to Capital flight. The model consistently suggests that large government deficits might prompt capital flight. This highlights the motivation of investors to move capital both to escape future taxation directly and indirectly via monetization of deficits. It appears that the higher taxation risk, both directly and indirectly through expectations of future inflation, dominates the regressions. The interest rate differential, adjusted for actual depreciation of the official exchange rate, does not prove to be a reliable

measure of the relative risk associated with domestic investment, as it is always statistically insignificant.

Pastor (1990), computed the capital flight magnitude from Latin American economies to be US dollar 151 billon in the years 1973 to 1985. If compared to the increases in debt over the same period, the results are startling: over 40 percent of the debt build up was used to finance capital flight.

Collier, Hoeffler and Pattllio (2001), estimated capital flight figures using indirect method for the five regions namely Latin American, Sub Saharan Africa, East Asia, South Asia and Middle East and found out four what the called striking results. First, the differences between regions in private capital per worker are for larger than those in public capital. Second, by 1990 Africa was remarkably short of private capital, both absolutely and relative to public capital. Third, and most remarkably, Africa had the highest incidence of capital flight. Despite its capital scarcity, it slightly exceeded even the Middle East in the high proportion of private wealth held abroad: 40% of the private portfolios were held outside the continent. Fourth, East Asia had a very low proportion of private portfolios held abroad, despite having a high level of private wealth.

Ndikumana and Boyce (1998), computed capital flight figure for Congo (or Zaire, as Mobutu renamed the country in 1971) comparing to accumulated external debt during Mobutu's period of roughly US dollar 14 billon during his 32-year regime (1965 – 1997), meanwhile, Mobutu and his associates amassed remarkable personal fortune. Mobutu's own assets reportedly peaked in the mid 1980 s at US dollar 4 billion. Using the modified version of world bank (1985) indirect method of measuring capital flight, they computed that nominal adjusted capital flight, real adjusted capital flight and cumulative stock of adjusted capital flight to be US dollar 7.3, 12.1, and 18.0 billon respectively for the period covering 1968 - 1990.

Ajayi (1997) estimates for a number of Sub Saharan countries capital flight using different alternative methods and found out that for the period 1982 – 1991 the total capital flight was $21.8 billion and for 1982 – 1994, total cumulative capital flight was $19.1 billion: the drop is

primarily accounted for by re flow from Kenya, Liberia and Nigeria based on "mirror stock statistics' approach. And using hot money method[13], which generally show the smallest estimates of capital flight consistent data series were obtained for only 21 countries, Nigeria, Zambia, Ethiopia and Cote d Ivoire were with the largest capital flight. More over, using the indirect method, the countries with the largest capital flight were Nigeria, Zambia, Ethiopia and Cote d Ivoire. Moreover, using the residual method, which has two versions, they found that significant capital flight for Cote d Ivoire, Ethiopia, Nigeria, and Sudan, with the largest amount of capital flight coming from Nigeria. And similarly Ajayi (1995) for Nigeria computed that the total flight capital using the four methods namely World Bank and Erbe (1985), Morgan trusty, Cline and Duwendag for the periods running from 1972 – 1989 as US dollar 22.8, 30.7, 75.3 and 20.8 billion respectively. The difference in the magnitudes of the results using various definitions of capital flight are not surprising given the differences in definition.

Fedderke & Liu (1998) start by examining the pattern and capital flows for South Africa, averaging about US dollar 39 million (Outflow) annually for the entire 1960-1995 period, this amount is small compared to the three measures of capital flight calculated. The balance of payments measure shows an annual average of US $676 million (outflow), computed to the US $ 292 million of the derived method, and the US $ 128 million of the indirect method. The balance of payments measure thus indicates the greatest net volume of capital flight US $ 24.3 billion for the full period, compared to US $ 4.6 billion from the indirect measure. Compared to this, for the same period, net total flows of normal capital add up to a relatively moderate outflow of US $ 1.4 billion. For all measures capital flight is concentrated in 1980 – 1995 period and in terms of the long-run growth prospects of South Africa carries serious implications.

Hermes, Lensink and Murinde (2002) showed that the capital flight estimates for the period of 1983 – 1998 was US dollar 309, 25, 43 and 947 billion for Latin America, Sub Saharan Africa, South Asia and East Asia respectively. The capital flight to GDP ratio in 1998 for these regions was 22.0, 41.3, 7.8 and 60.9 percent respectively. This result is also consistent with that of Collier et al (2001) estimation.

[13] There are three variants of the hot money method used in his study.

2.3. Determinants and Consequences of Capital Flight

2.3.1. Theoretical Models on Determinants of Capital Flight

Unlike any other capital movements, the existing literature on capital flight doesn't offer a consistent theoretical framework for guiding our empirical work. No single agreeable model exists that completely specifies the variables that may be included as factors responsible for capital flight.

Some capital flight literatures assume that the factors responsible for normal capital outflows are also the cause for capital flight and prefer to apply the standard portfolio selection model.[14] Others like Ndikumana and Boyce (2002) apply the deterministic model of capital flight that involves simply a vector of variables that are believed to affect capital flight. Ajayi (1995) and Alam *et al* (1995), on the other hand, prefer to discuss the possible impact of different macroeconomic variables as well as other related factors on capital flight. Tornel & Velasco (1992) modeled capital flight using the concept of 'tragedy of the commons' that arises from not properly defined property right in asset holdings, which is an application of a game theoretic approach. They analyze a differential game in which interest groups have access to a common capital stock. After introducing a technology that has inferior productivity but enjoys private access they noted that the latter increases capital flight and may ameliorate the tragedy of the commons. They use this model to analyze capital flight: hypothesizing that in many poor countries property rights are not well defined and hence 'safe' bank accounts in rich countries (the inferior technology) are available to citizens of these countries, leading them to engage in capital flight.

The widely applied approach in the literatures is the one that models capital flight using a standard portfolio choice model, which has two broad groups of arguments. It is found out in different studies conducted on developing countries including Sub-Saharan African countries that, factors that affect the arguments of this model, namely, rates of return or risk

[14] These include Collier et al (2001); Fedderke and Liu (1998); Eaton (1987); Schineller (1997); Collier et al (2003); Lensink et al (1998); Dooley (1998); Khan and Ul Haque (1987) and Cuddington (1987).

on asset holdings are significant in explaining Capital flight. The theory of portfolio choice assumes that private agents choose to hold their wealth as between domestic and foreign assets depending on relative levels of risk and rates of return.

Portfolio Selection Model

The process of selecting a portfolio is first explained by Markowiz H. (1952). In his study, this process is thought to be divided in to two stages. The first stage starts with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choices of portfolio. Markowiz (1952) was concerned with the later stage and considered the rule that the investor does (or should) consider expected return a desirable thing *and* variance of return an undesirable thing. Hence, this rule implies that the choice of portfolio is some function of its expected return (desirable thing) after giving allowance for associated risks (i.e undesirable thing).

Based on this first model of Markowiz (1952), Collier et al (2001) & Fedderke & Ziu (1998) apply it to the problem of capital flight after making some modifications to the first model. In the sense that like any type of capital flows, capital flight is basically, one type of capital flows that is carried out by an economic agent, who is governed by the stated rule, that he likes to maximize his expected returns out of his portfolio decision after giving allowance for the associated risks. In this case, this agent is diversifying his asset holdings as between foreign and domestic assets by considering critically, both foreign & domestic returns as well as both foreign and domestic risks (i.e costs of adjustment for his decision). These two major factors namely '*return*' and '*risk*', which in turn are affected by many variables, are the ultimate determinants of capital flight or the agents' decision. As it can easily be seen in the above reviewed literatures, rate of return is likely to be affected by the endowment of capital in the economy, the different policy environments, the ratio of tax to GDP, etc. On the other side, rate of risk is determined by inflation rate, the existence of War, political instability, corruption etc. This implies that capital flight is also determined by these factors as well. In general as it is found out that most of the severely affected Countries are resource rich and conflict porn areas. Thus the sample countries in this study are characterized by it.

For this study, therefore, a modified version by Collier et al (2001) & Fedderke & Liu (1998) of portfolio selection model is employed for three different reasons. This is because, firstly previous empirical works findings show that these responsible variables that better explain capital flight from developing countries are those variables that affect either rate of return or risk factors. Secondly Africa, particularly sub Saharan Africa, is a region in which foreign asset holding is risky due to the existence of war in different parts of the region, political instability, corrupted governments, high level of inflation and other forms of macroeconomic as well as non- macroeconomic instabilities. In addition, in some sub Saharan African countries, nationalization of private properties both domestic citizens and those of foreigners was practiced and hence they likely increase the risk ratings of the investor or asset holder. Similarly but in different argument the perceived rate of return on asset holdings is very less. This is due to non-promising investment climate in the domestic economy in the form of exchange rate, land etc policies. Moreover, to finance different development projects many international Banks & donor agencies grant huge amount of foreign fund in the form of new loan, aid, disbursements of other official development Assistant, (ODA). This availability of foreign fund in corrupted, politically instable or poorly performing policies countries would increase the motive for practitioners.

Thirdly Capital flight by itself is basically a type of capital flows by an economic agent who attempts to maximize his expected returns considering the related risks in his process of selecting his portfolio composition and holdings.

Thus, using the above-discussed model as well as other approaches, a number of explanatory variables are identified in economic literatures.

2.3.2. Theoretical Model on Consequences of Capital Flight

Unlike, the magnitude & determinants capital flight, the empirical work on assessing the possible consequences of capital flight is scarce except a study by Ajayi (1996) for Kenya. Ajayi found out a negative but insignificant relationship between capital flight and growth.

In many of the capital flight literatures including Pastor (1990), Ajayi (1995), Alam et al (1995), capital fight from the capital scarce developing countries is found to have negative impact on the their domestic economy at least in three ways. This includes progressive redistribution of income, erosion of the domestic tax base and affecting the debt servicing capacity of countries.

Given the fact that capital flight is simply motivated through economic incentives caused by an evaluation of the appropriate risks and returns, it is important to address the issue why it is considered as a problem for developing countries. Gordon and Levine (1988) as cited by Gulati (1987), argue forcefully that there is no stable link between capital flight and many of the policy targets that are sought by governments.

However, the most obvious detrimental consequence of capital outflows according to Gulati (1987) is the savings and foreign exchange shortages in developing countries for financing domestic investment; simply put, capital flight reduces the available resources at a developing country's disposal.

Gulati (1987) also identified other possible harmful effects of capital flight. These include capital flight may destabilize interest & exchange rates, decrease national warfare, erode the domestic tax base and drives up the marginal cost of borrowing because lenders do not accept such flight as being within reach of the government (and therefore the potential tax receipts from these foreign asset holdings cannot be seen as collateral to foreign bankers). Another of the possible detrimental effects, he identified, relates to income distribution. In a sense that continued capital flight by wealthier residents coupled with current account imbalances necessitates continued external borrowing at increasing levels; some form of taxation is required for repayment of such borrowing. A liability, which falls on the entire citizens, but especially on those unable to escape the effects of inflation or other forms of taxation. Thus the process of capital flight leads to increased borrowing which, in turn, leads to an increased tax liability and the resulting taxation leads effectively to a redistribution away from the general population towards those that are able to purchase foreign assets, in most cases the wealthy.

No literature, except Ajayi ((1995), & collier *et al (2001)* has attempted to demonstrate econometrically that capital flight indeed has a negative detrimental impact on developing countries economy. Collier *et al (2001)* showed that there is a foregone output due to capital flight from different regions including SSA. Where as Ajayi (1995) tried to create a link between capital flight and real GDP per capital growth on Kenya's data but end up with negative but insignificant variable.

In the present study, therefore, attempts are made to investigate the possible effects of capital flight on the economy in two ways. First the paper analyses the output foregone due to capital flight and its impact on growth rate of the economy through its impact through capital instability.

2.3.3. Factors Determining Capital Flight

The literature on capital flight identifies many explanatory variables that reflect the relative levels of risk & rates of return in allocating assets as between domestic or foreign. As discussed above a majority of these literatures apply a standard portfolio selection model while few of them used simply on ad-hoc model.

Using the portfolio model & his own capital flight measurement, Dooley (1986) showed that capital flight can be explained by differences in risk perceived by residents and nonresidents. He further argued that domestic inflation tax, financial repression (as measured by the difference between interest rates paid on short-term assets denominated in U.S. dollars & time deposits denominated in the subject country's domestic currency & adjusted for actual exchange rate changes), risk premium on external deficit (measuring non residents' perception of the risk of being "taxed" by the subject country's government) proxied by the ratio of fiscal deficit to GDP, debt to GDP and interest payments to GDP.

He argued that capital flight should be evident in circumstances in which residents perceive risks to income derived from domestic claims, but in which non-residents have perceived relatively smaller risks on credits to the residents of the country studied. The empirical results of a pooled regression for six countries for the 1976-83 time period support the view that capital flight is related to the relative perceptions of risks that residents and non residents associate with claims on residents of the countries studied. The positive coefficient for domestic inflation in the estimation results, as interpreted by him, where the authorities are "taxing" domestic money balances through inflation, residents prefer to hold a larger share of their financial assets in a form that is outside the control of the domestic authorities. The coefficient on the political risk premium indicates the expected negative impact on capital flight. Thus it appears that the increases in this premium in recent years, and the associated reluctance of non-resident investors to "recycle" flight capital, have tended to limit the scale of transactions. Finally, the positive relationship between financial repression and capital flight suggests that residents acquire foreign assets in cases where the yield on domestic currency time deposits is less than short-term rates in international markets (adjusted for exchange rates, charges). In some cases this may reflect controls on domestic interest rates, or it may simply reflect relatively slow adjustment of domestic interest rates to rapidly claiming economic conditions.

Ajayi (1995), after surveying the literatures, classified the causes of capital flight in to economic and non-economic. The former category includes variables like relative risks (as proxied by tax & uncertainty on government policies), exchange rate misalignment, financial sector constraints, fiscal deficits and external incentives and disbursement of new loans to LDCs. Where as the later include corruption of political leaders and extraordinary access to government funds. He also reviewed the previous literatures and discussed the four debt-capital flight linkages identified by Boyce (1992). However, using a panel data analysis for ten SILICs, he found no linkage running in any of the directions.

For Alam et al (1995) the determinants for capital flight are exchange rate, financial sector constrains, fiscal deficits, tax rates, political risk & external factors. Using South African data, Fedderke and Liu (1998) identified different variables that are affecting either the rate of return or risk associated with asset holdings. This includes current account deficit or surplus,

domestic inflation, interest rate differential adjusted for exchange rate movements, the ratio of tax rate and government budget deficit to GDP, GDP growth rate and percentage of GDP allocation to labor remuneration are to affect the rate of return on domestic asset holdings. Degree of over /under valuation of exchange rates in PPP terms, capital availability, the ratio of fiscal deficit to GDP, political factors as well as financial liberalization are expected to affect the risk associated with asset holdings in the domestic economy. He then indicates that capital flows for South Africa show strong sensitivity to risk factors, and political risk factors in particular. They note that both the level of political rights, as well as the level of political instability impacts or capital flows. Higher instability, and political liberalization in South Africa both served to stimulate capital outflows. Further, to the extent that the aggregate growth measure contributes to the long determination of capital flows, either to aggravate or to reduce the capital flight problem.

Hermes, Lensink and Murinde, (1998a), (1998b), (2000), (2002), found that the basic determinants of capital flight to be : macroeconomic and political instability, rate of return differentials, capital inflows, the stock of past capital flights and public policy uncertainty . In addition they identified uncertainty of government policies proxied by uncertainty owing to budget deficits, tax payments, government consumption. Inflation, the real interest rate as measured by standard deviation of the residuals of a forecasting equation of the variable determining factors of capital flight estimated for all LDCs. They also attempted to bring together the effect of financial liberalization on capital fight in African economies using three proxies – namely interest rate deregulation, reduction in reserve requirement and change in exchange rate policy. They expected capital flight to decline with financial liberalization. Lensink, Hermes & Murinde (1998), investigated the effect of political risk on capital flight as their variables of interests. For empirical test they, after augmenting the portfolio model with sub models for the banking sector, the government sector and the external sector, conducted simulation experiments involving the interest rate deregulation, a decrease in reserve requirements and a change in exchange rate policy. The simulation results show that capital flight is reduced by all the three financial liberalization measures. The effects, however, are very small considering both the estimation and simulation results, they conclude that financial liberalization measures are useful in attempts to reduce capital flight in African economics. In another study, Lensink, Hermes & Murinde (1998) also

showed that in most cases political risk variables do have a strategically robust relationship to capital flight once domestic and international measurement circumstances are added. They used six political risk variables.[15]

And Finally, Hermes and Lensink (2000), have showed that policy uncertainty measured by the uncertainty of budget deficits, tax payments, government consumption and the inflation rate, has a statistically significant positive impact on capital flight for the later drawn from all least developed countries that are in Sub-Sahara Africa, Latin America & Asian countries. This is in addition to other determining variables of capital flight identified in past & the above discussed capital flight literatures.

In their classic paper, Khan & Ul Haque (1987), developed a theoretical framework based on standard intertemporal optimization model for a representative consumer with expropriation risk. They identified that the higher the risks associated with domestic investment & the lower are the costs of investing abroad & hence the more likely is capital flight to occur. In addition to this, higher and more variable rates of inflation, larger fiscal deficits, and overvalued currencies would tend to increase capital flight. Using their model, for a representative country with expropriation risk, they investigated the relationship between foreign borrowing and capital flight.

Khan & Ul Haque (1987), conclude their analysis of the relationship between foreign borrowing & capital flight, as the higher are the risks associated with domestic investment and the lower are the costs of investing abroad, the more likely is capital flight. Nevertheless, domestic investment may not be affected by expropriation risk if the individual believes that the government will take over both the domestic assets and foreign liabilities of the firm should it be nationalized or simply fail on the other hand guarantees against expropriation & the imposition of exchange controls provided by an international agency may encourage domestic residents to repatriate funds held abroad.

[15] A measure of political instability based on the number assassinations per million of population per year & the number of revolutions per year, a dummy variable indicating the extent of political rights, a dummy variable representation the general openness of political institutions, a dummy variable representing the extent to which non-elites are able to access institutional structures for political expression and a dummy variable for countries that participated in at least one external war during their sample period 1960 – 1985.

