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ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES  
FACULTY OF BUSINESS AND ECONOMICS

AN EMPIRICAL INVESTIGATION OF THE STABILISATION  
POTENCY OF BUDGETARY AND FINANCIAL POLICY  
INSTRUMENTS IN SIERRA LEONE



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BY  
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## DEDICATION

This work is dedicated to my mother, Mrs Gbassay Korsu, née Kondoh.



## ACKNOWLEDGEMENT

To Allah be the glory for all the good things he has done for me.

Had it not been the scholarship offered to me by the African Economic Research Consortium (AERC) it would not have been easy to get a Masters degree by this time because getting full scholarship within the context of an international competition is not an easy exercise. Getting scholarships via local authorities is also not an easy exercise especially where the work experience is just a year. But with the existence of AERC, which requires only academic competence from only African Students supported by recommendation from the university and the independence of AERC from government officials, I have satisfied one of my objectives I long for since I was in secondary school. I would like to thank the AERC for this investment in my human capital, which is going to improve my productivity and the productivity of my country and hence Africa owing to the fact that such an investment has positive externality.

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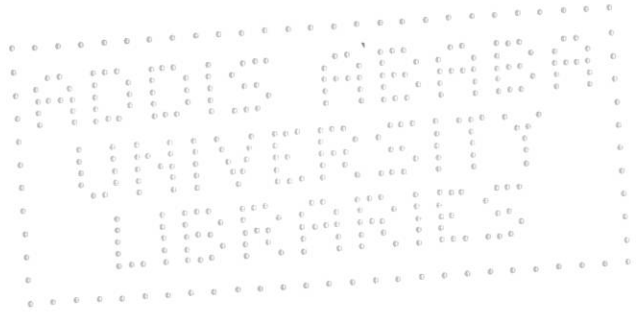
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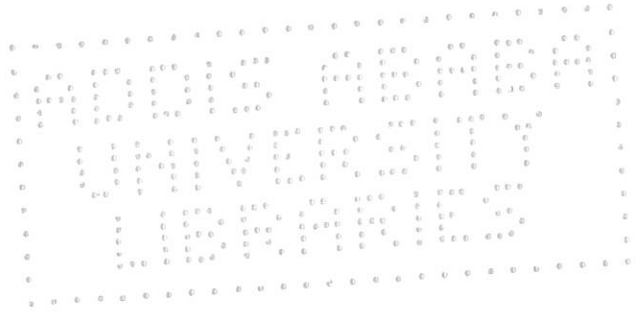
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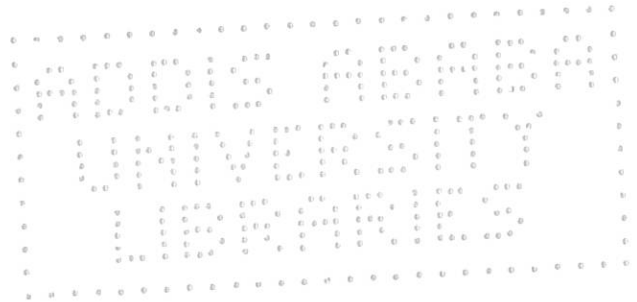
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## *Abstract*

*This study aims at determining the effect of government expenditure on real output, the effect of budget deficit and domestic credit on inflation and the balance-of-payments and the effect of exchange rate depreciation on the balance of payment, inflation and real output.*

*Time-series models of inflation, balance of payments and real output have been estimated as these are the key variables targeted by stabilisation programs, which involve budgetary and financial policy instruments. The procedure used involves applying the Johansen Maximum Likelihood Method in multivariate models and the Hendry's general-to-Specific Method to arrive at long- and short-run models, respectively.*

*Fiscal restraint is found to abate inflation and improve the balance of payments but it is accompanied by real output loss. Budget deficit is found to Granger cause domestic credit and the process through which the domestic credit creation worsens the balance of payments is through its inflationary effect. Thereby dwindling the competitiveness of the Sierra Leone economy. Exchange rate depreciation is found to improve the balance of payments in the long run. It is however inflationary and it reduces real output in the short run though expansionary in the long run.*

## SECTION ONE

### INTRODUCTION

*Stabilisation is what both households and governments long to maintain. When stability is lacking, households feel the want of it acutely, and in extreme cases governments may fall under elections or coups (Ross, 1991 P.3).*

Decline in real incomes and /or rising prices does directly undermine the welfare of the people of a nation. Balance of payments problem does the same harm though indirectly. Indirectly because policies that are undertaken in order to improve the balance of payments more often than not have adverse impact on price stability and growth of output.

Given the problems of external and internal imbalance, demand management policies, (fiscal policy and monetary policy) and exchange rate policies have been the commonly practiced ways of correcting external and internal imbalances. These policies have been widely used both in developed and developing countries. These policies are not however necessarily efficacious in the case of the developing countries.

This suspected inefficacy can in part be due to the differences in the structure of the economies of the LDCs and those of the MDCs as well as the acute macroeconomic disequilibria most LDCs have been facing since at least after the first oil shock (1973). LDCs have been facing acute macroeconomic disequilibria such as rapid inflation; declining or stagnant output; balance of payment crises; debt problems and high unemployment (Green and Murinde, 1992).

In particular, most LDCs are heavily dependent upon the agricultural sector, which has inelastic supply in the short run. Their financial sectors are not developed. Most of the activities are undertaken in the informal sector. Their labour markets are segmented. Their imports constitute mainly of capital and intermediate goods whose demand is inelastic. Their exports are not only non-diversified but are basically primary products, whose prices are volatile in the world market and their supply are inelastic at least in the short run.

The structure of the Sierra Leone economy is not an exception to these features. With respect to macroeconomic disequilibria, Sierra Leone has been facing high inflationary pressure, balance of payments deficit, and decline in real GDP since the end of the 1970s. Due to this feature, stabilisation Programs that rely as it is argued (Ghatak, 1995), too heavily on budgetary and financial policy instruments to regulate aggregate demand supported through stand-by arrangements and approved by the IMF have been in use.

Sierra Leone is among the countries that have been using demand management policies (monetary and fiscal policy) and expenditure switching policy (exchange rate policy,) to stabilise their economies.

While the issue of whether orthodox policy instruments in developing economies are effective or not has been well explored, the empirical investigation on a country basis is unsatisfactory. Most of the studies on macroeconomic stabilisation use a descriptive approach and then qualitative inferences are drawn from them, as in Porter and Raney (1982) and Killick (1984a,

1984b). In Porter and Raney, for example, an eclectic approach is undertaken and it is concluded that while the standard prescribed policies are efficacious in the MDCs they may not be so in the LDCs. Focusing on a particular problem (say balance of payments) and/or studying the potency of a single policy instrument in stabilization, as in Dhliwayo (1996) who considered only the effect of domestic credit restraint on the balance of payments, or modelling specific sectors of interest has also been another research agenda. There are cases where macroeconomic studies have been based on cross-country studies but the models have been intended to be applicable to any developing economy. The studies of Khan (1990), Agénor (1990) and Edwards (1986) fall under this category.

Both the theoretical and empirical literature on the potency of budgetary and financial policy instruments in stabilisation is split. The sense here is that a given instrument has been shown to have positive impact on a particular target by some authors but negative impact by some others.

What is uncommon in the literature is a study that includes all the various instruments as well as considering all three targets of a macroeconomic stabilisation-inflation, output, and the balance of payments. This study differs from most of the existing literature by bridging this lacuna.

In light of the controversy regarding the efficacy of orthodox budgetary and financial policy instruments in most developing economies, this study aims to investigate the potency of budgetary and financial policy instruments in correcting internal and external imbalances in the Sierra Leone economy using 1966 to 1998 aggregate data. Internal balance herein refers to

obtaining high output with low inflation. And external balance refers to obtaining favourable balance of payments.

The policy instruments in the study are budgetary and financial instruments. The budgetary instruments are government primary deficit and government expenditure while the financial policy instruments are domestic credit and the exchange rate. The macro policy targets are real output, the inflation rate and the balance of payments. More specifically, the study will attempt to examine the following issues in the Sierra Leone economy:

- (i) The impact of public deficit and domestic credit on inflation
- (ii) The impact of public deficit and domestic credit on the balance of payments
- (iii) The impact of government expenditure on real output
- (iv) The effect of exchange rate depreciation (defined as Leones per U.S dollar) on the balance of payments, inflation and real output.