Ize & Ortiz (1987), in their analysis, argued that it is asymmetric risk, instead of asymmetric information, which is responsible for capital flight. The debt crisis corresponded to fiscal crisis in which governments were faced with the prospect of not being able to keep servicing their debt, as fiscal rigidities prevented a sufficiently rapid adjustment of the budget deficit, following the occurrence of large external shocks and fast – rising external debt, aggravates the incidence of capital flight. They concluded that due to fiscal rigidities the government would be forced to borrow both in domestic and foreign sources and then this in turn increases the incidence of capital flight.

Regarding the relationship between capital flight and debt, Boyce (1992), confirmed that the results of an econometric analysis of Philippine data support the hypothesis that debt-fueled capital flight and debt-fueled external borrowing – involving circular movements of the same capital through a financial revolving door.

Collier, Hoeffler and Pattllio, (2001), (2003), modeled capital flight based on the theory of standard portfolio choice and argued that factors that affect the domestic private rate of return on capital such as relative endowment of capital to labor, rate of capital taxation, change in real exchange rate & policy environment as well as factors that determine portfolio risk that include return on domestic assets relative to foreign asset and riskiness variable (e.g. ratio of debt to GDP) are determinants of capital flight. They argued that, in addition to the determinants they used in their previous study, aid has also the likely role of affecting capital flight through four distinct routes; these are the corruption route, the volatility route, the Dutch disease route, the public investment route and the marginal income route.

Collier et al, (2001, 2003), explain cross-country differences in portfolio choice using variables that proxy differences in the risk-adjusted rate of return on capital. They set out a simple framework for portfolio choice based on the rate of return on domestic assets and their riskiness relative to foreign assets. They then proposed measurable proxies for the variables used in the theory and tested it on the data set. Other things being equal, the higher is the endowment of capital per worker the higher the capital flight. Exchange rate over valuation, foreign indebtedness, and investor risk all increase the proportion of the portfolio held abroad. They also analyzed the links between and capital flight in that whether aid is

'scaled up' by private movements in capital. They have integrated this analysis with their previous work and they have found out that aid has significant and substantial effects on capital flight despite the concerns of aid critics, of aid substantially reduces capital flight. As a consequence, aid is substantially 'scaled up' by the individual decisions of domestic wealth holders. In the short term additional aid has substantial effects on the portfolio, being matched more than dollar-for dollar by individual reductions in capital flight. In the long term such changes in the portfolio are only maintained if aid itself is maintained for a substantial periods.

Ndikumana and Boyce, (1998, 2002), used official foreign exchange rates, rate of growth of gross domestic opportunities for investment, difference between domestic and foreign interest rates and the government budget surplus or deficit as explanatory variables and applied it on Philippine data. They also identified four linkages or causal relation ships.[16] They also used data from 30 sub Saharan African Countries including 24 countries classified as SILICs[17], for their analysis of capital flight. They identified a number of explanatory variables such as capital flows & stocks, macroeconomic environment[18], fiscal policy (as proxied by public budget deficit, official development assistance and the ratio of tax to GDP), risk and returns to investment (proxied by percentage change in exchange rate, domestic deposit rate, the difference between lending & deposit rate) and the difference between deposit rates of Africa and that of USA adjusted for exchange rate, financial development, and governance & political environment as determinant of capital flight.

Ndikumana & Boyce (2002) using data for 30 SSA countries found out that external borrowing is the single most important determinant of capital flight in the sense that roughly 80 cents on every dollar that flowed into the region from foreign loans flowed back out as capital flight in the same year in the 1970-1996 period, suggesting that the phenomenon of debt fueled capital flight was widespread. Their result also indicate that past capital flight tends to persist over time, and provide fairly robust, support for the propositions that capital flight is negatively related to the growth rate differential between the African country and its

[16] See under the topic of consequences of capital flight.

[17] SILIC implies severely indebted low-income countries.

[18] This includes growth rate of per capita GDP, growth differential Africa& USA, growth differential between OECD and USA, change in inflation, differential of inflation between Africa and USA, the ratio of export to GDP

OECD trade partners, the volume of domestic credit to the private sector, and a political governance index of voice & accountability.

Pastor (1990) analyzed financial incentives, changing inflation, availability of foreign finance, domestic economic growth, tax policy, labor share of income and IMF stand by programs as determinants of capital flight from Latin American countries. In this study he found out in his econometric investigation on Latin America countries data that such residents capital out flows are caused by poor financial incentives, accelerating inflation, slowing economic growth, and the enhanced availability of capital, raising taxes may have also been a factor through the evidence here is weaker. On the other hand rising real wages have no significant statistical impact on capital flight and there is some historical econometric evidence that capital control are effective at slowing, the exit of domestic resources. Finally there is some weak evidence that accounting for other factor, IMF programs have no statistically significant impact in staunching flight.

Schineller (1997), argued in his econometric model of capital flight that, the basic explanatory factor of capital flight are sever macroeconomic imbalances, which includes fiscal deficit, overvalued exchange rates, high and /or volatile inflation, ambitious financial sector liberalization, political instability and domestic unrest as proxied by various variables. He then indicates that using regression on cross country economic imbalances and political events to motivate the proposal that capital flight responds to a domestically undiversifiable risk, which is determined by the stance of domestic policy for those countries in his sample, substantial fiscal and current account deficits, overvalued exchange rates, high and/or volatile inflation, and ambitious financial sector liberalization most commonly generate flight. Similarly, macroeconomic adjustment and structural reform seem to entice capital inflow. And his result confirms the importance of the government's budget surplus as a potential determinant of capital flight. In estimating the model with alternative sub-sets of the postulated determinants, the other proxies of the risk associated with macro economic imbalance are not significant. It appears that taxation risk, both directly and indirectly through expectations of further inflation, dominates the regressions.

The other proxies may not adequately capture macro economic risk, this highlights the need to continue considering alternative measures of this risk, all of which are likely affected by measurement error.

Easton (1987) developed a model that can demonstrate a government policy of guaranteeing private debt can in turn generate more than one outcome. One such outcome replicates the allocation under perfect contract enforcement; national savings are invested domestically and foreign debt is repaid. The tax obligation implied by potential nationalization of private debt, however, can also lead to another outcome in which national capital flees, and foreign debt may not be repaid. A move by one borrower that increases the likelihood of default would increase the expected tax obligations of other borrowers. This increases the incentive for other borrowers to place their own funds abroad, and it increases the likelihood of default on their own loans as well capital flight arises as a form of contagion. He found out that a move by one borrower that increases the likelihood of his own default increases the expected tax obligations of other borrowers and this will increases the incentive for other borrowers to place their own funds abroad and it increases the likelihood of default on their own loans as well. This raises the occurrence of capital flight as form of contagion. Eaton (1987) also discussed that imperfect contract enforcement may lead to implicit or explicit government guarantee of foreign debt. This could read to a perception of tax obligation implied by potential nationalization of private debt and hence encourage further capital flight.

Alesina & Tabellini (1989) consider a model in which different government types with conflicting distributional goals randomly alternate in office. The uncertainty over future fiscal polices leads simultaneously to capital flight, low domestic investment, and the occurrence of large external debts. Over borrowing occurs because the current government dose not fully internalizes the future costs of saving the debt.

Similarly, Vos (1992) argued that the determinants of capital flight, using portfolio choice model, are real effective exchange rate, domestic inflation, the interest rate differential between domestic and foreign, debt-overhang/tax risk indicators, debt accumulation and a target level of asset position by private asset holders. He found out that real effective

exchange rate, interest rate differential, debt accumulation and a target asset position are to be significant with their expected signs while inflation and debt overhang/tax risk indicators to be insignificant.

Cuddington (1987), analyzed the macroeconomic determinants of capital flight using econometric method for Mexico, Argentina, Uruguay, and Venezuela. The result of his analysis is first; exchange rate overvaluation was an important determinant of Capital flight in all four countries studied. Second, for Mexico & Venezuela high interest rates in the United States seem to have exacerbated capital flight. And thirdly, at least in same countries, notably Mexico, but perhaps Uruguay as well, capital inflows in the form of foreign borrowing seem to have facilitated or induced capital flight.

Bhattacharya (1998) analyzed in a simple general equilibrium framework uncertainty regarding the future level of (domestic) taxes on factor incomes, & trade liberalization in an economy contemplating tariff reforms. This is found to affect the overall volume of domestic investment and capital flight. The results show that an increase in the probability of a future tax on income from domestic capital will not necessarily lead to more capital flight. This is because on the one hand there will be a portfolio shift in the allocation of domestic savings away from investment in the domestic economy and in favor of foreign assets this is the substitution effect. At the same time, there may be income effect on the overall volume of domestic savings. Another result is that a higher probability of tariff reform will lower the expected rates of return on domestic investment but will not necessarily give rise to more capital flight.

In sum as it can clearly be seen the discussion above that there are two major pillar variables, namely rate of return and risk factors on domestic assets holdings that are common in all the studies. However, the above-mentioned authors have used different proxies and data sets to represent these two factors. Of all these different proxies, domestic inflation, tax, fiscal deficit/surplus, capital availability and political uncertainty are most common variables that are dealt with by most. This paper will also employ those proxies identified in the literature to analyze capital flight from Sub-Saharan Africa.

CHAPTER III: THE METHOD

3.1. Data Type, Sources and General Methodology

This study used secondary data that are collected from different sources. These include, International Monetary Fund (IMF) and World Bank's different publications such as International Financial Statistics, Balance of Payments Year book, Direction of World Trade Statistics, Global Development Finance, World Development Indicators and World Bank African Database. Given the nature of the problem (i.e., capital flight issues) and objectives of the paper, the methods to be employed are both descriptive statistics as well as a rigorous econometric analysis. In this study the methodology is what is called, as Alemayehu, 1998, p 4 cited Blaug 1992, the Popperian approach that is of: theory – hypothesis – critical test/evidence – falsification or corroboration chain. In detail, for addressing the first objective of the study, different methods of measurement, developed by different economists and institutions, which involve arithmetic computation, is employed as discussed below. To achieve the other objectives of this study an econometric methods, i.e., specifically panel data analysis, has been employed using currently available statistical software particularly EVIEWS 5, which is superior in testing group unit root and cointegration tests for panel data set. Finally, appropriate inference is made from procedure of data analysis to give a logically deducted conclusion and policy recommendation.

3.2. Measuring the Magnitude of Capital Flight

Capital flight statistics are not readily available hence they must be constructed. As discussed in the previous chapter, there are various definitions and methods of measurement developed by different institutions and/or individuals. In this study three alternative methods of measurement are employed. Ndikumana and Boyce (1998) also made the necessary adjustments on all the three alternative methods used namely- exchange rate adjustment, adjustment for trade misinvoicing, correcting for inflation and adjustment for interest earnings. In this paper the first adjustment, i.e. exchange rate adjustment is excluded

since the debt data used for all countries is already denominated in US dollar. In this study these methods are called an adjusted methods.

3.2.1. The World Bank (1985) or Erbe (1985) Methods of Measurement

Using this approach, which was introduced in pioneering studies by the World Bank (1985) and Erbe (1985), capital flight (KF) in a given year t for a country i is thus computed as:

$$KF_{it} = \Delta DEBT_{it} + DFI_{it} - (CA_{it} + \Delta RES_{it}) \qquad (3.1)$$

where $\Delta DEBT$ is the change in total external debt outstanding, DFI is net direct foreign investment, CA is the current account deficit, and ΔRES is net additions to the stock of foreign reserves. In other words, it implies that the sources of funds must be equal to the uses of these funds, if not it is unrecorded capital that flows out or in to the country. Hence capital flight could either be positive and negative.

The above measure of capital flight can be adjusted to correct its limitations as follows (see Boyce and Ndikumana 2001):

A. Adjustment for trade misinvoicing:

Trade misinvoicing is estimated by means of trading partner data comparisons, using the IMF's *Direction of Trade Statistics Yearbook*. It is assumed that the trade data from industrialized countries, compared to their developing countries trade counterparts, are relatively accurate and the discrepancy between these and the data from their African trading partners is interpreted as evidence of misinvoicing.

For an individual African country i in year t, export discrepancies with the industrialized countries ($DXIC$) are computed as:

$$DXIC_{it} = PXIC_{it} - (XIC_{it} * CIF_t) \qquad (3.6)$$

where *PXIC* is the value of the industrialized countries' imports from the African country as reported by the industrialized trading partners, *XIC* is the African country's exports to industrialized countries as reported by the African country, and *CIF* is representing the costs of freight and insurance. A positive sign on *DXIC* indicates export under invoicing.

Import discrepancies with the industrialized countries (*DMIC*) are computed as:

$$DMIC_{it} = MIC_{it} - (PMIC_{it} * CIF_t) \quad (3.7)$$

where *MIC* is the African country's imports from industrialized countries as reported by the African country, and *PMIC* is the industrialized countries' exports to the African country as reported by the industrialized trading partners. A positive sign on *DMIC* indicates net over invoicing of imports; a negative sign indicates net under invoicing.

To obtain global totals, they multiply these discrepancies by the inverse of the average shares of industrialized countries in the African country's exports (*ICXS*) and imports *ICMS*. They obtain total trade misinvoicing as the sum of export discrepancies and import discrepancies:

$$MISINV_{it} = \frac{DXIC_{it}}{ICXS_i} + \frac{DMIC_{it}}{ICMS_i} \quad (3.8)$$

The adjusted measure of capital flight is:

$$ADJKF_{it} = \Delta DEBT_{it} + DFI_{it} - (CA_{it} + \Delta RES_{it}) + MISINV_{it} \quad (3.9)$$

B. *Correcting for inflation:*

Real capital flight (adjusted for trade misinvoicing) is calculated as:

$$RADJKF_{it} = ADJKF_{it} / PPI_t \quad (3.10)$$

where *PPI* is the US producer price index.

C. *Adjustment for interest earnings:*

Some of the capital that fled African countries was used to finance the acquisition of assets abroad, including fixed assets such as real estate, and liquid and semi-liquid assets such as savings deposits and stocks. These assets gain value over time through market appreciation

or interest earnings: a dollar invested abroad in 1970 is worth more than a dollar today due to these accumulated earnings. Imputing interest earnings to the entire amount of capital flight provides an estimate of its opportunity cost to the nation, on the assumption that this capital would have otherwise been available for investment. The stock of interest-earnings adjusted capital flight (*SADJKF*) is computed as follows:

$$SADJKF_{it} = SADJKF_{i,t-1}(1 + TBILL_{it}) + ADJKF_{it} \qquad (3.11)$$

where *TBILL* is the interest rate on short-term US Treasury bills. This estimation method is called in this study the adjusted World Bank method.

3.2.2. Morgan Guaranty (1986) Estimation Method

This approach of measuring capital flight is basically a modified version of the above World Bank (1985) or Erbe (1985) methods of measurement. This is shown as:

$$MGKF_{it} = \Delta DEBT_{it} + DFI_{it} - (CA_{it} + \Delta RES_{it}) + BSFA_{it} \qquad (3.12)$$

where $MGKF_{it}$ is capital flight estimate using Morgan Guaranty's Method and $BSFA_{it}$ is Banking System's Foreign Asset for country *i* in year *t*.

3.2.3. Cline (1986) Approach

As the above approach, this method also makes minor modification on Morgan Guaranty's methods of measurement by excluding some components of Current account balance such as income from tourism and border transactions, from the estimation. This is because these earnings are beyond the control of foreign exchange-control authorities. In addition this method argues that reinvested investment income should not be considered as capital flight since this income is also beyond the control of the authorities and that if residents do not repatriate income from capital held abroad, this should not be considered as additional flight of capital. Hence, capital flight using this approach is: -

$$CLKF_{it} = \Delta DEBT_{it} + DFI_{it} - (TB_{it} + \Delta RES_{it}) + BSFA_{it} \quad (3.13)$$

where $CLKF_{it}$ is the capital flight estimate using Cline's approach and TB_{it} is trade balance of country i at time t.

The above adjustments done on the World Bank and Erbe method would also be applicable to the other two approaches as they are a modified version of World Bank and Erbe method and suffer from same limitations. Hence in this study these adjustments are considered and used in estimating the magnitude of capital flight for the selected fourteen countries. The results are discussed in the next chapter.

3.3. Determinants of Capital Flight

3.3.1. Model Specification

Capital flight, as discussed in the previous chapter, is a type of capital outflow from a number of countries, with out leaving records on the balance of payments statistics by private residents, corrupted government officials and non-residents through different meanses in view of getting high profit, confidence over their asset acquisition or secured extra benefit out of their holdings. According to the above economic literatures, capital flight is determined both by macroeconomic and non-macroeconomic variables that are mentioned in the previous chapter. Theoretically it can be thought as an act or a response of a representative investor who attempts to maximize his expected return or utility net of associated risks in his portfolio selection. This logically implies that to reverse the flight of capital from LDCs, appropriate macroeconomic policies should be formulated and implemented. Imposing restrictions or controls on capital is found out to be not helpful in reversing flight capital and stopping its occurrence. In this study, therefore, a modified portfolio selection model, which is due to Fedderke and Liu, (1995) and Collier et al (2001), will be employed.

In terms of Portfolio allocation theory, normal capital flows and capital flight are both fundamentally driven by two classes of determinants; rates of return, (+) and risk factors, (-).

Expected return on a portfolio of capital assets, E(R) of a given investor can be defined as: -

$$E(R)=D^R-D^C+F^R-F^C \qquad (3.14)$$

where:-

D^R& F^R = the return on domestic and foreign capital assets.

D^C& F^C = the cost of adjustment of domestic and foreign capital asset holdings.

Costs of adjustment are expected to arise due to information and transactions costs associated with altering the composition of capital asset portfolios.

Country specific risk depends on both domestic and foreign factors. Its present value nature suggests sensitivity to the investor's attitude for changes in returns, dR, which reflects available world financial returns.

They assumed that Returns on foreign assets, or the opportunity cost of using funds in the domestic economy, are exogenous factors depending on foreign interest rates and too-health of economies abroad. Returns on domestic assets are further distinguished from F^R by having a non-zero probability of "expropriation", denoted by $0\leq \pi_d \leq 1$.

Here, π_d could be nationalization of assets, periods of domestic instability (i.e. reducing D^R and $D^R=0$ in case of bankruptcy), capital controls and the direct or implicit taxes faced by foreign and domestic investors.

Assuming that there exists at least some countries (developed economies) in which "expropriation" risk factors are negligible. This implies: -

$$D^R=[\alpha(K^d) - \beta(K^d)^2] (1- \pi_d), 0< \pi_d <1$$
$$F^R=[\gamma(K^f) - \delta(K^f)^2]$$

Where, K^d=Domestic capital asset, K^f=Foreign capital asset and α, β, γ, and $\delta>0$.

In both instances an upper bound defined by the first order conditions, $\frac{\partial D^R}{\partial K^d} = 0, \frac{\partial F^R}{\partial K^f} = 0,$ is present for returns on domestic and foreign assets, given the decreasing rates of return to both classes of assets,

$$\frac{\partial^2 D^R}{\left(\partial K^d\right)^2} < 0, \frac{\partial^2 F^R}{\left(\partial K^f\right)^2} < 0.$$

For adjustment costs, assume that it increases as number of adjustment increases.

$$\left.\begin{aligned} D^c &= a(K^d) - b(K^d)^2 \\ F^c &= c(K^f) - d(K^f)^2 \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.15)$$

where, a, b, c, and d > 0. Thus positive marginal adjustment costs, $\left(\frac{\partial D^c}{\partial K^d} > 0, \frac{\partial F^c}{\partial K^f} > 0\right)$ are increasing at an increasing rate:

$$\left(\frac{\partial^2 D^c}{\left(\partial K^d\right)^2} > 0, \frac{\partial^2 F^c}{\left(\partial K^f\right)^2} > 0\right)$$

The net present value of expected return on a portfolio of capital assets over an infinite time horizon is stated as follows. The optimization portfolio selection problem of the agents who attempts to maximize his net present value of the expected return out of his asset holding and allocation can be stated as :

Maximize $N[K^d, K^f] = \int_0^\infty E(R)e^{-rt}dt$ (3.16)

Subject to : $D^R = [\alpha(K^d) - \beta(K^d)^2]\ (1 - \pi_d),\ 0 < \pi_d < 1$

$F^R = [\gamma(K^f) - \delta(K^f)^2]$

$D^c = a(K^d) - b(K^d)^2$

$F^c = c(K^f) - d(K^f)^2$

The general solution to the Euler equation for the K^d state variable is given by:

$$K^{d*}(t) = A_1 e^{r_1 t} + A_2 e^{r_2 t} + \overline{K}^d \quad (3.17)$$

where $r_1, r_2 = \frac{1}{2}\left[\rho \pm \left(\rho^2 + 4\beta\frac{(1-\pi_d)}{b}^{\frac{1}{2}}\right)\right]$, such that $r_1 > \rho > 0 > r_2$ and the particular integral: -

$$\overline{K}^d = \frac{(1-\pi_d)\alpha - a\rho}{2\beta(1-\pi_d)}$$

Given the boundness of D^R for profit maximizing agents, the holding of domestic capital assets cannot exceed $K^d = \frac{a}{2\beta}$.

Similarly, the general solution to the Euler equation for the K^f state variable is given by:

$$K^{f*}(t) = A_3 e^{r_3 t} + A_4 e^{r_4 t} + \overline{K}^f \qquad (3.18)$$

Where $r_3, r_4 = \frac{1}{2}\left[\rho \pm \left(\rho^2 + \frac{4\delta}{d}\right)^{\frac{1}{2}}\right]$ such that $r_3 > \rho > 0 > r_4$ and the particular integral $K^f = \frac{\gamma - c\rho}{2\delta}$.

Again given the boundness of F^R, for profit –maximizing agents, the holding of domestic capital assets cannot exceed the $K^f = \frac{\gamma}{2\delta}$.

The model has the advantage of being able to handle both steady state and the dynamics of adjustment to steady state. The concern here is the mix of the two assets in the portfolio of agents.

The Mix of Assets in International Equilibrium

The ratio of particular integral from equation (3.17) and (3.18), denote,

$$\overline{w}_k = \frac{\overline{K}^f}{\overline{K}^d} = \frac{\beta(\gamma - c\rho)(1-\pi_d)}{\delta[(1-\pi_d)\alpha - a\rho]} \qquad (3.19)$$

where $\overline{w}_k$ is the ratio of the stock of foreign to domestic capital holding after agents adjust to optimal holdings. This gives the portfolio mix as a function of marginal rate of return, marginal cost of adjustment and expropriation risk factors.

Given marginal rate of return (MRR) on domestic and foreign asset holdings of $\frac{\partial D^R}{\partial K^d} = \left[\alpha - 2\beta K^d\right](1-\pi_d)$ and $\frac{\partial F^R}{\partial K^f} = \gamma - 2\delta K^f$, an increase in returns on domestic assets at the margins follows from $d\alpha>0$ and $d\beta$, $d\pi_d<0$. This implies that increase in domestic asset holdings relative to foreign asset holdings, given $\frac{\partial w_k}{\partial \alpha} < 0, \frac{\partial w_k}{\partial \beta} > 0, \frac{\partial w_k}{\partial \pi_d} > 0$. Equally plausibly, an increase in the marginal rate of return (MRR) on F ($d\gamma>0$, $d\delta<0$) raises the $\mathbf{w_k}$ ratio, given $\frac{\partial w_k}{\partial \delta} < 0$. Also given the marginal cost of adjustment (MCA) of D and F holdings, $\frac{\partial D^c}{\partial K^d} = a + 2bK^d$ and $\frac{\partial F^c}{\partial K^f} = c + 2dK^f$ an increase in the MCA follows from $da>0$ and $dc>0$. Consequently, $\frac{\partial \overline{w}_k}{\partial c} < 0, \frac{\partial \overline{w}_k}{\partial a} > 0$, implying increased inertia in portfolio structure.

The implication of the model is that in intertemporal equilibrium the ratio of foreign to domestic capital assets is a function of expropriation risk, *(EPRISK)* net foreign return *(NFR)* and net domestic return, *(NDR)*. Mathematically:

$$W_k = f(EPRISK, NFR, NDR) \qquad (3.20)$$

There are a number of factors that are believed to be determining capital flight from capital scarce economies against the theory of capital mobility which states that capital is expected to flow from countries with relatively high capital and low rate of return on capital to economies with scarce capital availability but high rates of return. These factors are mainly of macroeconomic and few of them are of non-macroeconomic. Of these factors, in this study only the effects of the following variables are investigated using econometric models.

A. The dependent Variable: Capital flight

The dependent variable in this model is capital flight as a proportion of GNP, KF_{it}/GNP_{it}. As noted, there is no one agreed upon measure of capital flight in the literature. Hence this variable is to be estimated using different adjusted alternative measurement methods. These are World Bank (1985) or Erbe (1985), Morgan Guaranty (1986) and Cline (1986) methods.

B. The determinants of Capital flight

Determinants of flight capital are those factors that affect either the relative rate of return or risk of the portfolio choice. These are given as follows assuming that the rate of return on foreign assets is the same for all asset holders. Hence its effect in determining portfolio allocation is assumed to be null (i.e., NFR=0 in equation 3.20), and so relative returns differ only because of differences in domestic rates of return. The domestic private rate of return on capital, r, is assumed to be determined by: according to Collier et al 2001, the endowment of capital relative to labour, which is proxied by capital availability in the country; *KAVIL*; anticipated changes in real exchange rate, *OVALER*; and the policy environment, POL, which is proxied by the growth differential between African countries and that of USA; *CGDPPKGR*. In addition to these four factors in this study the effect of change in domestic credit, *CDC* is investigated as this factor appears to be significant determinant of private investment in Sub-Saharan African countries (*Wai and Wong, 1982*). So if it affects private investment is Sub Saharan African, then it also affects either the relative rate of return or risk on investment. This shows indirectly that domestic investment and capital flight are inversely related. This implies that the more the investor gets credit domestically from local banks in local currency, the less would be his intention to send his foreign assets abroad. This could be due to his interest to back up his local investment using his foreign assets or due to lack of foreign exchange in local markets for sending it abroad without leaving records. The four factors that determine the productivity of capital for a given capital/labour ratio are: -

$$r = r\,(KAVIL,\ OVALER,\ CGDPPKGR,\ CDC) \qquad (3.21)$$

Assuming linear relationship mathematically it is expressed as: -

$$r = \theta_0 + \theta_1 KAVIL + \theta_2 OVALER + \theta_3 CGDPPKGR + \theta_4 CDC \quad (3.22)$$

On the other hand this portfolio selection is determined by the relative risk of investment, which is determined by the presence of corruption in the domestic economy, the country's experience of engaging in war, the presence of political instability etc. However, among many factors that determine the relative rate of risk, in this study the variable of interest to reflect the risk argument is the rate of taxation of capital, as proxied by the ratio of debt to GDP. This is so because the increase in debt to GDP ratio implies that the history of poor utilization of public resources which reduces rate of growth as a result of poor policy environment. Moreover, since capital once installed is largely irreversible, owners of capital will be concerned not just with current rates of taxation but also with expected future tax liability and hence one of the indicators for this is the debt burden of the country, which could probably be financed by taxing capital in the economy. Hence the risk factor, v is given as: -

$$V = v(DEBT/GDP) \quad (3.23)$$

Mathematically,

$$v = \gamma_0 + \gamma_1 DEBTGDP \quad (3.24)$$

C. Estimation Method

Based on the application of the standard portfolio selection model, which assumes that both normal capital outflows and capital flights are responsive for relative rates of return and risk associated with asset holdings i.e. both domestic and foreign assets, the econometric model for estimation is specified as follows. That is: -

$$KF_{it} = f(r, v) \quad (3.25)$$

This says that capital flight is determined by both rates of return and risk factors. Mathematically,

$$KF_{it} = \alpha_0 + \alpha_1[r] + \alpha_2[v] \quad (3.26)$$

Furthermore, each rates, i.e. risk and return factors are being determined by many other factors including the one included in the above equations 3.22 and 3.24. Combining and substituting these groups of determinants gives us the model of this study as follows.

$$KF_{it} = \alpha_0 + \alpha_1(\theta_0 + \theta_1 KAVIL + \theta_2 OVALER + \theta_3 CGDPPKGR + \theta_4 CDC) + \alpha_2(\gamma_0 + \gamma_1 DEBTGDP)$$

This further gives us the reduced form of the estimable model or regression equation of this study for analyzing the determinants of capital flight as: -

$$KF_{it} = \beta_0 + \beta_1 KAVIL + \beta_2 OVALER + \beta_3 CGDPPKGR + \beta_4 CDC + \beta_5 DEBTGDP + e_{it} \quad (3.27)$$

Where all variables in this last estimable model is as defined above and to be estimated using panel data analysis technique for the selected Sub Saharan African Countries. And the coefficients in the reduced model are as defined below.

$\beta_0 = \alpha_0 + \alpha_1\theta_0 + \alpha_2\gamma_0$, $\beta_1 = \alpha_1\theta_1$, $\beta_2 = \alpha_1\theta_2$, $\beta_3 = \alpha_1\theta_3$, $\beta_4 = \alpha_1\theta_4$ and $\beta_5 = \alpha_2\gamma_1$

In order to see the full description of all variables used in the study and their expected signs, table 2 in section (3.5).

3.4. Consequences of Capital flight

3.4.1. Lost Output due to Capital Flight

In order to investigate the output foregone due to capital flight, as it will not be available for production of output in the domestic economy, the starting point is the traditional production function with the argument of capital and labor. For econometric estimation purpose it is assumed that the specific functional form of the production function is the classic Cobb-Douglas Production Function of the form:-

$$Y_{it} = AK^{\beta_1}L^{\beta_2} \quad (3.28)$$

Using logarithmic transformation, it has the following linear form.

$$LnY_{it} = \gamma_0 + \gamma_1 LnL_{it} + \gamma_2 LnK_{it}\ ^{19} \quad (3.29)$$

Where, Y_{it} is the aggregate output in country i at period t, L_{it} is the unit of labour used in production and K_{it} is the actual capital employed in production. If the flight capital had been used in productive activity of domestic economy, the total output would have been,

$$LnY_{it} = \alpha_0 + \alpha_1 LnL_{it} + \alpha_2 Ln(K_{it} + KF_{it}) \quad (3.30)$$

Where, Y_{wf} is the potential output that could have been produced with the flight capital, and K + KF is the potential capital without the occurrence of capital flight.

The implication of the above argument is that the foregone output due to capital flight can be determined upon subtracting the predicted value of output using equation 3.28 from 3.29, due to the existence of capital flight.

And for estimation purpose, the econometric model of this production function is

$$LnY_{it} = A + \beta_1 LnK_{it} + \beta_2 LnL_{it} + e_{it} \quad (3.31)$$

And the variant of equation 3.30 will be given as:

$$LnY_{it} = \alpha_0 + \alpha_1 LnL_{it} + \alpha_2 Ln(K_{it} + KF_{it}) + e_{it} \quad (3.32)^{20}$$

Where K is gross domestic investment in country I in period t, and L is total labour force in country I in period t respectively.

[19] The variables L & K are replaced by LABOR as well as GDINV, WBKFGDI, MGKFGDI and CLKFGDI respectively for case of identification.

[20] In this regression, since the same labor force is used there is scale effect on the proportion of capital to labor. So instead of simulating the impact of the inclusion of capital flight on output, it is preferred to run separate regressions.

3.4.2. Impact of Capital flight on Growth

For the selected countries in Sub Saharan African regions, the impact of capital flight can be assessed using the model specified below. The starring point of the analysis is the standard augmented production function framework where output is not only a function of the traditional neo-classical inputs of labour and capital but also of exports (Fosu, 1991)

$$Y = f(L, K, X) \qquad (3.34)$$

where Y is real aggregate output, L and K are labour and capital inputs, respectively, and X denotes exports, which is employed to reflect international factors influence productivity but not captured in L or K. Based upon equation (3.34) the following equation is usually estimated.

$$g_{yi} = b_1 + b_2 g_{Li} + b_3 g_{ki} + b_4 g_{xi} + u, \qquad i = 1,2, \ldots n. \qquad (3.35)$$

where g_{yi}, g_{Li}, g_{ki} and are growth rates of output, labour, capital and exports in the i^{th} country respectively b_j (j = 2,3,4) measures the impact of the respective functional argument; b_1 is the intercept, u_i is the appended stochastic term ; and n denotes the number of countries.

According to Fous, (1991), if instability – Capital Instability - influences economic growth, then the conditional expectation E (u_i/g_{ci}, g_{ki}, g_{xi}) is non - zero and u_i will not be independently and identically distributed so that failing to appropriately account for the instability may lead to biased or inconsistent estimates of the parameters of equation (3.35). Under the hypothesis that instability affects growth, a fuller specification of the model may be written as

$$\mathbf{g_{yi} = b_1 + b_2 g_{Li} + b_3 g_{ki} + b_4 g_{xi} + b_5 I_i + vi, \quad i = 1, 2 \ldots n} \qquad (3.36)$$

where in this case I ; is the measure of capital instability for the i^{th} country due to the existence of capital flight and b_5 is non -zero, v_i is new error term, now assured to be independently and identically distributed.

According to neo-classical theory, b_2 and b_3 are non-negative, and b_4 is expected to be positive in view of the above arguments regarding the beneficial effect of exports. Moreover, the hypothesis that Capital Instability is deleterious to economic growth via a reduction in productive efficiency, that is, independently of the level of capital acquisition implies that b_5 is negative. Given this, the measure of capital instability, I, is defined as: -

$$I_s = \left[\frac{\left\{ \sum \left(\hat{K}_{it} - \left(K_{it} + KF_{it} \right) \right)^2 \right\}}{df} \right]^{\frac{1}{2}} \qquad S = 1, 2, 3 \qquad (3.37)$$

where $\hat{K}_{it}$ is the predicted value of capital or investment using linear, quadratic or exponential functions for forecasting., K_{it} is the actual level of investment, expressed as proportion of GDP, for the country i in t^{th} period and , df is the appropriate degrees of freedom (i.e., df=T-K, where K is the number of coefficients to be estimated) KF_{it} is the estimated level of capital flight using alternative methods and ($KF + K_i$) is potential value of investment or capital stock, if flight capital was used for domestic economy.

And it can take on I_1, I_2 and I_3 that are the prediction standard errors of estimated trends based on the linear, quadratic and exponential specifications respectively. Since the value of I_s varies depending on the value of $\hat{K}_{it}$ due to different forecasting equations, the one which gives the minimum value for I_s is used. That is:

$$I_s = \text{Min } \{I_1, I_2, I_3\}$$

3.5. Variable Description, Proxies and Expected Signs

All variables and proxies used in this study are grouped into three different sub classes. These are those used for estimating the size of capital flight from the sample countries in Sub-Saharan Africa, those used for the investigation of the behavioral determinants of capital flight and those variables that are required for the analysis of capital flight effects on the selected countries' economy. These variables' name, description and their expected signs are discussed and summarized in the table below.