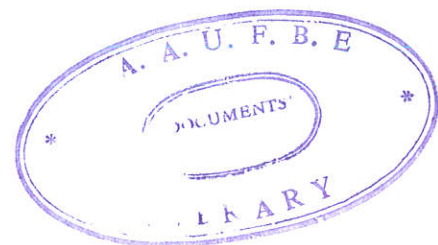
Owing to data availability problem, 1966 has been chosen as the start date for the study. For the same reason 1998 is chosen as the end date of the study. The data for the study will of course be secondary data and will be from the International Financial Statistics yearbooks, African Development Indicators, World Tables, World Development Indicators, and various issues of the Bank of Sierra Leone Economic Review and the Bank of Sierra Leone Bulletin.

Despite the consideration that stabilisation programs have been implemented in the economy, it is worth noting that macroeconomic policies are incompatible, in the sense that a given policy can alleviate a given problem while it may exacerbate another problem. There has been high

inflationary trends and adverse balance of payments crisis synchronised with stagnation in the Sierra Leone economy since the late 1970s.

A study like this can help in the formulation of macroeconomic policy for the Sierra Leone economy given the range of objectives and its country-specific nature. To this end, the study is useful for the economy because monetary, fiscal and exchange rate policies are used in Sierra Leone for correcting internal and external imbalances. This is in addition to the fact that Sierra Leone is one of the countries that have been using the IMF prescribed stabilisation policies as a way forward to lowering inflation and improving the balance of payments, with pro-growth objective at the background. This study therefore examines the extent to which policies in Sierra Leone have been effective.

The study is organised as follows. Section one is an introduction, which contains the background to the topic, the research objectives and the usefulness of the study. Section two deals with an overview of the Sierra Leone economy including the structure and the macroeconomic performance since independence as well a review of some macroeconomic policies. Section three contains a survey of the relevant literature on stabilisation and the efficacy of budgetary and financial policy instruments. Section four deals with the specification of the model, estimation and analysis of the estimated model. In section five, conclusion and policy implications of the study are discussed.



## SECTION TWO

### AN OVERVIEW OF THE SIERRA LEONE ECONOMY

#### 2.1 The Sierra Leone Economy: Background

Sierra Leone is a small, non-oil producing, poor and open economy with a population of 4.8 million (1998) growing at a rate of 2.2% (1998) with a per capita income of \$ 140 (1998)<sup>1</sup>. Per capita income has declined from \$380.00 in 1980 to \$260.00 in 1990 and \$140 in 1998 (see figure 2.1a).

Majority of the population live and work in the rural sector. About 35% of the population lives in the urban sector (1998) (see figure 2.1b). Production which is largely dependent on human, physical and infrastructure development is largely in the primary sector since most part of the rural activity is in the primary sector and majority of the population live and work in the rural sector.

The dominant sector of the economy is agriculture, which provides about 45% on average to the Gross Domestic Product (see figure 2.2) and 75% of employment to the labour force. Exports are based mainly on few commodities, which are primary commodities. Coffee, cocoa and fish are the major agricultural exports. The marketing was handled until 1989 by a public corporation (The Sierra Leone Produce Marketing Board: SLPMB). Agriculture accounts for about 40% of exports. More than 60% of the farmers grow the staple food (rice) but it has been imported in large quantities since the late 1970s.

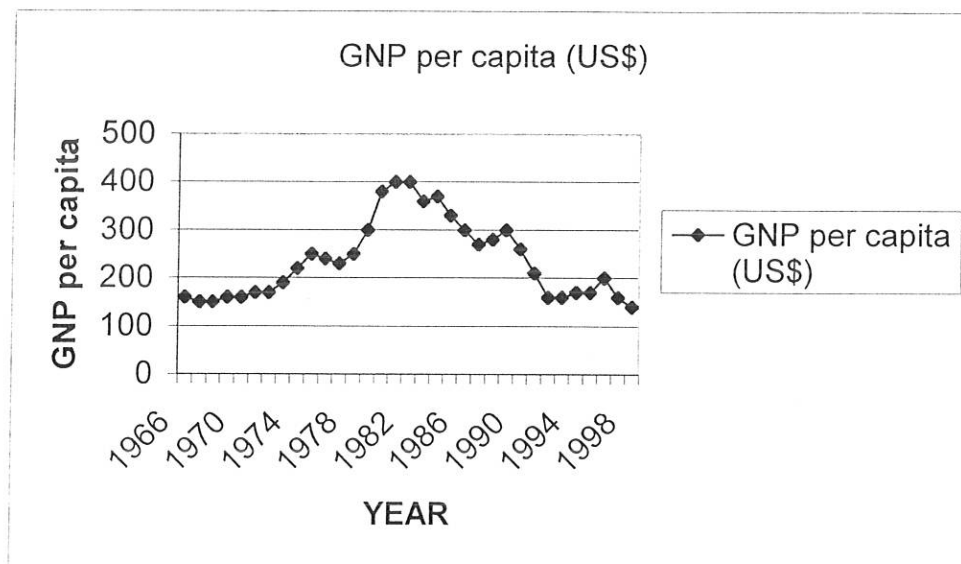
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<sup>1</sup> World Development Indicators, 2000 (World Bank).