Table 2: Variable description and their expected signs

Expected Sign	Variable Name	Description
		1. MEASURING THE MAGNITUDE OF CAPITAL FLIGHT
	KF_{it}	Estimates of *capital flight* (the study's dependent variable) using three alternative methods for country, *i* in period, *t*.
	CDEBT	*Change in country's debt outstanding*, which consists of public and publicly guaranteed long-term debt, private non-guaranteed long-term debt (whether reported or estimated by the staff of the World Bank), the use of IMF credit, and estimated short-term debt.
	FDI	*Foreign direct investment* that is defined as investment that is made to acquire a lasting management interest (usually 10 percent of voting stock) in an enterprise operating in a country other than that of the investor (defined according to residency), the investor's purpose being an effective voice in the management of the enterprise. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.
	CAD	*Current account balance* is the sum of the credits less the debits arising from international transactions in goods, services, income, and current transfers. It represents the transactions that add to or subtract from an economy's stock of foreign financial items.
	CRES	*Change in the country's reserves* that are the sum of a country's monetary authority's holdings of special drawing rights (SDRs), its reserve position in the IMF, its holdings of foreign exchange, and its holdings of gold (valued at year-end London prices).
	PPI	Producer Price Index in the United States
	ADJKF	The adjusted measure of capital flight for trade misinvoicing.
	TBILL	The interest rate on short-term Us Treasury Bills.
	MISINVO	The total trade misinvoicing calculated as the sum of export and imports discrepancies. (Source: Direction of World Trade Statistics yearbook,

		IMF.)
	RADJKF	The adjusted measure of capital flight for inflation rate.
	SADJKF	The stock of interest-earnings adjusted capital flight.
	BSFA$	Banking System Foreign Assets converted by multiplying BSFA in local currency by the year average official exchange rate.
2. DETERMINANTS OF CAPITAL FLIGHT		
2.1. Rates of Return Variables		
	KAVIL/GDP	*Capital availability*: calculated as net short and long-term capital flows (i.e., the sum of Disbursement of bilateral and multilateral concessional debt with disbursement of long term and short term loan including IMF)
	CGDPPKGR	The difference between the country's growth rate and the growth rate of the United states (lagged).
	OVAL	*Over/Under valuation of the exchange rate* in terms of PPP, with 1995 as base year. PPP=(CPI_{Africa}/CPI_{USA}*e). Oval is the percentage deviation of actual exchange rate from PPP. A positive figure indicates under valuation. (Source: IFS)
	CDC	Change in domestic credit to the private sector in the year.
2.2. Risk Variables		
	DEBT/GDP	The *ratio of total stock of country's debts* to GDP, which consist of public and publicly guaranteed long-term debt, private non-guaranteed long-term debt (whether reported or estimated by the staff of the World Bank), the use of IMF credit, and estimated short-term debt.
3. CONSEQUENCES OF CAPITAL FLIGHT		
	GDP	Gross domestic product of country, i in period t.
	GDINV	Gross domestic investment in US dollar
	LABOR	Total labor force inter pooled
	EXPORT	Exports of goods and services that are the total value of goods and services exported as well as income and worker remittances received.

	gQ	Annual growth rate of output for country, *i* and period *t*.
	gK	Annual growth rate of gross domestic investment for country *i* and period *t*.
	gL	Annual growth rate of labor for country *i* and period *t*.
	gx	Annual growth rate of exports for country *i* and period *t*.
	I *i* *i*= *1, 2, 3*	It is the measure of capital instability for the i^{th} country due to the existence of capital flight computed using linear, quadratic and exponential functions.

3.6. Estimation procedure

3.6.1. Panel data Analysis

In the present chapter, the basic results of the estimation employing the above discussed data and methods on the selected 14 Sub Saharan African Countries. The estimation procedure used Panel data analysis econometric techniques. Panel, or a longitudinal, data may be defined as a set of data obtained when a given number of firms, countries or households are observed over a number of time periods. Whenever available, panel data sets for economic research possess several advantages over cross-sectional or time series data. Hasio, 1985 cited in Baltegi (2002) lists several benefits from using panel data.

First, they control for individual heterogeneity. Panel data suggest that individuals, firms, states of countries are heterogeneous. Time series and cross- section data cannot control for this heterogeneity, and this may lead to biased result. One of the benefits of pooling time series and cross section data is, therefore, the ability to control for individual specific effects, possibly unobservable, which may be correlated with other included variables in the specification of an economic relationship. Analysis of cross-section data alone can neither identify nor control for such individual effects (Hausman and Tylor, 1981).

Second, panel data give the researcher more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency of econometric estimates. Time series studies are plagued with multicollinearity. This is less

likely with a panel data since cross-section dimension adds a lot of variability, adding more informative data.

Third, panel data are better able to study the dynamics of adjustment. Cross- sectional distributions that look relatively stable hide a multitude of changes. And fourth, panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure series data. Specific to efficiency analysis, panel data have also some benefits over cross section data in the estimation of stochastic frontier models.

Hence, in this study, it is modeled that data that are collected on fourteen Sub- Saharan African countries (i.e units) for the period 1980 to 2003 (i.e time). This gives us a pooled data set having a total of 280 observations. For proper estimation procedure these data are arranged in panel data matrix structure.

3.6.1.1. Panel data unit root tests

As discussed above, panel data has a number of advantages over its counterparts. One of its major importance is its ability to capture individual country, firm or unit's heterogeneities specific to them. Panel data (i.e cross-sectional time series data with i=1, 2,…,N "countries" in each time period and with t = 1, 2, …, T observation for each country over time) have both important features that its counterparts have. However, by ignoring or non-existence of innovative econometric methodology to address the issue, traditional panel data analysis adopted in previous studies suffers from serious heterogeneity bias problems. Hence, as panel data have time series data properties, especially when N is small and T is very large, important features like stationary, cointegration etc become the features of panel data too.

Testing for unit roots in panel data is becoming more common, given both the development of testing procedures and their incorporation into econometric software packages. There are many unit root tests suggested by different authors including Levin and Lin (1992, 1993), Im, Pesaran and Shin (1995, 1997), Harris and Tzavalis (1999), Maddala and Wu (1999) and Breitung (2000), and Hadri (2000). In this study Levin, Lin and Chu (1992), Breitung (2000), Im, pesaran and shin (2003), Fisher-type tests using ADF and *pp* tests (i.e. Maddala and Wu

(1999) and Choi (2001), and Hadri (1999). Unit root tests are employed using Eviews 5 software. All except Hadri (1999) tests are based on a null hypothesis that individual series in the panel are jointly stationary, against alternatives where some or all these are non-stationary.

Before going directly into testing unit roots, the basic underling concepts of each of these tests are discussed as below.

Levin and Lin (1992, 1993) (LLC-test)

Using Harris and Sollis (2003) formulation and notations consider the model:

$$y_{it} = \rho_i y_{i,t-1} + z_{it}^{'}\gamma + e_{it} \qquad (3.38)$$

Where y_{it} are y_{it-1} a given panel data series with its corresponding lag, z_{it} is the deterministic component that can take on any values[21], e_{it} is a disturbance term. This LLC-test assumes that e_{it} are IID(0, σ^2)- thus individual processes for each i are cross-sectionally independent and there is no serial correlation and $\varrho_i = \varrho$ for all i.[22]

For LLC tests the null $H_0 = \rho = 0$ against $H_1 = \rho < 1$. There are various forms of LLC tests depending on the values of Z_{it} as discussed.

A variant of LL (1992) tests, LL (1993) developed testing procedures that take care of the problem of autocorrelation and heteroskedasticity that are apparent in the LL (1992) tests. Their considered model was:

$$\Delta y_{it} = \rho^{*} y_{i,t-1} + \sum_{L=1}^{\rho_i} \theta_{iL} \Delta y_{i,t-L} + z_{it}^{'}\gamma + e_{it} \qquad (3.39)$$

Where $\Delta y_{it} = y_{it} - y_{it-1}$ such that the null $H_0 : \rho^{*} = (\rho - 1) = 0$ against $H_1 : \rho^{*} < 0$

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[21] These values can be Zero or one, a simple trend, the fixed effect and a mixture of fixed effects and heterogonous time trends.

[22] If $\rho_i \neq \rho$ for all I, then incorrectly imposing this constraint will ensure that the first assumption is not correct as Cov (e_t, e_j) $\neq 0$. (Harris and Sollis, 2003)

Thus the major change to LL (1992) test is that deferent lags are allowed across the i cross sections in the model. The test t-values are asymptotically distributed under the standard normal distribution.

Breitung (2000) test (UB test)

Breitung (2000) suggests that a test involving only a constant in the model or by allowing no fixed effects unlike LL tests and finds his UB test to be substantially more powerful than the LL tests. This test is basically an extension of the above LL (1992, 1993) tests.

Im, Pesaran and Shin (1997) test (IPS test)

IPS (1997) tests relax the homogeneity (i.e. $\varrho_i = \varrho$) assumption by estimating (3.38) with ρ_i free to vary across the i individual series in the panel. They also allow different lags for the i cross section in the model. Using equation (3.39) they test their null hypothesis, $H_0 = \rho^* = 0$ against $H_1 \rho^* < 0$ for at least one i. This implies that the IPS (1997) tests the hypothesis that each series in the panel contains a unit root for all i against at least one of the individual series is stationary.

Hence, the IPS test averages the ADF unit root test statistics obtained from (3.39) for each i. That is:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_\rho \qquad (3.40)$$

where $\bar{t}$ is the IPS t-bar test statistic, t_ϱ is the usual t-statistic from equation (3.39).

Maddala and WU (1999) tests (MU tests)

Using model in equation (3.39), these tests are also based on the null of non-stationary against alternative of stationary using a fisher type test that combines the significance levels for rejecting the null (the p-values) obtained when estimating unit root tests for each cross section i separately. That is:

$$p = -2\sum_{i=1}^{N} \ln p_i \qquad (3.41)$$

When p has a $\chi 2$ distribution with 2N degrees of freedom. This MW (1999) test is found superior to IPS(1997) by having advantages like easy to compute, no requirement of a balanced panel or no imposition of the same lag lengths on each i etc…

Maddals and Wu (1999) and Choi (2001) (MWC test)

This test is basically the same and an extension of the above MW (1999) as its name implies, except Choi (2001) proposed a modified p test when N is large. That is:

$$p_m = \left[\frac{1}{2\sqrt{N}}\right] X \sum_{i=1}^{N} (-2 \ln p_i - 2) \qquad (3.42)$$

Where P is as defined above and distributed according to $\chi 2$ distribution with same degrees of freedom.

Hadri (2000) test

As discussed above, unlike the other tests, this test tests panel unit of the null that the time series for each i all is stationary around a deterministic trend, against the alternative hypothesis of a unit root in the panel data. His model amounts:

$$y_{it} = z_{it}'\gamma + r_{it} + \varepsilon_{it} \qquad (3.43)$$

Where $r_{it} = r_{i,t-1} + u_{it}$ and $u_{it} \approx IID(0, \sigma_u^2)$. This r is a simple random walk and ε_{it} is a stationary process. Using the fact that $e_{it} = \sum_{j=1}^{t} u_{ij} + \varepsilon_{it}$ equation (3.43) can be rewritten as:

$$y_{it} = z_{it}'\gamma + e_{it} \qquad (3.44)$$

Thus, under Ho the variance of e_{it} equals zero. This suggests that y_{it} do not drift, rather it is stationary around z_{it} in equation (3.44). An LM test can be computed as a test statistic for this test, which is distributed as standard normal distribution under Ho as T→ ∞ as followed by N → ∞ as sequentially.

In the present study all the above-discussed panel unit root tests are discussed & presented for testing using the new version of Eviews statistical and Econometrics software-namely Eviews 5. Since the last test has advantages over the rest, for the purpose of this study Hadri (2000) is used.

3.6.1.2. Panel data cointegration tests

In panel data cointegration tests, there are both univariate equation based tests as well as multivariate equation based tests. However, for the later there are only few tests developed so far. These include Larsson, Lyhagen and Lothgren (2001) and Groen and Kleibergen, (2001). Where as in the first group of cointegration tests, there are many tests that include those developed by kao (1999) and Pedroni (1995, 1999) where the null hypothesis is that there is no cointegration, and Mckoskey and Kao (1998), who developed a residual-based test for the converse of the hypothesis above.

Since discussing all the alternative univariate equation based cointegration tests is not the concern of this study as no make use of them is made, this paper discusses only those tests that are based on multivariate models.

Larsson, Lyhagen and Lothgren (2001) tests (LLL tests)

While it is interesting to know that there are one or more long run relationships in the non-stationary data, it is of more interest to discover the nature of these relationships. Larsson et al. (1998) develop a test based on Johanson's (1988) multivariate cointegration framework. As Harris and sollis (2003) put, the LLL test uses a multi equation framework to construct a panel test for cointegration rank in heterogeneous panels based on the average of the individual rank trace statistics developed by Johansen (1995). Given N countries with time dimension T, and a set of p I(1) variables, the heterogeneous vector error-correction model is given by:

$$\Delta Y_{it} = \prod_i Y_{i,t-1} + \sum \Gamma_{ik} \Delta Y_{i,t-k} + \varepsilon_{it} \qquad (3.45)$$

where Y is a PX1 vector of variables and the long run matrix is of order PXP. This equation is estimated for each country N, using the maximum likelihood method, and the trace statistic is calculated. The null hypothesis to be tested is that all N countries have the same number of cointegrating vectors (r) among the p variables. In other words, $H_0 : rank(\prod) = r_i < r$, against the alternative hypothesis, $H_1 : rank(\prod) = p$ for all i=1, 2 ,..., N.

The panel cointegration test rank trace test statistic, γ, is obtained by calculating the average of the N individual trace statistics, LR, and then standardizing it as follows:

$$\gamma_{LR} = \frac{\sqrt{N}\left(\overline{LR}_{NT}\left\{H(r)/H(p)\right\} - E(z_k)\right)}{\sqrt{Var(z_k)}} \qquad (3.46)$$

Where E (z_k) is the mean and Var (z_k) is the variance of the asymptotic trace statistic tabulated in Larsson et al. (2001, Table 1).

Groen and Kleibergen (2002) Cointegration Test

Groen and Kleibergen (2002) argued that Larsson et al. (2001) approach is valid only if the parameters of the individual model and test statistics are assumed to be determined independently of each other, and therefore, it doesn't use the panel dimension of the data. Hence, they allow for interdependencies between the different individuals in testing panel cointegration so as to enhance the power of the test.

Their approach stacks vector error correction (VEC) models of the different individuals in to a joint panel VEC model, and then they conducted cointegration rank tests on all of the individual VEC models simultaneously, based on a common cointegration rank value, within the joint panel VEC model. In order to construct LR panel cointegration rank test statistics, they used iterated estimators based on the generalized methods of moments (GMM) framework to construct maximum likelihood estimates of the cointegrating vectors.

However, since there is no software released that performs a homogeneous panel cointegration tests, this study is not going to discuss how this test proceeds and what models are being used in it.

3.6.1.3. Estimating Panel Cointegration Model

Once it is identified that the variables in a panel data set are co integrated i.e., have long run relationships, the next step is to examine the long run determinants of capital flight in these fourteen sub Saharan African Countries. There are various approaches for estimating a cointegration vector using panel data. The various estimators available include within-and between – group fully modified OLS (FMOLS) and dynamic OLS (DOLS) estimators.

FMOLS is a non-parametric approach that deals with serial correlations, while DOLS is a parametric approach where lagged first-differenced terms are explicitly estimated.[23]

[23] See Harris and Sollis (2003) p 208-209 for further discussion of these approaches.

As to whether FMOLS or DOLS is preferred, the evidence is conflicting. Harris and Sollis (2003) cited Kao & Chiang (2000) and Pedroni (2000, 2001) that the later approach undertakes Monte Carlo simulations and find the group means DOLS estimator has relatively small size distortions. Whereas the Harris and Sollis (2003) approach found that FMOLS may be more biased than DOLS.

Breitung (2002) as cited by Harris and Sollis (2003), has developed a two-step procedure that is based on estimating VECM for multivariate panel regression models. In step 1, the short-run parameters of the model are allowed to vary across the i members of the cross section, while in step 2, the homogeneous long-run parameters (the cointegration vectors) are estimated from a pooled regression. The advantages of the multivariate approach also extend to allowing for the number of cointegration vectors that can be separately estimated.

Hence in this study, the usual Engle-Granger two stage Least squares estimation technique is used as the Breitung (2002) two step procedure multivariate framework is not based on Larsson et al (2001) cointegration test.

CHAPTER IV: ANALYSIS AND EMPIRICAL RESULTS

4.1 Introduction

In the present Chapter, the estimation results that were the main concern of this study are presented. As in the objective of the study and previous chapter discussions, first the magnitude of capital flight from the sample fourteen SSA countries is estimated and then using this capital flight estimates the determinant factors and consequences of flight capital in these fourteen SSA countries are investigated. Hence in section 4.2 the magnitude or size of capital flight in the period 1980 - 2003 from the selected fourteen SSA countries using three alternative methods of measurement is presented. And then in section 4.3 different tests (unit root and co integration) results are discussed. Finally, regression results of the basic models used to address the issue of determinants and consequences of capital flight is reported and discussed in section 4.4.

4.2 Empirical Results of Capital Flight

4.2.1. *Trade Misinvoicing*

Most measurements of capital flight do not consider the possible under/over estimation of their estimates due to trade faking. The impact of trade misinvoicing could run in both direction, i.e. either it underestimates the current account thereby capital flight estimates or overestimates the current account which in turn resulted in overestimation of capital flight. These systematic over and under invoicing of exports or imports or both can be detected through the use of partner – country trade analysis as introduced by Bagwati (1964) (cited by Gulati (1987) in P 70). The conclusion in his study was that underinvoicing of exports seemed to be used as a mechanism for capital flight while overinvoicing of imports was much less prevalent.

For the purposes of studying capital flight, the expectation is that exporters (importers) will systematically underinvoice (overinvoice) and thereby gain foreign exchange that is outside the control of the central bank or exchange authority. In this study, a total of fourteen debtor countries for the period 1980-2003 using the partner- country analysis is employed to test for over- and under- invoicing. Examining the partner country trade statistics of these fourteen countries generates the estimates. Here only the industrial countries are used rather than the world because partner-country analysis relies on accurate reporting by one partner. If both countries fake trade invoices it becomes impossible to sort out under- and over-invoicing.

By using direction of trade statistics with the industrial countries as a partner and adjusting exports and imports for a cost insurance freight (c.i.f) factor[24], it can be obtained a measure of invoice faking relying on the assumption that the industrial countries report accurately. The results are given in Annex 1.

This annex highlights that many countries in the sample show up as underinvoicers of exports except Niger, half of them are also shown up as underinvoicers of imports and the rest are overinvoicers. Given these results, the effect on capital flight is either incremental or negative by such trade invoice faking. In the analysis of these fourteen Sub Saharan African countries, trade data for 24-year period is used. Annex 2 presents summary of quantitative results, which reflects the net effects of over-and under invoicing.

As it shows, capital flight is affected positively through trade invoice faking in eleven of the countries of these 14 countries on aggregate, where as the effect was negative in three of them from the sample countries. In fact, in each of these three countries out of total sample countries, for most of the period, it is observed that capital inflows due to the phenomenon of over- and underinvoicing. In the cases of Benin, Ethiopia and Nigeria capital inflows occurred, particularly in the cases of Benin this was true in 1980 to 1990 of the 24 years and from 1995 to 1999.

[24] The standard adjustment is to use 10% (Gulati (1986)).

Since the underinvoicing of exports outweighs the over invoicing of imports in most of the sample, current account deficits are being underestimated. Thus, all three techniques to measure capital flight discussed above- as they use the current account balance under estimate the level of capital flight. Therefore, it can be concluded that on average adjustment for under-and over-invoicing of both exports and imports increases the estimates of the total amount of capital flights. So in this paper the adjusted estimates of capital flight is therefore presented in Annex 2, 3 and 4 for the three alternative measures of capital flight.

4.2.2. Magnitude of Capital Flight

In this section, capital flight estimates are presented based on a common database and a standard time period and obtained using the definitions and methods discussed above. This helps to show the range of estimates of capital flight implied by the alternative definitions used, to make a comparison among the results of these different methods of measurement and to investigate the problem of capital flight in the recent past by extending the previous studies' sample period. Moreover, the study attempts to determine if the different modified definitions adopted by the World Bank (1985), and Erbe (1985), Morgan Guaranty (1986) and Cline (1986) give rise to significantly different estimates of capital flight.

The results show that, important differences arise when comparison is made between World Bank (1985) and Morgan Guaranty (1986) methods of capital flight estimates. But this difference is marginal. To investigate their differences more formally, Antony and Hallett (1992) method is adopted and taking one method capital flight as dependent and the estimates of capital flight obtained from another methods each at a time do regression. It is expected that if all these methods are measuring same capital flight figure the coefficient of the independent variable is unity, if not other wise. Hence, if the coefficient is statistically different from one, then all these methods are measuring different estimates or some portion of the overall capital flight process.

Table 3 presents the results of the regression analysis conducted to compare these alternative methods, estimates more formally than describing it informally. Hence, it is shown that there are significant differences among all measures of estimates. The test result conducted to see weather the coefficient of correlation is unity shows that there is information to reject this hypothesis. Hence each estimates of capital flight may be measuring different portion of the process instead of one process.

Table 3: Regression results of three models taking one measure of capital flight as dependent variable on the other.

	Dependent Variable		
Regressors	WBKF	MGKF	CLKF
C	9.35E+07	8.83E+07	8000455
	(4.01e+07)	(4.02e+07)	(2.42e+07)
WBKF	-	-	0.50
	-	-	(0.02)
MGKF	1.395823	-	-
	(0.0534)	-	-
CLKF	-	1.390802	-
	-	(0.0534)	-
R-squared	0.69	0.68	0.99
Adjusted R-squared	0.68	0.68	0.99
Root MSE	6.90E+08	6.90E+08	1.90E+07
F-statistic	681.5	678.39	524.78
Prob(F-statistic)	0.0000	0.0000	0.0000
T- test: H0: B=1	3.8784	3.9717	3.97
Prob(t-statistic)	0.0001	0.0001	0.0001

In this study the magnitude of capital flight from fourteen Sub-Saharan African Countries for the period 1980-2003 is estimated using three alternative methods together with their adjustments for trade faking, interest rate, and inflation in the sample period. Annex 3, 4 and 5 present the magnitude of capital flight after

adjusting the estimates using World Bank (1985) or Erbe (1985), Morgan Guaranty (1986) and Cline (1986) approaches respectively.

A. *World Bank (1985) or Erbe (1985) Approach's Capital flight Estimates*

As it is presented in Annex 3, it is shown that capital flight estimate using this approach after making the necessary adjustments mentioned above. The total capital flight from all the fourteen Sub-Saharan African Countries for the period 1980-2003 amounted to USD 160.13 billion after adjustments. Of all these fourteen Sub Saharan Africa countries Nigeria, Ethiopia and Cote d' Ivoire are the top three countries that have registered large amount of capital flight. Where as Burundi, Tanzania and Zimbabwe are the least three countries that have experienced low level of capital flight. The rest are in the middle.

The largest and lowest amount of capital flight is coming from Nigeria and Burundi respectively. Using this approach's estimate, it can easily be observed that, the pattern of capital flight incidence can be assessed for these top and least three countries respectively. For Nigeria, the capital flight estimate was positive and huge in between 1980 to 1994 and also in between 1998 to 2003. But in between 1995 to 1997 it was negative reflecting an inflow not outflow. In the period of 1980 to 1990 and recently from 2001 to 2003 the capital flight was positive for Ethiopia data whereas in 1991 to 1995, it was negative. In the case of cote d Ivoire, capital was flying out of the country in the period 1980 to 1987 significantly except a two-year interruption in 1983 and 1984, while it was negative from 1991 to 2003 except in the year 1995.

For the least affected three Sub-Saharan African countries namely Burundi, Tanzania and Zimbabwe capital flight was negative in the years from 1980 to 1984 and 1989 to 1992. For Burundi & Tanzania except in few years is negative, for the whole sample period for Zimbabwe, it was negative from 1980 to 1983 and 1990 to 2000. Hence, for the top three countries there was net capital flight aggregately and for the least three countries the inflow outweighs during the sample period.

B. Morgan Guaranty (1986) Method's Capital Flight Estimates

Annex 4 presents the resulting estimates of capital flight using Morgan Guaranty (1986) approach after making those adjustments discussed above. The total stock of capital flight for the period 1980-2003 is $ 50.13 billion using the approach. Like the above method from the result it is also noted that Nigeria, Ethiopia and Cote d' Ivoire are the top three Sub Saharan Africa countries that scored the largest estimates of capital flight using the approach after adjusting it. Whereas Burundi, Tanzania and Zimbabwe have again experienced the lowest capital flight estimates in the same method after adjustment except for few years.

The result also shows the patterns of capital flight estimates for these countries. For most of the countries, capital flight estimate is positive for some periods and negative for other years. In Nigeria, Ethiopia and Cote d' Ivoire capital flight was positive for the above top three Sub Saharan Africa countries in the period between 1980 – 1990 except one and two year interruptions for the second and third countries respectively. On the other hand, in the period 1991 to 1994 it was negative for Ethiopia and Cote d' Ivoire and from 1995 to 1998 capital flight estimate was negative for Nigeria.

C. Cline (1986) Approach's Capital Flight Estimates

The adjusted Cline's approach estimate is presented in Annex 5 for the sample period and countries. Using this method, as presented the total capital flight amounted to USD 50.0 billion. This method's capital flight estimates are large for the above same three countries and small for Benin, Tanzania and Zimbabwe respectively. The rest countries in this approach are in the middle & experience modest size of capital flight.

As expected, capital flight estimates depend on the definition used in estimation. World Bank and Erbe's method yield the highest level of capital out flow, where as Cline's method yield the lowest estimates. The Morgan Guaranty method gives level of capital flight, which is in between the two. There is, in general, very little

difference between the estimates obtained by using the Morgan Guaranty method and those obtained using that of World Bank and Erbe.

It can also be noted that, in the years when there were capital flight a significant portion of borrowed capital financed an outflow of private capital, therefore, not all the time-borrowed funds were used to finance current account deficits. Annex 6 presents the resulting sum of capital flight estimates using three methods for the selected fourteen countries. In the period 1980-2003 the ratio of this capital flight estimates to these countries' change in debt and GDP to show clearly that for several of the countries, the amount of capital flight was well a significant proportion of the increase in debt and GDP level over the period of 1980-2001. More specifically except for Benin, Burundi, Sudan, Tanzania and Zimbabwe, capital flight actually accounts for 5 – 15 % of debt accumulation. And for the same group of countries the amount of capital flight was exceeded the total of their GDP level in the period. This is true for the capital flight estimate using the first approach.

Given the fact that Nigeria, Ethiopia and Cote d' Ivoire or these Sub Saharan Africa countries are suffering from both the saving & the foreign exchange constraint, have higher average debt-GNP ratio, the amount of foreign exchange fleeing every year is substantial. In fact the same amount of capital could probably have financed the interest payments of total external debt had it stayed in these countries.

4.3 TEST RESULTS

In this study different panel unit root tests are used to investigate weather the variables are stationary or not. This is unlike the traditional panel data analysis technique where by no attention is given to the Stationarity of the variables involved or it is assumed that the variables in the panel data set are stationary. However there is a risk of getting spurious results in the traditional approach especially when time (T) is very large and cross-section units (N) is small as the time series data properties outweigh. Once the variables order of integration is identified and if they happen to

be in different order of integration or Integration of order one, I (1), it suggests next that these variables must be investigated to check if they have long - run relationship (co-integration). Hence in this paper the multivariate framework cointegration test developed by Larsson et al (1998) is employed.

4.3.1. Panel Unit Root Tests

As it is discussed in the previous chapter, there are many panel unit root tests. In this study a total of six unit root tests are employed. These include Levin and Lin (1992, 1993), Breitung (2002), Im, Pesaran and Shin (1997), Maddala and Wu (1999). Maddala and Wu (1999) and Choi (2001) as well as Hadri (2000) tests. All except Hadri (2000) have null hypothesis of unit root against the alternative hypothesis of no unit root whereas Hadri (2000) test has the reverse. The test results are presented in Annex 7. From the table it can be concluded that all alternative measures of *capital flight* is an I(0) variable and from the *determinant variables* except capital availability (KAVIL), which is an I (1), the remaining four variables are an I (1) variables. These variables that are used in the estimation of the *production function* are both an I (0) and I (1) variables. Again taking most of the tests, it is clearly seen that, variables involving in the estimation of the *growth model* are an I (0) variables except the instability index which is an I(1) variable. This is so because they are computed by differencing an I (1) variables while they are in level.

However, all tests have their own limitations. Of all these unit root tests, Hadri (2000) has been selected as it has advantages over the rest by assuming individual processes for each cross section are not independent. This implies the test uses the panel dimension of the data.

4.3.2 Cointegration Tests in Heterogeneous Panel

As also discussed in the previous chapter Larsson et al (1998) co integration test based on individual countries trace statistics is employed to test for the number of cointegration vectors in each model. The results of the Larson et al (1998) panel Co

integration tests for determinant variables, production function and growth model variables are given in Appendix 8-10.

The tests indicate the existence of five & exactly one cointegrating vectors in the case of determinant variables and production function arguments respectively. It is also noted that there are four and three co integrating vectors at 5 percent and 1 percent significance level respectively for growth model variables. Even though there exist more than one cointegrating vectors for determinant and growth models' variables, in this study estimation is carried out only for one of the cointegrating vector. This is because first there are no estimation techniques and software thus developed to solve this problem except Brietung (2002). Secondly even Brietung (2002) is assuming homogeneous cointegration vector unlike that of Larsson et al (1998), which is used in this paper. Brietung (2002) criticized the Larsson *et al* (1998) test by saying that the test statistics assumes that the cointegration vectors are different across i (Heterogeneous cointegration) whereas his framework assumes that the cointegration vectors are the same for all cross section units (homogeneous cointegration). Hence, in this study Brietung's (2002) two-stage parametric estimation technique is not applicable. Rather the usual two stage least square estimation procedure is applied where by in the first step the long run model is estimated and in the second step the ECM model is estimated. The results are presented in the next section.

4.4 Estimation Results of Determinants and Consequences of Capital Flight

In the last section it is observed that there exist cointegration vectors among variables involved in each of the three variants of these models. This suggested that the long - run relationship among these variables. The three alternative methods of capital flight measurement are used in each of these three models - namely the determinant, production function and growth models. Hence, there are nine regression resulted that would be discussed in the next sections. In section 4.4.1 the estimation results of the first model i.e. determinant model is presented. Then in the subsequent section the production function and growth models results will be

discussed to show the negative consequences of capital flight from capital scarce developing countries.

4.4.1 Estimation Results of Determinants Model

Conducting vector error correction model (VECM) estimation technique using two stage least square estimation procedure, the long - run model is estimated in the first step and then the short - run error correction model is estimated in the second step. The estimation results of both the long and short - run models are presented in table 4 and 5 below. The dependent variables used in regression 1, 2 and 3 are capital flight estimates using the three methods respectively.

Table 4 Estimation Results of Determinants of Capital Flight

Regressors	Regression 1	Regression 2	Regression 3
C	9.99	9.99	10
	(0.005)	(0.003)	(0.003)
KAVIL	0.57	0.33	0.3
	(0.03)	(0.02)	(0.02)
OVAL	0.144	0.06	0.0235
	(0.01)	(0.01)	(0.0056)
DEBTGDP	-0.000314	-0.0002	-0.0002
	(4.82E-05)	(2.79E-05)	(3.13E-05)
CGDPPKGR	-0.002	-0.0013	-0.001
	(0.00024)	(0.0013)	(0.0001)
CDC	-1.96E-11	-2.75E-11	-2.52E-11
	(5.11E-12)	(3.81E-12)	(4.62E-12)
R-squared	0.999	0.999	0.999
Adjusted R-squ	0.999	0.999	0.999
Akaike info crit	-1.19	-1.19	-1.19
F-statistic	1507373	412375	3231487
Prob(F-statistic	0.0000	0.0000	0.0000
Durbin-Watson	1.57	1.92	1.82
Wald Tests	34250408	82550704	6622445

Note: The figures in parenthesis are standard errors.

The table shows that there are only minor differences among the three regression results. The first column of the table shows that the dependant variable is taken to be capital flight estimate using the World Bank (1985) or Erbe (1985) approach. The second and last columns of the table show that the dependent variable is generated using the Morgan guaranty (1986) approach and Cline (1986) method respectively. This could be due to the similarity of the three methods of measurement in the sense that one being the adjusted or modified version of the other.

However, of all determinant variables the ratio of debt to GDP is found out to be insignificant by having the unexpected sign. The rest four determinant variables are significant both in having expected signs and statistical significance. It can also be noted from the table that among the determinant variables the availability of foreign capital that proxies the endowment of capital in these developing countries economy and overvaluation of the domestic exchange rate over and above the actual exchange rate affect the capital flight positively, which imply that the larger the availability of new loan disbursements from different sources denominated in foreign currency, the higher will be the incidence of capital flight and similarly when there is an overvaluation of the domestic exchange rate due to different reasons or when there is a perception by asset holders of overvaluation, capital flight is likely to increase and the problem is aggravated further.

On the other hand unlike the above discussed two factors, change in domestic credit and the per capital GDP growth rates differential have a negative effect on the level of flight capital.

This implies that when there is a change in domestic credit available to the residents, which is denominated in local currency as well as when there is a large discrepancy or differences between the per capita GDP growth rates of African countries and that of the 'heaven' country or USA, the level of capital flight would decrease.

The dependent variables used in regression 1, 2 and 3 are the change in capital flight estimates using the three methods respectively in the next table.

Table 5: The Error Correction Model Results of Capital flight Determinants.

Regressors	Regression 1	Regression 2	Regression 3
D(KAVIL)	0.14	0.165	0.189
	(0.09)	(0.07)	(0.07)
D(OVAL)	0.02	0.036	0.028
	(0.13)	(0.10)	(0.098)
D(DEBTGDP)	0.0001	0.0001	7.15E-05
	(0.0002)	(0.0002)	(0.0002)
D(CGDPPKGR)	-8.91E-05	-0.0005	-0.0006
	(0.0006)	(0.0004)	(0.0004)
D(CDC)	-1.44E-11	-2.78E-11	-2.83E-11
	(8.29E-12)	(6.11E-12)	(6.00E-12)
RESID(-1)	-0.37	-0.65	-0.66
	(0.046)	(0.056)	(0.056)
R-squared	0.22	0.38	0.39
Adjusted R-squared	0.17	0.34	0.35
Akaike info criterion	-2.34	-2.94	-2.98
F-statistic	72.93	89.37	108.26
Prob(F-statistic)	0.0000	0.0000	0.0000
Durbin-Watson stat	1.38	1.95	1.96
Wald Tests	215.55	399.56	334.023

Note: The figures in parenthesis are standard errors.

Table 5 shows the three regression results of the short run - error correction models. Like in the long run analysis, also there are only marginal differences among the estimation results of the three models. In regression 1 shown in the first column, of the above five determinant variables only overvaluation of domestic exchange rate and the ratio of debt to GDP are insignificant statistically, where as the rest are significant short run determinants of capital flight both in having expected signs and statistical significance. One important result here is that unlike the result obtained in the long run analysis, the ratio of debt to GDP, though, is not statistically significant it has the expected sign. Hence in the short run the level of capital flight is likely to be affected positively as this ratio increases. This could either affect the perception of

residents or asset holders towards higher future taxation or by showing them the non-conduciveness of the domestic policy environment in these Sub-Saharan African countries. In the results of regression 2 and 3 that take capital flight estimates using Morgan guaranty's and Cline's approach, in addition to the above significant variables in regression 1, overvaluation of domestic exchange rate is found out to be statistically significant and has the expected sign. Hence, it can be concluded that except the ratio of debt to GDP, all the rest four determinant variables discussed above determine the level of capital flight both in the short - and long - run in the selected fourteen SSA countries for the sample period.

One important finding is that, in these three regressions the speed of adjustments to words the long - run equilibrium state are 37, 65 and 66 percent respectively. Hence the speed of adjustment is faster in the case of the second and third methods of capital flight measurement.

4.4.2 CONSEQUENCES OF CAPITAL FLIGHT

In this study two attempts are made to quantify the effect or consequences of capital flight on the selected SSA countries economy. One is to quantify how much worth of output is forgone from these sample countries during the sample period, where as the other is to create the link between capital flight and growth through causation of capital instability. In the following sections these two aspects and analysis results are presented and discussed.

A. LOST OUTPUT ANALYSIS

As it is reported in section 4.3.2, there is one cointegrating vector among the variables involved in the estimation of the Cobb - Douglas production function. And the estimation results of the base regression, which is estimated without considering capital flight to represent the actual level of production and make comparisons with the estimate of output considering the flight capital that otherwise would be used in

the production process of the domestic economy. The regression results are given in table 6 and 7, where the later shows the short run - error correction model.

Table 6: ECM for Production Function With and Without Capital Flight

Regressors	Base Regression	Regression 1	Regression 2	Regression 3
D(LNGDINVcurr)	0.08	-	-	-
	(0.01)	-	-	-
D(LNLABOR)	1.84	2.05	2.06	2.02
	(0.20)	(0.213)	(0.21)	(0.21)
D(LNWBKFGDI)	-	0.042	-	-
	-	(0.009)	-	-
D(LNMGKFGDI)	-	-	0.04	-
	-	-	(0.007)	-
D(LNCLKFGDI)	-	-	-	4.60E-02
	-	-	-	0.01
RESID(-1)	-0.25	-0.213	-0.23	-0.24
	(0.034)	(0.034)	(0.035)	(0.035)
R-squared	0.48	0.41	0.41	0.42
Adjusted R-squared	0.45	0.37	0.38	0.39
Akaike info criterion	-2.999	-2.86	-2.86	-2.88
F-statistic	16.09	11.67	12.03	12.47
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000
Durbin-Watson stat	1.68	1.7	1.69	1.69
Wald Test	188.58	153.92	160.27	169.50

Note: The figures in parenthesis are standard errors.