The mining sector accounts for about 60% of foreign exchange earnings. Diamond, bauxite, iron ore, rutile and gold are the minerals that make the country rich in natural resources, with diamond being the premier one. The manufacturing sector is small. About 6% of GDP consists of import substituting industrial products and this sector employs about 2% of the labour force.

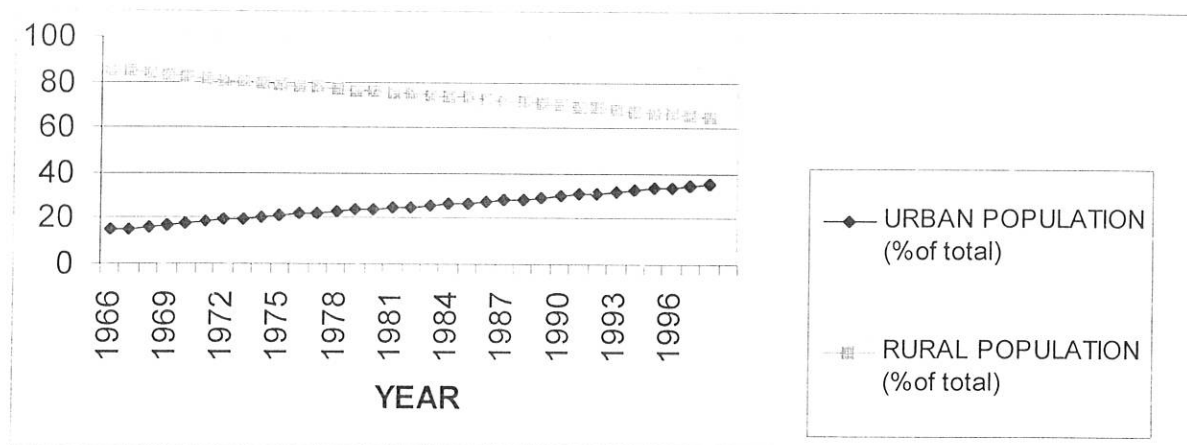
The service sector accounts on average for about 40% of GDP (see figure 2.2). The service sector comprises mainly transport, communications, insurance, and finance and government services. The middle and lower staff of the civil service lack adequate educational qualifications and are therefore often moonlighting because salary levels are insufficient for their subsistence.

**Figure 2.1a: Trends in Per Capita GNP**



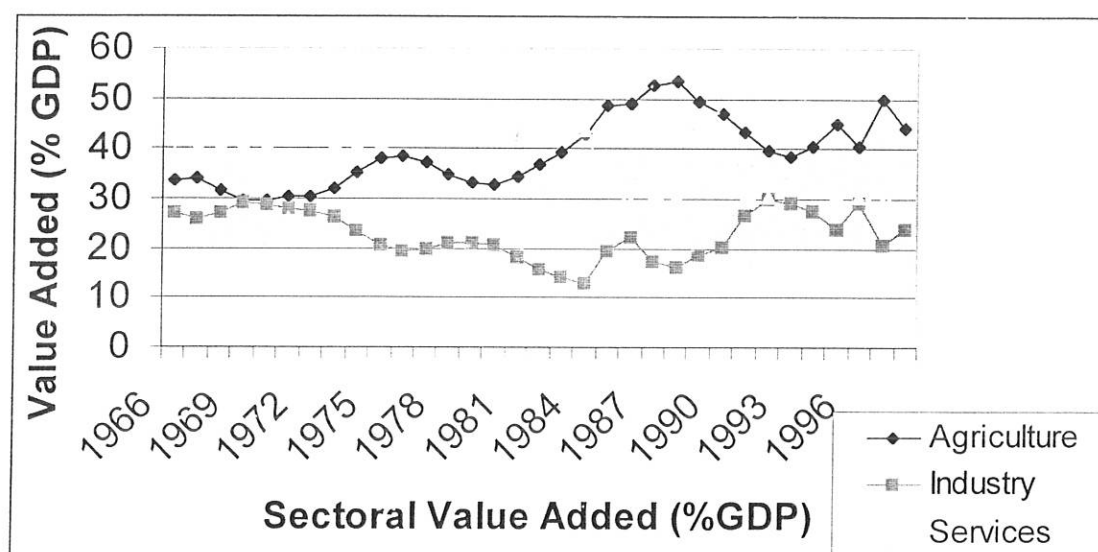
**SOURCE: World Development Indicators CD-ROM, (2000)**

Figure 2.1b: Distribution of population between urban and rural sectors



SOURCE: World Development Indicators CD-ROM, (2000)

Figure 2.2: Sectoral Value Added as percentage of GDP



SOURCE: World Development Indicators CD-ROM, (2000)

## 2.2 Social Indicators

The magnitude of poverty and the dept of poverty are very high and the distribution of income is markedly uneven. About 70% of the population lives in abject poverty (are below the poverty

line: U.S \$1.00 per day). In addition to the high headcount ratio, the Poverty-Gap ratio is 55.58%, Squared Poverty-Gap ratio is 45.86% and the Gini Coefficient is 66.67% (1998),<sup>2</sup>(Ali and Thorbecke, 1998). These statistics suggests that the people of Sierra Leone taken as a set are among the poorest group of people in the world.

Life expectancy at birth was 37 years in 1997 and 1998 while infant mortality rate was 170.0 in 1997 and 169 in 1998 (Little Data Book, 2000; World Bank). With respect to these figures Sierra Leone was the least in Africa. Human Development index score of 0.19 in 1995-the least in the world, Institutional Investor country risk rating score of 6.2 in 1998-the least in Africa (Institutional Investor; 1998). Primary school enrolment ratio is about 40% of the relevant age group, which is below the average for low-income sub-Saharan countries (75%). Adult illiteracy rate is estimated at about 70% for males and 90% for females and about 80% overall, this is among the least in Africa.

The economic infrastructure of Sierra Leone is not well developed. Rural feeder roads are in moribund while the trunk roads are not up to scratch. Electric power generation system is unsatisfactory. Access to safe drinking water is wanting by about 70% of the rural population.

### **2.3 Economic Performance**

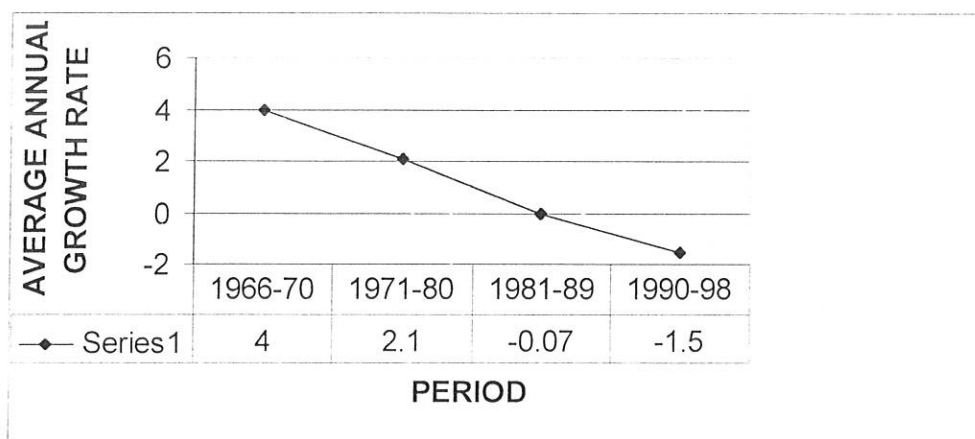
Until 1980 Sierra Leone experienced a moderate rate of growth in GDP synchronised with macroeconomic stability. From 1966 to 1970 GDP growth averaged to about 4.0% a year.