In both the long as well as short - run models results it is found out that all the arguments i.e. labor and capital (as measured by the above discussed three alternatives) are statistically significant and have expected signs. Employing equation 3.33 in Chapter III, the estimation results are presented in the following table.

Table 7 Production Function With and Without Capital Flight

Regressors	Base Regression	Regression 1	Regression 2	Regression 3
C	7.92	7.57	7.98	7.36
	(0.51)	(0.62)	(0.55)	(0.58)
LNGDINVcurr	0.13	-	-	-
	(0.014)	-	-	-
LNLABOR	0.75	0.83	0.8	0.81
	(0.031)	(0.034)	(0.03)	(0.032)
LNWBKFGDI	-	0.08	-	-
	-	(0.014)	-	-
LNMGKFGDI	-	-	0.09	-
	-	-	(0.013)	-
LNCLKFGDI	-	-		1.10E-01
	-	-		(0.014)
Sum of Predicted Value	1.96167E+12	2.80767E+12	2.049E+12	2.44117E+12
Lost Output	**-**	**8.45997E+11**	**8.732E+10**	**4.79493E+11**
R-squared	0.988	0.986	0.987	0.987
Adjusted R-squared	0.987	0.984	0.986	0.986
Akaike info criterion	-1.84	-1.69	-1.73	-1.75
F-statistic	1614.83	1315.25	1442.5	1480.07
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000
Durbin-Watson stat	0.45	0.43	0.48	0.48
Wald Tests	1083.16	1568.56	1584.69	1271.00

Note: The figures in parenthesis are standard errors.

The last row in this table represents that, the output that is lost due to inavailability of flight capital in the production process of the domestic economy. It is clearly presented that USD 846.0, 87.3 and 479.5 billion amount of total output in the sample period is forgone due to capital flight estimated using the World Bank (1985) or Erbe (1985), Morgan Guaranty (1986) and Cline (1987) approaches respectively.

B. IMPACT ON GROWTH

In this section one of the most important result of the study is presented. In table 8 and 9 regression results based on equation 3.36 is presented. Table 8 presents the

estimation results of the long - run model whereas table 9 represents the results of the ECM model. The dependent variable is the annual rate of GDP growth.

Table 8: Capital Flight Impact on Growth

Regressors	Regression 1	Regression 2	Regression 3
C	0.02	0.02	0.02
	(0.011)	(0.011)	(0.011)
Gk	0.09	0.094	0.09
	(0.011)	(0.011)	(0.011)
GL	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
GX	0.043	0.042	0.042
	(0.008)	(0.008)	(0.008)
I_1	-8.81E-11	-	-
	(3.48E-11)	-	-
I_2		-8.74E-11	-
		(3.37E-11)	-
I_3			-6.63E-11
			(2.61E-11)
R-squared	0.968	0.969	0.969
Adjusted R-squared	0.966	0.967	0.967
Akaike info criterion	-1.19	-1.19	-1.19
F-statistic	524.67	525.24	524.78
Prob(F-statistic)	0.0000	0.0000	0.0000
Durbin-Watson stat	1.32	1.31	1.31
Wald Test	7833.7	7819.1	7697.1

Note: The figures in parenthesis are standard errors.

In both tables except the growth rate of labor, all the rest regressors involved in both long and short - run models are found out to be statistically significant with expected sign. Taking the level of output as dependent variable, for this study the variable of interest is the instability index computed using equation 3.37 based on the capital flight estimates obtained using the alternative methods. And as it is shown in the tables, capital instability due to capital flight can affect economic growth negatively both in the long as well as in the short run.

Table 9 Error Correction model of Capital Flight Impact on Growth

Regressors	Regression 1	Regression 2	Regression 3
D(Gk)	0.07	0.07	0.07
	(0.011)	(0.011)	(0.011)
D(GL)	-0.005	-0.005	-0.005
	(0.01)	(0.01)	(0.01)
D(GX)	0.06	0.06	0.06
	(0.008)	(0.008)	(0.008)
$D(I_1)$	-7.03E-11	-	-
	(1.96E-11)	-	-
$D(I_2)$	-	-7.40E-11	-
	-	(1.95E-11)	-
$D(I_3)$	-	-	-3.56E-11
	-	-	(1.80E-11)
RESID(-1)	-0.97	-0.97	-0.97
	(0.032)	(0.032)	(0.032)
R-squared	0.99	0.99	0.99
Adjusted R-squared	0.99	0.99	0.99
Akaike info criterion	-2.43	-2.43	-2.42
F-statistic	1807.82	1806.99	1785.12
Prob(F-statistic)	0.0000	0.0000	0.0000
Durbin-Watson stat	1.77	1.76	1.77
Wald Test	30075	30100	29623

Note: The figures in parenthesis are standard errors.

Moreover, there is also high speed of adjustment equal to 97 percent towards the long run or equilibrium state as it is shown in the last row of the above table.

The growth rate of labor is statistically insignificant and has opposite sign of the expectation probably because in this study the total pooled labor force from all sectors of the economy as given in world development indicators (WDI, (2004)) is used. This implies that since there is high unemployment problem in the sample SSA countries, the marginal contribution of labor in these economies might be minimal or negative.

CHAPTER V: CONCLUSION AND POLICY IMPLICATION

5.1. Conclusion

In the last few decades, the African debt crisis has brought many problems to the region. They are farced to generate large trade surpluses while facing restricted world markets, as well as to curtail imports. In addition, but to the opposite their domestic capital has been placed out of the region by different agents. Hence, the overall effect on the regions economy was devastating as it is a capital scarce region.

In this paper, attempts are made to examine the key issues in the literatures of capital flight, including the main measurement methods of its magnitude and a discussion of its determinants as well as consequences on the domestic economy. For fourteen sub- Saharan African countries during 1980-2003, the magnitude of capital flight, using three alternative methods, estimates are constructed. Taking these estimates as dependant variable, the possible factors responsible for capital flight are analyzed by applying a portfolio selection model developed by Markowiz (1952) & modified for the application of the study's problem. It is further investigated to show that capital flight has a negative impact on these 14 countries economy through the assessment of lost output and its link with capital instability.

The findings of this study suggest that the magnitude of capital flight for the selected sub-Saharan African countries are high and still a serious issue in recent years too. Nigeria, Ethiopia and Cote D' Ivoire are found out to be the top three highly affected countries in the sample. This finding is same as the results of Boyce & Ndikumana (2001). On the contrary the least three countries are being Burundi, Tanzania and Zimbabwe; where as the remaining countries are in between.

Econometric analysis in this paper shows that, except the ratio of debt to GDP, all the rest determinant variables namely foreign capital availability, overvaluation of exchange rate growth differential and change in domestic credit are found out to be a significant determinants of capital flight in the long- run, where as of these four significant variables,

except overvaluation of exchange rate, the rest are also significant determinants in the short-run too.

It is also seen that capital flight has indeed a negative impact on the developing countries economy. This is first by loosing out put which could have been produced in these countries had the flight capital stayed or reversed back home. It is quantified that between USD 87.3-846.0 billion of out put is forgone aggregately from 14 countries during 1980-2001. On the other hand, due to its link with capital instability, capital flight has a negative effect on growth of these countries economy.

5.2. Policy implication

The issue of capital flight is a very controversial one on the one hand it is viewed as something which is determinant to economic development of a developing country; on the other hand it is considered as a relational economic response to higher return abroad.

At the policy level one thing that should be noted is that capital flight is a rational response of economic agents for a serious break down of domestic policies. So policies should be based on how the policy markers define capital flight.

Hence policy makers have to recognize the need for macroeconomic stability in order to stem continued capital flight and induce its reversal. As discussed, the causes of this instability may be wrong or non- implementable economic polices etc. Whatever the exact reasons, when a country experiences macroeconomic instability this may cause budget deficits increment, current account deficits increment, occurrence of exchange rate overvaluation, increment in inflation rate etc…

In all these cases, macroeconomic instability leads to (indirectly) increasing taxes and tax- like distortions. This lowers returns and increase risk and uncertainty of domestic investment or asset and increases incentive for capital flight.

As it is found out after applying the standard portfolio section model, which has return and risk arguments, that the significant causes of capital flight are discussed above. Hence policy makers have to consider the policies regarding these variables.

Foreign capital Utilization

As shown in this paper, the availability of foreign capital which is proxied by the newly disbursed loans & Aids, is one of important determinant for flight capital by giving incentive to the practitioners in these Sub-Saharan African countries. Hence there must be appropriate policy or policy mix that allow the effective utilization of these available resources. The donors/creditors and debtor countries' governments can work together & with the help of close follow-up on what has been done with the money.

Exchange rate policy

The second causes for capital flight is the overvaluation of domestic exchange rate. The policy makers in the central Banks of these fourteen countries must design a policy that controls the over/under valuation of exchange rate from that of the actual exchange rate as it helps to avoid the perception of asset holders that there is going to be higher taxation or tax like distortions on their investment or asset holdings.

Rate of Growth differential

The third variant of capital flight determinant is the difference between the per capital GDP growth rate of African countries and that of USA. Even though, it might be very difficult to recommend a single policy package that can speed up the African countries economy, from the results of this study it is implied that narrowing the gap between the growth rates of the developing & developed nations is inevitable through a mix of different policies.

Change in domestic credit

Finally, the important result that equally determines capital flight from sub- Saharan African countries is the availability of credit denominated in local currency. This factor is found out to reduce the capital flight probably due to non-availability of foreign currency to convert it or serious follow-up by the lending commercial Banks disbursement- after disbursement or due to the decision of foreign asset holders to invest their foreign capital instead of placing it abroad as a safeguard not to loss their investments made out of domestic credit. Hence, the credit policy of these sub- Saharan African countries must be designed in such a way that the granted loans are used effectively for the intended purpose as well as not diverted in to the unintended purpose through conversion of the loan from parallel markets and placed in foreign Banks.

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Annex 1: Export and Import Misinvoicing of the fourteen Sub-Saharan African Countries.

No	Year	Benin		Burundi		Cote D' Ivoire		Ethiopia		Gabon		Kenya		Mali		Niger		Nigeria		Rwanda		Senegal		Sudan		Tanzania		Zimbabwe	
		XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC	XIC	MIC
1	1980																												
2	1981	0.21	-2.48	0.63	0.20	4.28	1.37	0.59	0.16	4.19	0.81	3.15	0.94	1.03	-0.25	-0.27	-0.89	53.43	19.16	-0.07	0.80	0.61	0.35	0.61	-2.14	-0.24	1.38	-0.34	7.89
3	1982	0.17	-3.68	1.15	0.53	4.92	3.68	0.79	0.17	4.44	1.10	3.37	-0.46	0.29	0.73	-0.38	-0.24	38.94	9.27	-0.10	0.93	1.03	-2.06	1.73	-9.42	0.04	1.77	0.64	6.24
4	1983	0.20	-1.22	0.49	0.35	5.71	2.94	0.73	0.87	3.64	0.67	2.20	1.19	0.13	0.31	0.18	-0.23	26.67	29.88	-0.28	0.93	0.32	-0.40	1.45	-3.25	0.60	2.63	1.16	2.75
5	1984	-0.49	-0.19	0.81	0.10	3.58	1.48	0.98	-1.10	0.64	0.73	2.72	-0.09	0.17	0.32	-0.19	-0.18	16.89	3.16	-0.02	0.97	0.67	-0.65	1.28	-0.20	0.59	0.44	0.83	2.60
6	1985	0.15	-1.34	0.17	0.47	3.96	2.79	0.40	-1.71	2.00	0.87	3.94	-0.18	-0.18	-0.45	0.49	0.13	16.50	2.31	-0.01	1.02	1.02	-0.65	2.35	-6.31	0.78	5.61	0.65	2.58
7	1986	0.45	-0.89	0.36	0.47	4.68	2.09	1.20	-0.50	1.26	0.82	4.84	-4.30	-0.98	0.49	-0.55	0.38	34.06	-12.89	0.06	1.45	0.80	-1.13	2.57	-4.90	1.01	0.88	1.41	2.68
8	1987	0.31	-1.85	0.40	0.27	5.03	2.49	1.13	-0.27	1.29	0.73	4.41	-0.53	1.70	-0.60	1.26	-0.47	10.88	-5.04	0.31	1.00	1.66	-0.81	1.11	-1.82	0.81	-2.92	6.70	2.68
9	1988	0.19	-2.40	0.85	0.19	6.72	1.54	0.06	-2.80	1.27	0.73	2.63	0.42	0.15	0.41	1.38	0.23	13.52	-5.09	0.55	1.19	2.22	-1.27	1.63	-3.22	0.86	0.47	2.91	1.04
10	1989	0.72	-1.80	1.70	0.08	0.52	-0.24	0.78	-1.23	1.54	0.75	4.00	1.11	0.25	0.38	1.08	-0.20	30.26	-6.28	0.33	0.88	1.80	0.32	0.33	1.90	2.47	-8.11	4.28	1.66
11	1990	0.40	-2.83	1.20	-0.10	10.72	-0.41	1.20	-1.96	2.48	0.78	7.72	-1.98	0.19	0.65	0.50	0.15	38.38	-10.31	0.71	0.59	1.05	-0.28	0.54	1.18	0.92	0.09	1.74	2.99
12	1991	3.04	-2.26	0.70	0.05	9.23	0.14	0.62	-6.20	2.52	0.98	3.00	-2.78	0.23	0.52	0.40	-0.14	67.55	-11.97	0.41	0.96	2.14	-1.10	0.62	1.18	0.34	1.40	4.69	4.44
13	1992	1.08	-1.08	1.64	0.10	6.67	2.08	0.58	-8.09	2.39	0.88	6.39	-1.44	0.19	0.66	-0.13	-1.19	12.35	8.26	0.19	0.59	1.15	-0.55	0.47	1.13	0.47	1.59	4.49	4.99
14	1993	2.05	-2.53	1.26	0.12	4.78	2.40	1.00	-6.08	2.24	0.82	4.93	-1.29	0.15	0.66	0.07	-0.61	11.72	6.91	0.10	0.25	-0.23	-0.57	0.32	1.13	0.47	0.78	1.82	5.81
15	1994	1.31	-1.21	1.00	0.19	9.89	3.97	0.16	-2.66	2.79	0.34	4.51	-1.44	0.13	0.64	-0.49	-0.94	11.29	4.54	0.07	0.21	5.32	-0.65	0.68	1.02	0.51	0.84	-1.27	6.56
16	1995	0.84	-1.29	3.23	0.37	9.57	2.64	1.41	-3.45	2.69	0.82	6.56	2.86	0.24	0.91	0.21	-1.17	11.93	5.18	0.06	0.32	5.79	-2.57	0.69	1.14	0.74	0.87	1.81	7.75
17	1996	0.92	-2.27	2.59	-0.04	-2.86	1.71	1.24	-5.12	2.31	1.12	8.39	0.05	0.30	1.00	-1.45	-1.31	16.70	6.08	0.15	0.29	2.38	-3.48	0.64	1.08	0.80	0.68	3.36	9.69
18	1997	1.71	-2.19	0.31	-0.06	7.48	-1.11	0.99	-2.54	3.40	1.15	8.56	2.86	0.67	1.01	-0.63	-0.80	16.02	6.32	0.12	0.29	1.38	-4.17	0.49	1.37	1.22	-0.06	4.47	9.42
19	1998	0.69	-2.13	0.53	-0.28	11.09	-1.31	0.67	-1.16	2.49	0.99	8.60	4.68	0.29	1.11	0.51	-0.14	11.24	6.88	0.11	0.25	0.78	-0.06	0.53	1.45	1.72	1.11	4.73	8.49
20	1999	0.69	-2.58	0.29	-0.54	10.10	-1.01	0.47	2.42	3.37	1.42	2.00	2.83	0.24	1.14	0.57	-0.48	11.94	6.90	0.08	0.26	2.09	-2.29	0.70	1.42	0.79	0.64	4.20	4.83
21	2000	0.21	1.26	0.20	0.01	12.86	-8.39	0.52	2.64	3.95	1.27	1.95	3.05	0.22	1.16	-0.07	-2.02	21.60	8.02	0.10	0.23	0.85	-3.74	1.69	1.31	-0.21	0.62	5.49	5.15
22	2001	0.18	1.37	0.00	-0.48	9.07	-0.94	0.47	2.32	3.71	1.32	2.17	3.44	0.15	1.23	0.74	-2.98	20.56	10.42	0.13	0.26	0.84	1.90	1.76	1.64	0.63	0.07	5.39	2.04
23	2002	0.42	-3.74	0.08	0.16	-6.86	-2.82	-3.50	5.63	17.89	-13.79	-9.82	9.86	0.14	0.80	-0.25	-1.96	18.96	-14.76	0.13	0.18	1.60	-0.08	1.23	1.00	-3.42	1.17	1.99	-5.88
24	2003	0.07	1.07	0.24	0.09	-8.23	6.44	-9.49	14.02	23.88	-18.31	-6.34	5.90	0.20	1.14	-0.27	-1.33	36.71	13.52	0.09	0.20	0.83	-1.10	6.87	-1.97	-5.67	0.69	3.05	-5.56