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<sup>2</sup> The headcount ratio measures the existence of poverty; the Poverty-Gap ratio and Poverty Squared-Gap ratio measure the dept/severity of poverty; the Gini Coefficient measures the extent of income inequality.

Despite the first and second oil shocks GDP growth averaged to about 2.1% from 1971 to 1980. This decline was mainly due to fall in incomes from the mining sector. The fall in incomes from the mining sector was as a result of the depletion of alluvial deposits and the fact that iron ore mining came to a halt. The country's reserve was seriously drained as a result of investments made for the hosting of the Organisation of African Unity (O.A.U) in 1980. The foundation for slow growth which had been laid in the 1970s by the depletion of the alluvial deposits, the oil shocks, the halt of iron ore mining, the huge expenditure for the hosting of the O.A.U and decline in prices for the country's export was built upon in the 1980s by deteriorating budgetary revenue situation. Over 1981-1989, GDP growth slowed to about -0.07% a year. From 1990 to 1998 (the war period in this study) GDP growth averaged to about -1.5% per annum (See figure 2.3)<sup>3</sup>. This ongoing war is to blame inter alia for this severe decline in economic activities since 1990.

**Figure 2.3: Average Annual Growth Rate of Real GDP**

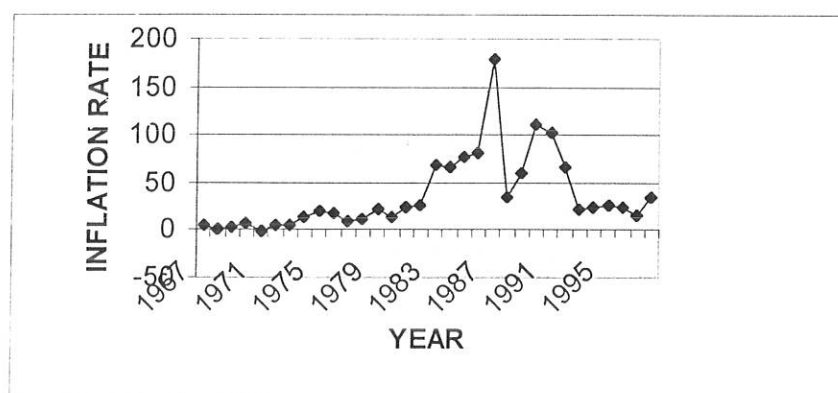


**SOURCE: Calculated from World Development Indicators CD-ROM, (2000)**

<sup>3</sup> The linear trend (OLS) growth rate was used to calculate the annual average growth rates. This method's accuracy is not undermined by the presence of outliers in the model, unlike the simple and compound-growth-rate methods.

Budgetary revenue fell sharply from 17% of GDP in fiscal year 1981 to only 6.7% in fiscal year 1986. The reduction in imports and official diamond sales (owing mainly to the growing overvalued exchange rate), which reduced the tax base and the indiscipline in the public-sector management (which eroded tax collection efficiency) were the key factor that triggered the deteriorating revenue situation. Inflation accelerated from 23% in 1981 to 179 (its highest in the history) in 1987. Foreign reserves fell from U.S \$ 16 million in 1981 to U.S\$ 6.3 in 1987 (see figures 2.4 and 2.5).

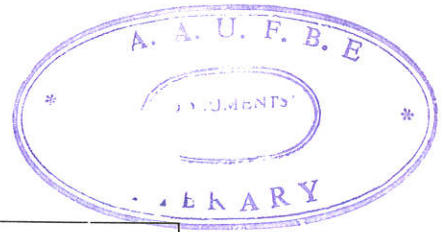
**Figure 2.4: Trends in Inflation Rate**



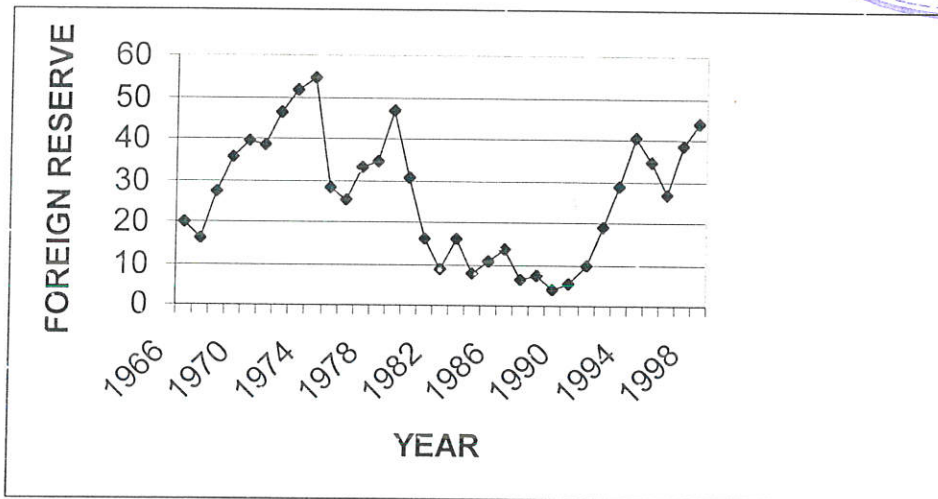
**SOURCE:** Calculated from World Development Indicators CD-ROM, (2000)

Too late and unsustainable exchange rate adjustments in order to avert the declining economic performance were introduced by the end of 1982. A dual exchange rate system was introduced in December 1982 under the “Modified Exchange Rate Arrangements”. This involved an official exchange rate and a commercial market rate. The former was set at Le1.25 per U.S \$ but the latter had no definite rate. But this turn out to be beating a dead horse as reserves failed to flow in the banking system as expected. A unified exchange rate set at Le2.50 per U.S dollar

was substituted for the dual exchange rate system in July 1983. This policy had the same outcome as the one for which it was substituted.



**Figure 2.5: Trends in Foreign Reserve**



**SOURCE: World Development Indicators CD-ROM, (2000)**

In June 1986 a comprehensive economic reforms including a market-determined exchange rate system, a liberalised import regime and deregulated prices for a lot of basic goods were attempted to be introduced by a new government that had been installed in 1985 (The Momoh Government).

The National Economic Emergency Program was introduced in November 1987. This comprises rigid currency holding control of cross border trade, and controlling of prices of staple products. As it is usually expected, official trade and foreign exchange flows into the banking system dwindled. Thus in 1989, these measures were abolished.

An Economic Recovery Program was embarked upon in December 1989. This came from the series of meetings with The Fund and The Bank in relation to the issue of an adjustment program. The prime objective was to restore economic growth and basic social services. Strict fiscal discipline cum structural reform was the centre of the program.

This was however not the first time Sierra Leone had relationship with The Fund. The first financial programme signed in August 1966 with the key aim of reducing the overall credit so that demand for imports can be restricted thereby improving the balance of payments. Since 1979, the stabilisation program with The Fund had been regular until in March 1984 when the relationship was cut. The fall of the financial assistance program was mainly due to the non-willingness of the Stevens government (that had been in power since 1968) to: curtail public expenditure, devalue the Leone and cut subsidies on petrol and rice. The slope of the economic decline hill Sierra Leone was going down became steeper when it fell apart with The Fund in 1984. President Siaka Stevens could not help it. The only avenue, probably to escape blame, was for an ill-health man to unconstitutionally hand over an economically ill country to the then head of the armed forces, Major-General Joseph Saidu Momoh in 1985.

All import and export licenses were subsequently abolished apart from those for gold and diamond. Importations of rice, the staple food, were privatised. In addition to this, The Sierra Leone Produce Marketing Board's monopoly over the exportation of coffee and cocoa was terminated. In 1990, a market determined exchange rate was introduced in an effort to add to the simplification of import and export procedure.

The emergence of the ongoing rebel war on March 23rd 1991 (a war led by the Sierra Leonean Corporal Foday Sankoh in collaboration with president Charles Taylor of Liberia, who was then a rebel leader in Liberia), averted the Economic Recovery Program from the direction of progress. To borrow from Davies (2000: p350), “ the internecine rebel war waged by the Revolutionary United Front (RUF) has only served to exacerbate Sierra Leone’s tragic condition” .

The war set in motion with the campaign to overthrow the then unpopular one-party-system APC (All People’s Congress) government that had ruled since 1968 was fuelled nonetheless of the military coup (which was initially popular as people wanted nothing but a change of government) of April 1992, headed by Captain Valentine Strasser. Infrastructure, public and private property have been vandalised. Manpower has been destroyed. Private investment have been discouraged, for one thing no rational investor is willing to under take huge investment in an economy with both political and macroeconomic instability (especially rebel war) at work.