Annex 2

Ser no	Year	Magnitude of Total Trade Misinvoicing for the period 1980 - 2003													
		Benin	Burundi	Cote d Ivoire	Ethiopia	Gabon	Kenya	Mali	Niger	Nigeria	Rwanda	Senegal	Sudan	Tanzania	Zimbabwe
1	1980	-0.90135	0.96117	6.27923	-0.59481	3.62540	4.54683	0.86471	-0.59504	27.32825	0.75052	0.48188	0.65321	0.81990	6.73941
2	1981	-2.26631	0.83788	5.64970	0.74301	5.00787	4.08394	0.77953	-1.15518	72.58718	0.73040	0.96775	-1.52435	1.14616	7.55439
3	1982	-3.50644	1.68231	8.59905	0.95892	5.53463	2.91086	1.02704	-0.61901	48.21375	0.82194	-1.03347	-7.69636	1.80631	6.8747
4	1983	-1.02071	0.84936	8.64328	1.59510	4.31072	3.39191	0.44318	-0.04463	56.54804	0.65244	-0.07881	-1.80150	3.23369	3.90871
5	1984	-0.67378	0.91288	5.05738	-0.12173	1.36951	2.63051	0.49067	-0.37041	20.05332	0.95356	0.02559	1.08227	1.02587	3.42409
6	1985	-1.19452	0.63428	6.75563	-1.30975	2.86899	3.76353	-0.62653	0.61996	18.80281	1.00171	0.36490	-3.96106	6.39290	3.22109
7	1986	-0.44014	0.83188	6.77809	0.69698	2.08280	0.54137	-0.48799	-0.17319	21.16960	1.50282	-0.33276	-2.32925	1.88919	4.08836
8	1987	-1.54416	0.67726	7.51366	0.86001	2.01379	3.88475	1.10247	0.79615	5.84450	1.31477	0.85194	-0.70634	-2.10763	9.37819
9	1988	-2.20529	1.03962	8.25717	-2.74446	2.00003	3.04684	0.56090	1.61291	8.43110	1.73587	0.95536	-1.58949	1.33141	3.95155
10	1989	-1.07738	1.77429	0.27327	-0.44273	2.28286	5.11007	0.63476	0.88203	23.98017	1.20877	2.12473	2.22713	-5.64787	5.93774
11	1990	-2.43542	1.09179	10.31334	-0.76846	3.26057	5.74498	0.83435	0.65218	28.06772	1.30457	0.76758	1.71849	1.01088	4.72902
12	1991	0.77356	0.75766	9.37180	-5.58600	3.49857	0.22630	0.74658	0.25364	55.57918	1.36722	1.04216	1.80043	1.73258	9.12454
13	1992	0.00373	1.74400	8.75325	-7.51873	3.26927	4.95504	0.84577	-1.32434	20.60741	0.78630	0.59837	1.59519	2.06327	9.47825
14	1993	-0.48269	1.38248	7.18723	-5.08003	3.06218	3.63664	0.81178	-0.54298	18.62679	0.35141	-0.79686	1.45326	1.25457	7.63141
15	1994	0.10364	1.18956	13.85723	-2.50538	3.13282	3.06441	0.77459	-1.43005	15.83062	0.28301	4.66859	1.70604	1.34452	5.29071
16	1995	-0.45325	3.59647	12.20375	-2.04076	3.50906	9.42171	1.14876	-0.96180	17.10743	0.38333	3.22104	1.83302	1.60254	9.56232
17	1996	-1.35452	2.55532	-1.15583	-3.87951	3.42824	8.43489	1.29518	-2.75687	22.77288	0.44434	-1.09656	1.71782	1.48431	13.04576
18	1997	-0.47637	0.25435	6.36894	-1.55311	4.55247	11.41565	1.68643	-1.43090	22.34165	0.40933	-2.79545	1.86175	1.15438	13.88362
19	1998	-1.43593	0.24792	9.78349	-0.48846	3.48625	13.27529	1.39865	0.36464	18.11935	0.36157	0.72205	1.98253	2.82539	13.22285
20	1999	-1.88959	-0.25037	9.09147	2.89576	4.79167	4.83727	1.37928	0.09078	18.83849	0.33604	-0.20433	2.11544	1.43511	9.03301
21	2000	1.47102	0.20923	4.46247	3.16379	5.21596	5.00141	1.38127	-2.09958	29.61849	0.32871	-2.88828	3.00790	0.40535	10.63493
22	2001	1.55351	-0.48234	8.12112	2.78784	5.03025	5.61003	1.37744	-2.24315	30.97951	0.39348	2.73920	3.40077	0.69905	7.42874
23	2002	-3.32025	0.24666	-9.68062	2.12838	4.10620	0.03789	0.94324	-2.20914	4.19341	0.30484	1.52201	2.23668	-2.24879	-3.88499
24	2003	1.14030	0.32439	-1.78254	4.52868	5.56937	-0.44815	1.34095	-1.59704	50.23632	0.28560	-0.26154	4.89339	-4.97550	-2.51260

Annex 3

Ser no	Year	Magnitude of Capital Flight from 1980 - 2003 Using A Modified World Bank(1985) Method After adjusting for Interest Earnings													
		Benin	Burundi	Cote d ivoire	Ethiopia	Gabon	Kenya	Mali	Niger	Nigeria	Rwanda	Senegal	Sudan	Tanzania	Zimbabwe
1	1980	27202036	-34128861062	6707786562	15564999439	-29613434523	-3925798161	14133791795	1863872263	368003396790	2686679563	30604903745	-19770994	-680827338	3953539622
2	1981	[illegible]	-3729778682	[illegible]	[illegible]	-59327129476	-2739852523	32236614260	[illegible]	[illegible]	[illegible]	[illegible]	209220337	[illegible]	[illegible]
3	1982	-1279779860	2955870683	3205212642020	17133877282	-42238945427	[illegible]	30782773908	-13026839948	12646526310	-4332869829	7238950871	378622562	-176466534	[illegible]
4	1983	-268524757	-42192703036	-29337658796	25026374352	-13681199844	25735632022	66730848856	670477793	-118793862805	13245544253	6130070724	-1587129556	-1322187239	-346729630
5	1984	-35247046	-16740226531	-27239493145	38430584110	54865908686	10483685612	85002322172	-48612673772	206988847812	22864680296	94256335680	2020417652	-235660117	235253892
6	1985	-43375444	164975631	52046056603	410483252034	189723300588	199015189000	118004377511	91855890177	905608148147	28200207839	200202662887	2114153204	-727258803	885036978
7	1986	-75892485	294467726	66970147988	290567700789	271498087945	269816150795	137838398952	86793063241	2083329614242	44457902597	28045641615	2718155827	-1143426476	1770040[illegible]8
8	1987	-222914562	120695660	3432185051[illegible]6	92193629588	158708753764	19859367097	54385666765	56268815887	1479170514319	39645922466	125542126324	968739069	988246[illegible]52	5296[illegible]2444
9	1988	[illegible]	27659150	[illegible]	34670343772	2435894042	-2071306877	-6417764757	12730833266	13240159923	9437493877	-2775524365	2642145939	-92998316	[illegible]
10	1989	1009325634	-17484304	372481572	923776135	197712773	642032850	-136537024	-80756[illegible]817	1903096046	-68618428	-16[illegible]902727	364767827	-117283924	[illegible]
11	1990	546425252	-140780149	[illegible]	1070982382	174896342	2217075162	249757599	72470305	[illegible]	82427030	-790463207	114131360	1540047917	[illegible]
12	1991	[illegible]	-92673037	20727523[illegible]8	-73603289	[illegible]	77762245	-246410394	-97652257	[illegible]	13757722	[illegible]	-162001071	-279598[illegible]	[illegible]
13	1992	373023677	-20806927	-2318567882	-131974347	-486124732	2487861272	314637048	38743339	-8741659127	-86595550	[illegible]	26[illegible]472054	278146007	[illegible]
14	1993	58364971[illegible]	52311326	-4239138822	-725089821	352551027	-52827348	-969443833	-295797828	8223747096	-95934211	-1479404359	1244695665	-1819531029	[illegible]
15	1994	193087767	92748404	-1870924795	-123835873	1470216552	177606881	-517229546	-285186407	3305042232	166381593	-1071149327	1101729738	-1013344311	1732[illegible]1620
16	1995	-252328827	85361394	3199240251	-328201441	1267956796	-1831167240	-534700192	-538743873	-1595977123	183738884	-1046431384	-2679799781	-1462294724	-191449412
17	1996	-113092379	-75668302	-6173812702	3352619	825724814	-3571171520	-483098539	-615880040	-9399735776	-77850519	-1008350982	-5641340142	-2380734872	[illegible]
18	1997	294863724	22644154	-9370977417	594038766	243295825	-2024387070	-187023983	-448931665	-10738904205	-30561925	-271446306	-2928918082	-1654393755	[illegible]
19	1998	72430754	103533708	-4423179630	-10662530848	-512702085	-1351718192	-549524764	-544494243	2297054782	-117339999	-638246213	-1941665487	-746620102	[illegible]
20	1999	-34759784	-102345250	-4775912765	-11270374675	373946613	-1782444283	-1151238573	-662138389	15687916133	-459291053	-1691661443	-2960796566	-2482728432	-1892916962
21	2000	47962275	-200607934	-3699651323	-548208848	1464343539	-2743815352	-1333163084	-899278770	22472661491	-548140884	-1412284121	-1621442678	-4889098067	-1598667235
22	2001	306072268	33244134195	-1015155645	860413197	2079335306	-1426558419	-112084465	-763251984	10319617366	-320687083	-1200350060	-1057332237	-758514919	356191200
23	2002	319561367	34745380142	-588679005	1413799451	1825195922	540163092	333793034	-448921803	6459772048	-149796772	-1218769986	-550748808	1359305314	689871083
24	2003	102704121	1690131506	-1055044490	247587153	402160523	56190949	-58613126	-233541138	6953216199	-81325973	-327009519	71880931	-741965249	1006071009

Annex 4

Ser no	Year	Magnitude of Capital Flight from 1980 - 2003 Using Morgan Guaranty's Method After Adjustment													
		Benin	Burundi	Cote d Ivoire	Ethiopia	Gabon	Kenya	Mali	Niger	Nigeria	Rwanda	Senegal	Sudan	Tanzania	Zimbabwe
1	1980	-112200	-109578202	28977167	333912023	75835134	115177370	76930544	46482296	129920281	25602153	131479969	6980200	-5844961	-162641
2	1981	451632	-7944787	58834867	1675343840	-446436449	-155375065	109423768	194920150	349397631	10741301	269106105	-3156111	-3311190	-488348
3	1982	-6048410	-141410899	84758427	751847417	-155978779	187018819	48810040	-7816086	602285386	2316766	202699550	1466155	-4566010	-610324
4	1983	-1150441	-149802156	115183614	258197659	-92658593	297230236	131603446	991805	6791894093	26376183	222621146	1914189	-2361930	-271244
5	1984	-77346	-96689326	-1293899163	1190282472	11703052	-142074647	255781562	2892723	208201761	51674426	135616301	4794801	-4215371	652240
6	1985	-125865	466518	1142825212	1023687435	305142658	748293639	233949502	27877286	986346650	80140653	408148035	6851955	2874605	1858618
7	1986	-130742	509835	1947136389	1409699551	824557491	423988248	467388649	2652012	4420058808	86740969	781386617	5634082	-7325427	337433
8	1987	-319667	1237846	2047836733	3381563	795916362	1176273482	356573347	25287647	7965520387	177370146	890745781	10522281	389834	3645621
9	1988	-1079641	-393281	-23966485	1969981	133593292	-6206286	-34815683	7667401	718681820	53995798	-145398740	-4629852	184868	-505227
10	1989	3123382	523218	5845270	-1530796	3510278	-5208718	-1288975	-4586791	26235123	-770744	-10500940	18662637	-5164836	2381272
11	1990	2189641	-595271	13689021	6253049	680761	8341202	540494	264133	72924139	390364	1789902	11107216	-1061648	2671690
12	1991	628567	-130878	-1544536	-725006	221227	3092224	-1825316	-399472	15340083	34893	-5855596	-5206025	-6900605	-2820592
13	1992	1455257	-350228	-9204820	-3094218	-1681599	-707428	537442	-1090143	22611142	-26519	-3021965	-3221181	-7631863	-415941
14	1993	489064	237881	-2882527	-3725185	-849117	-699269	-2151870	-768511	19693146	-420331	-3425759	1826441	-6664683	-751246
15	1994	2495074	32074	-18783138	-22154	3657400	420765	-2515869	-750558	22518446	-74532	-4166355	4547618	-2704400	-1297977
16	1995	-1463876	423014	8977388	-584747	3665141	463104	-102644	-671256	-5564115	886363	-1220406	1001980	-2348982	405824
17	1996	233491	-8440	6402447	-985300	2432818	-9137522	-2435748	-1899371	-2133153	5450	-3770746	-13689025	-4640485	-1303953
18	1997	-773024	-352439	-35851647	1001975	1503654	-7888231	133369	-1036652	-42695663	-376742	-1035811	-13206898	-6710894	-2991465
19	1998	-649400	472162	-9066594	1877826	-352043	-1811677	-1051456	-1132568	-8738418	236871	-265391	-781421	-1209456	-931823
20	1999	995358	33915	-12462430	-53579872	-2137673	-4759641	-1622638	-1517795	19807999	-804054	-2832550	-8642885	-2421933	-3630319
21	2000	-1100284	-501319	-10117182	-1026552	3735302	-3673343	-3744630	-1601182	53205708	-1345800	-5078778	-5405358	-9094024	-5241316
22	2001	1304777	-409513	-6690036	-1458764	2914165	-8749919	-2312899	-2474836	48796100	-1142683	-1350350	-1971290	-13070243	-2022841
23	2002	1030850	155853768	2100212	5515828	6739665	2284783	1842979	-1035861	-1688274	-329947	-4230342	-2926181	9829693	3745441
24	2003	526121	8658020	-5404666	1268316	2060144	287852	-300257	-1196359	35619191	-416605	-1675168	368247	-3800858	-542194

Annex 5

Ser no	Year	Magnitude of Capital Flight from 1980 - 2003 Using Cline (1995) Method After Adjustment													
		Benin	Burundi	Cote d Ivoire	Ethiopia	Gabon	Kenya	Mali	Niger	Nigeria	Rwanda	Senegal	Sudan	Tanzania	Zimbabwe
1	1980	384081	394475	315146132	33566285	70502381	127351004	78657703	50312409	1227272041	26273746	13684362	5088263	1395460	1913000
2	1981	1640099	822419	606306735	167851214	-45157013	-148226495	111206172	197230428	3576383782	1159918	27498085	505189	186387	206745
3	1982	-1342074	661580	860264014	75647557	-15983911	19082887	50247375	-75255776	693148685	24296664	2060138	451199	196356	178471
4	1983	510798	318681	116328192	26197014	-9386559	29781259	13286923	1753876	6845280857	2697553	2263724	454841	139217	219110
5	1984	609607	654879	-129302318	119481665	10346667	-140547305	25721397	287831	2067257	5217381	1388954	435565	10527	1168450
6	1985	345261	965881	1142004107	102819396	30710792	74968477	23648550	27865114	954856978	8091116	4124969	499161	741132	263464
7	1986	527415	960265	1950844368	141297891	8377278	42454859	47055355	2671435	4417432285	876034	785979	589727	-332656	316539
8	1987	96422	2393411	2059586134	34346444	80136390	11823655	35916456	25502148	7966408707	1790054	895960	133054	533297	294201
9	1988	151028	424025	-9513778	20297111	14077381	-70829	-3200269	7936296	722140215	5538862	-1406789	-45374	434421	-196662
10	1989	327257	650922	16586990	1733627	5646428	1353694	379598	-1731682	14125353	368579	-663385	203190	-14404	219258
11	1990	2384352	150079	2672102	886977	5007634	13998428	2914058	2795896	1938496	1310768	568907	151025	498735	417258
12	1991	2945796	225466	9957510	4926096	141130	5376662	22223	-2108014	2461939	396536	-187467	501826	99690	206703
13	1992	2229378	284377	1576879	476526	108246	-5156325	3098320	604417	-1532081	860228	125033	216751	-2797	601092
14	1993	1105500	532876	6473405	1489903	-334078	-1445999	-173229	251118	27881069	933396	111696	394804	272365	463138
15	1994	2385788	206949	-18640428	2988721	370395	-593338	-831512	555999	44558135	404024	-222474	1077962	389724	310295
16	1995	140675	318553	13901774	314253	-981974	4467589	2735590	845367	20219675	311529	1224218	600098	354862	410582
17	1996	633641	382477	7987706	-1644802	-6249433	-8419731	233598	-130501	-36396661	88442	-1821279	-561135	-60755	45471
18	1997	732215	-342589	-34339026	5073152	-3691689	-3421678	1877657	821442	-48088215	231731	771478	-511049	-208230	505507
19	1998	679175	1009798	-6157097	5217509	5618543	2953664	1035853	918485	33807501	1069706	2215618	880851	668945	262743
20	1999	2542307	302688	-11265741	-46537016	-6019079	-3868328	886856	10088	14779804	618178	350934	-435631	401509	-206921
21	2000	-342851	-42649	-7846469	2122240	117080	-1759054	-1352276	-232638	-12227416	-269383	-2161655	-539300	-628890	-429197
22	2001	1996634	-187697	-6153544	995680	-1130157	-5795097	569595	-898053	2997062	-44320	1407813	2880885	-620660	-100015
23	2002	2225459	155880022	-5199318	6938413	1185772	1484665	3806565	403180	-11211999	871007	316582	5882668	12220742	427826
24	2003	1404793	9030291	-718780	2647595	1470393	2806743	1877543	399672	22932401	413375	1769754	5206968	1746923	1606692

Annex 6

The ratio of Total Capital Flight to Total GDP and DEBT for the period of 1980-2001.

Country	Total Capital Flight Using			Total	Total	Ratio of	Ratio of	Ratio of	Ratio of	Ratio of	Ratio of
	Approach 1	Approach 2	Approach 3	GDP	DEBT	KF1 to GDP	KF2 to GDP	KF3 to GDP	KF1 to DEBT	KF2 to DEBT	KF3 to DEBT
Benin	1217511521	335350.6382	23627818.43	4020928250	2.93335E+12	3.03	0.00	0.06	0.04	0.00	0.00
Burundi	-1.26538E+11	-575733328	11086864.65	21494327077	1.91531E+12	-588.71	-2.68	0.05	-6.61	-0.03	0.00
Cote d Ivoire	2.05951E+12	6625777912	6793699437	2.36913E+11	3.62388E+13	869.31	2.80	2.87	5.68	0.02	0.02
Ethiopia	2.17875E+12	7120525675	7201073880	1.23213E+11	1.46952E+13	1768.28	5.78	5.84	14.83	0.05	0.05
Gabon	5.35398E+11	1477092386	1462422916	97787049104	7.58366E+12	547.51	1.51	1.50	7.06	0.02	0.02
Kenya	8.57775E+11	2607640480	2680799832	1.75505E+11	1.31974E+13	488.75	1.49	1.53	6.50	0.02	0.02
Mali	5.26174E+11	1627804437	1675791735	50757202384	5.42203E+12	1036.65	3.21	3.30	9.70	0.03	0.03
Niger	3.30202E+11	1018494833	1058800295	41188920674	3.04535E+12	801.68	2.47	2.57	10.84	0.03	0.03
Nigeria	8.56192E+12	26728168569	26691620378	5.47027E+11	5.41916E+13	1565.17	4.89	4.88	15.80	0.05	0.05
Rwanda	1.7429E+11	532401827.5	550507040.1	40292864942	1.70689E+12	432.56	1.32	1.37	10.21	0.03	0.03
Senegal	9.02359E+11	2855670020	2936174749	93416341166	7.52312E+12	965.95	3.06	3.14	11.99	0.04	0.04
Sudan	24087113.7	9117326.821	106704793.8	1.42398E+11	2.15109E+13	0.02	0.01	0.07	0.00	0.00	0.00
Tanzania	-32988068318	-93799632.2	30636809.39	1.16321E+11	1.41642E+13	-28.36	-0.08	0.03	-0.23	0.00	0.00
Zimbabwe	-6766242992	-20790907.9	38791068.68	1.41321E+11	7.3025E+12	-4.79	-0.01	0.03	-0.09	0.00	0.00

Annex 7

Panel Unit Root Test Results

Variable Name	In Levels						First Difference					
	LLC	BRT	IPS	MW	PPT	HADR	LLC	BRT	IPS	MW	PPT	HADR
CAPITAL FLIGHT												
WBKF/GDP1	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)
MGKF/GDP1	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)
CLKF/GDP1	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)
RADJWBKF	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)
RADJMGKF	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)
RADJCLKF	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(0)	I(0)	I(0)
DETERMINANTS												
KAVIL	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)						
CGDPPKGR	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)						
OVAL	-	-	-	I(0)	-	I(1)						
DEBT/GDP	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)						
CDC	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)						
PRODUCTION FUNCTION												
GDP	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)
GDINVcurr	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
LABOR	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
EXPORT	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
WBKF+GDI	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
MGKF+GDI	I(1)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(0)	I(0)	I(0)
CLKF+GDI	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
LNGDP	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)						
LNGDINVCURR	I(1)	I(0)	I(0)	I(0)	I(0)	I(1)						
LNLABOR	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)						
LNWBKFGDI	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)						
LNMGKFGDI	I(1)	I(0)	I(0)	I(0)	I(0)	I(1)						
LNCLKFGDI	I(1)	I(0)	I(0)	I(0)	I(0)	I(1)						
GROWTH FUNCTION												
gQ	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)						
gK	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)						
gL	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)						
gx	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)						
Kin3	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)						
Kin11	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)						
Kin32	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)						

Annex 8a

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Growth model

Country-by-country tests							
		LRiγ (H(r)/H(3))					
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	Rank(ri)
Benin		127.32	61.28	29.62	11.47	1.34	
Burundi		120.54	57.38	29.4	9.56	0.14	
Cote d Ivoire		86.19	45.72	23.99	9.4	1.9	
Ethiopia		96.94	47.98	29.47	12.9	3.93	
Gabon		112.73	70.01	35.84	10.43	1.92	
Kenya		111.61	34.34	20.53	7.42	0.99	
Mali		108.49	65.71	37.2	14.49	3.37	
Niger		128.08	57.42	25.58	8.03	0.74	
Nigeria		104.67	39.32	18.67	6.09	1.79	
Rwanda		102.06	50.72	27	9.29	3.14	
Senegal		148.51	78	33.57	6.84	1.39	
Sudan		89.98	50.69	21.9	5.57	2.22	
Tanzania		109.83	63.38	31.01	8.03	3.27	
Zimbabwe		149.39	60.39	21.53	4.77	0.54	
E(zk)		*1.137*	*6.086*	*14.555*	*27.73*	*44.39*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	
Panel Tests		r=0	r=1	r=2	r=3	r=4	
$\underline{\gamma}$ (H(r)/H(3))		***283.9988***	***57.39***	***9.7565***	***-10.5***	***-18.8***	
Avg(Tr)		**114.0243**	**55.88**	**27.522**	**8.878**	**1.906**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 8b

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Growth model

Country-by-country tests							
		LRiγ (H(r)/H(3))					
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	Rank(ri)
Benin		146.76	66.9	34.23	12.55	2.47	
Burundi		110.35	56.75	31.29	8.95	1.22	
Cote d Ivoire		90.49	47.79	27.24	12.67	2.13	
Ethiopia		82.31	41.2	20.91	7.73	1.73	
Gabon		99.72	48.64	21.47	8.53	1.92	
Kenya		106.91	31.81	18.79	7.86	0.67	
Mali		99.18	65.73	37.18	19.66	7.66	
Niger		129.79	56.12	25.54	7.71	0.6	
Nigeria		105.08	39.27	18.67	6.13	1.81	
Rwanda		101	49.64	25.34	8.18	2.11	
Senegal		128.78	70.78	30.97	13.33	1.79	
Sudan		92.45	46.8	25.52	7.82	2.6	
Tanzania		106.33	48.86	17.53	7.17	0.29	
Zimbabwe		128.31	47.88	25.45	8.65	1.05	
E(zk)		*1.137*	*6.086*	*14.555*	*27.73*	*44.39*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	
Panel Tests		**r=0**	**r=1**	**r=2**	**r=3**	**r=4**	
χ (H(r)/H(3))		***271.6212***	***52.11***	***8.4033***	***-9.98***	***-18.8***	
Avg(Tr)		**109.1043**	**51.3**	**25.724**	**9.781**	**2.004**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 8c

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Growth model

Country-by-country tests		LRiγ (H(r)/H(3))					
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	Rank(ri)
Benin		146.76	66.29	33.55	12.52	2.33	
Burundi		118.91	58.63	28.48	13.97	1.30	
Cote d Ivoire		104.17	63.54	34.35	16.02	1.35	
Ethiopia		90.55	48.75	25.21	9.34	1.75	
Gabon		144.25	56.67	25.55	10.04	1.89	
Kenya		106.91	32.85	19.60	8.53	1.14	
Mali		98.90	56.28	30.34	11.62	3.05	
Niger		180.82	89.20	42.41	8.73	1.19	
Nigeria		153.20	51.65	22.20	8.56	2.64	
Rwanda		108.89	56.57	26.86	8.98	2.89	
Senegal		124.45	63.46	25.29	10.09	2.29	
Sudan		93.04	47.03	25.59	7.86	2.67	
Tanzania		105.54	49.30	17.55	7.217	0.16	
Zimbabwe		128.64	48.03	25.41	8.61	1.13	
E(zk)		*1.137*	*6.086*	*14.555*	*27.73*	*44.39*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	
Panel Tests		r=0	r=1	r=2	r=3	r=4	
Ψ (H(r)/H(3))		***303.5302***	***57.88***	***9.5996***	***-9.78***	***-18.9***	
Avg(Tr)		121.7879	56.3	27.314	10.15	1.841	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 9a

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Determinant model

Country-by-country tests								
		LRiγ (H(r)/H(3))						
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	r=5	Rank(ri)
Benin		245.38	120.69	57.48	26.25	8.09	1.15	
Burundi		259	139.4	68.75	40.28	14.02	0.043	
Cote d Ivoire		200.26	120.58	63.73	32.44	8.51	0.07	
Ethiopia		274.38	157.3	80.27	45.25	25.07	6.77	
Gabon		191.82	122.45	77.43	41	18.79	5.48	
Kenya		261.63	141.39	72.37	38.09	12.86	2.37	
Mali		276.35	105.82	55.12	18.89	9.18	1.17	
Niger		176.05	109.9	56.28	26.44	10.35	4.14	
Nigeria		201.88	107.53	60.38	35.71	16.16	4.09	
Rwanda		169.02	97.53	50.15	28.01	10.56	0.009	
Senegal		278.59	168.7	95.58	47.66	13.92	0.46	
Sudan		184.5	119.35	73.18	36.9	17.86	7.24	
Tanzania		262.04	113	66.02	35.18	16.56	1.45	
Zimbabwe		378.77	148.57	74.81	27.61	11.23	2.67	
E(zk)		*1.137*	*6.086*	*14.56*	*27.73*	*44.39*	*64.96*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	*103.5*	
Panel Tests		r=0	r=1	r=2	r=3	r=4	r=5	
χ (H(r)/H(3))		***600.87***	***138.88***	***40.19***	***3.635***	***-13.6***	***-22.9***	
Avg(Tr)		239.98	126.59	67.97	34.27	13.8	2.651	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 9b

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Determinant model

Country-by-country tests								
		LRiy (H(r)/H(3))						
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	r=5	Rank(ri)
Benin		219.1	116.35	63.69	31.96	9.51	1.56	
Burundi		225.48	120.72	70.33	42.27	18.27	0.313	
Cote d Ivoire		166.44	95.7	54.62	26.85	11.67	0.033	
Ethiopia		370.73	122.6	67.56	38.82	19.06	8.02	
Gabon		197.61	135.47	87.64	49.49	25.25	3.38	
Kenya		218.2	121.69	60.61	31.51	10.15	2.48	
Mali		204.47	88.5	41.53	15.09	4.1	0	
Niger		208.03	120.94	71.96	25.29	8.51	1.77	
Nigeria		171.97	106.18	56.81	31.06	14.79	4.4	
Rwanda		226.74	104.84	59.46	27.31	8.57	0.75	
Senegal		260.17	164.31	83.48	41.16	7.3	0.09	
Sudan		208.2	134.51	68.51	34.75	15.51	7.41	
Tanzania		336.2	122.92	54.68	33.52	14.76	1.63	
Zimbabwe		254.3	127.14	55.89	18.65	8.75	0.96	
E(zk)		*1.137*	*6.086*	*14.56*	*27.73*	*44.39*	*64.96*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	*103.5*	
Panel Tests		r=0	r=1	r=2	r=3	r=4	r=5	
χ (H(r)/H(3))		***584.33***	***131.44***	***37.24***	***2.364***	***-14.1***	***-23***	
Avg(Tr)		**233.4**	**120.13**	**64.06**	**31.98**	**12.59**	**2.343**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 9c

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Determinant model

Country-by-country tests								
		LRiy (H(r)/H(3))						
Country	Lag(ki)	r=0	r=1	r=2	r=3	r=4	r=5	Rank(ri)
Benin		196.67	121.19	53.89	25.77	8.8	1.11	
Burundi		264.88	120.81	69.86	29.21	5.32	0.52	
Cote d Ivoire		166.54	95.63	54.68	26.92	11.67	0.032	
Ethiopia		374.02	122.66	67.51	38.77	19.07	8.03	
Gabon		197.12	183.08	87.19	48.77	22.83	3.38	
Kenya		218.13	121.67	66.6	31.47	10.14	2.47	
Mali		203.87	88.48	41.38	15.09	4.13	0	
Niger		207.77	120.27	71.74	25.23	8.48	1.75	
Nigeria		172.67	107.22	56.91	31.16	14.81	4.4	
Rwanda		226.89	104.81	59.32	27.35	8.51	0.76	
Senegal		260.31	164.49	83.39	41.12	7.28	0.08	
Sudan		211.98	128.95	63.54	27.21	13.99	5.9	
Tanzania		248.56	124.99	60.36	36.28	17.41	2.74	
Zimbabwe		219.68	129.81	60.14	25.64	12.34	3.82	
E(zk)		*1.137*	*6.086*	*14.56*	*27.73*	*44.39*	*64.96*	
Var(Zk)		*2.212*	*10.54*	*24.73*	*45.26*	*71.28*	*103.5*	
Panel Tests		**r=0**	**r=1**	**r=2**	**r=3**	**r=4**	**r=5**	
χ (H(r)/H(3))		***566.62***	***135.74***	***37.23***	***1.659***	***-14.5***	***-23***	
Avg(Tr)		**226.36**	**123.86**	**64.04**	**30.71**	**11.77**	**2.499**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 10a

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Production function

Country-by-country tests					
		LRiγ (H(r)/H(3))			
Country	Lag(ki)	r=0	r=1	r=2	Rank(ri)
Benin		20.68	7.17	0.97	
Burundi		32.59	6.92	1.4	
Cote d Ivoire		28.31	10.65	0.06	
Ethiopia		19.7	7.62	0	
Gabon		26.23	11.58	0.09	
Kenya		58.34	12.18	1.03	
Mali		31.5	13.54	0.26	
Niger		29.27	13.32	5.42	
Nigeria		33.41	13.42	0.33	
Rwanda		18.44	7.43	1.92	
Senegal		15.57	5.1	1.09	
Sudan		37.31	15.84	2.78	
Tanzania		40.62	14.96	3.58	
Zimbabwe		37.33	16.97	3.82	
E(zk)		*1.137*	*6.086*	*14.555*	
Var(Zk)		*2.212*	*10.54*	*24.73*	
Panel Tests		r=0	r=1	r=2	
γ (H(r)/H(3))		***74.284***	***5.886***	***-9.729***	
Avg(Tr)		**30.664**	**11.193**	**1.625**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 10b

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Production function

Country-by-country tests					
		LRiγ (H(r)/H(3))			
Country	Lag(ki)	r=0	r=1	r=2	Rank(ri)
Benin		20.75	7.14	0.96	
Burundi		32.03	6.9	1.39	
Cote d Ivoire		38.59	10.71	1.05	
Ethiopia		19.65	8.68	0.34	
Gabon		33.58	13.71	1.36	
Kenya		43.69	13.36	0.43	
Mali		39.27	11.66	0.02	
Niger		29.38	16.3	5.53	
Nigeria		24.55	10.46	0.03	
Rwanda		16.16	5.98	0.73	
Senegal		22.66	7.8	0.97	
Sudan		37.08	15.68	2.74	
Tanzania		41.28	15.08	3.66	
Zimbabwe		37.46	17.09	3.81	
E(zk)		*1.137*	*6.086*	*14.555*	
Var(Zk)		*2.212*	*10.54*	*24.73*	
Panel Tests		**r=0**	**r=1**	**r=2**	
γ (H(r)/H(3))		***75.511***	***6.203***	***-9.714***	
Avg(Tr)		**31.152**	**11.468**	**1.644**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

ıex 10c

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Production function

Country-by-country tests					
		LRiγ (H(r)/H(3))			
Country	Lag(ki)	r=0	r=1	r=2	Rank(ri)
Benin		20.8	7.11	1.04	
Burundi		16.65	6.79	0.13	
Cote d Ivoire		33.14	14.2	0.01	
Ethiopia		17.48	7.49	0.35	
Gabon		36.41	13.91	1.4	
Kenya		38.6	11.48	0.32	
Mali		32.42	11.93	0.01	
Niger		23.47	9.99	4.34	
Nigeria		27	9.91	0	
Rwanda		17.13	6.63	0.54	
Senegal		25.71	9.95	1.14	
Sudan		37.56	15.98	2.71	
Tanzania		40.78	15.02	3.62	
Zimbabwe		37.62	17.2	3.82	
E(zk)		*1.137*	*6.086*	*14.555*	
Var(Zk)		*2.212*	*10.54*	*24.73*	
Panel Tests		r=0	r=1	r=2	
γ̲ (H(r)/H(3))		*69.876*	*5.959*	*-9.907*	
Avg(Tr)		28.912	11.256	1.388	

Avg(Tr) is the average of the trace statistics for the individual countries.
E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 10b

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Production function

Country-by-country tests					
		LRiγ (H(r)/H(3))			
Country	Lag(ki)	r=0	r=1	r=2	Rank(ri)
Benin		20.75	7.14	0.96	
Burundi		32.03	6.9	1.39	
Cote d Ivoire		38.59	10.71	1.05	
Ethiopia		19.65	8.68	0.34	
Gabon		33.58	13.71	1.36	
Kenya		43.69	13.36	0.43	
Mali		39.27	11.66	0.02	
Niger		29.38	16.3	5.53	
Nigeria		24.55	10.46	0.03	
Rwanda		16.16	5.98	0.73	
Senegal		22.66	7.8	0.97	
Sudan		37.08	15.68	2.74	
Tanzania		41.28	15.08	3.66	
Zimbabwe		37.46	17.09	3.81	
E(zk)		*1.137*	*6.086*	*14.555*	
Var(Zk)		*2.212*	*10.54*	*24.73*	
Panel Tests		**r=0**	**r=1**	**r=2**	
γ (H(r)/H(3))		***75.511***	***6.203***	***-9.714***	
Avg(Tr)		**31.152**	**11.468**	**1.644**	

Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Annex 10d

Larsson et al (2001) Likelihood based cointegration tests in heterogeneous panels for Production function

Country-by-country tests					
		LRiγ(H(r)/H(3))			
Country	Lag(ki)	r=0	r=1	r=2	Rank(ri)
Benin		20.75	7.13	0.95	
Burundi		23.28	7.22	0.79	
Cote d Ivoire		38.61	10.72	1.06	
Ethiopia		19.71	8.67	0.34	
Gabon		33.53	13.74	1.36	
Kenya		43.59	13.33	0.43	
Mali		39.23	11.65	0.02	
Niger		29.3	16.35	5.53	
Nigeria		24.42	10.47	0.02	
Rwanda		16.52	6.01	0.75	
Senegal		22.66	7.8	0.97	
Sudan		37.32	15.78	2.72	
Tanzania		41.17	14.99	3.67	
Zimbabwe		37.43	17.08	3.79	
E(zk)		*1.137*	*6.086*	*14.555*	
Var(Zk)		*2.212*	*10.54*	*24.73*	
Panel Tests		r=0	r=1	r=2	
γ (H(r)/H(3))		*73.964*	*6.235*	*-9.747*	
Avg(Tr)		30.537	11.496	1.600	

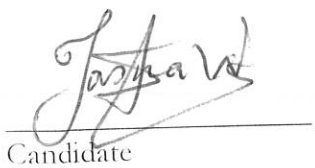
Notes:

1. Avg(Tr) is the average of the trace statistics for the individual countries.
2. E(Zk) is the mean of the asymptotic trace statistic obtained from Larsson (1998).
3. Var(Zk) is the variance of the asymptotic trace statistic obtained from Larsson (1998).
4. The statistic is normally distributed, and so the critical values are 1.645 (at 5%) and 2.326 (at 1%).

Declaration

The thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Declared by
Tamrat Workalemahu



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13 June 2005
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13 June 2005
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