There are other awkward nesses of the war. Export earnings has been substantially low. The only rutile company (Sierra Rutile) and the only diamond mining company were de facto shut down in 1994, as these areas were over run by the rebels. The Agricultural sector (the country’s main sector in terms of sectoral value added and employment) has been shrinking as rebels kill and recruit people wherever they settle or go by, there by creating an uncertain atmosphere. The social consequences need not be highlighted. Government expenditure to finance the war has been rising at the detriment of capital expenditure.

By and large, the first decade after independence (27<sup>th</sup> April 1961) was a good period in the economic- performance history of the Sierra Leone Economy. Since then the situation has been tragic with multiplicity of prejudicial factors at work. All in all, among the factors that have conspired against a mineral-resource rich country's satisfactory growth performance since the early 1970s are: external factors such as the two oil shocks, fall in prices of cocoa and coffee, domestic mismanagement and the rebel war. The last two are perhaps the most spotlighted ones.



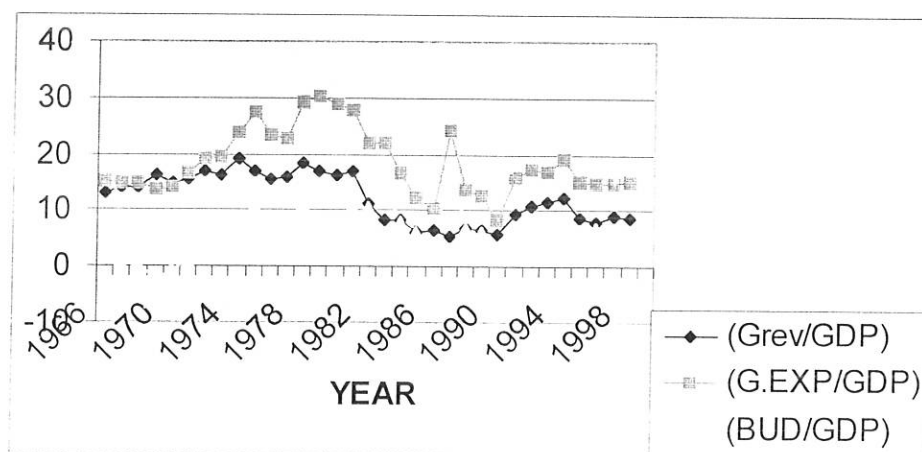
## 2.4 Fiscal Policy

The major emphasis by 1966 was to limit the budget deficit in order to restrict monetary expansion. In 1969 and 1970 the government obtained overall surplus. The reduction of deficit was achieved by both the reduction of expenditures and increasing revenue. “The government aimed at curtailing the expansion of current expenditures while maintaining efficient administration; it made no retrenchments but froze all personnel vacancies (except in such essential areas as hospitals) and reduced appropriations for travel and material supplies. Capital expenditures were allowed only for ongoing projects and those considered absolutely necessary” (Bhatia et al, 1969: PP. 508-509). Various efforts were put to reduce fiscal deficit. The fiscal deficit as a ratio of GDP reduced from an average of 51% per annum from 1971 to 1975 to 16% over 1976 to 1980. From 1981 to 1986 it declined by 20.4% a year. From 1987 to 1990, fiscal deficit as a ratio of GDP declined by 57.6% a year. Over 1991 and 1998 it declined by only 0.2 % a year.

From 1981 to 1986, revenue as a share of GDP declined by 19% a year. Over 1987 to 1990 it grew by 0.23% a year. The 1981 to 1986 decline in revenue was mainly due to the more overvaluation and restrictive economic measures, which led to the diversion of a larger share of transaction to the parallel economy with tax evasion being widespread. Over 1991 to 1998, revenue as a share of GDP declined by 3.3% a year.

The government overall budget deficit reached 18% of GDP in 1987 but was moderated to 6% by 1989. Strict fiscal discipline became a key success in stabilising the economy. Total government revenue rose from 6.6% of GDP in 1989 to 12.4% of GDP in 1994. The overall budget deficit rose from 6% of GDP in 1989 to 7% of GDP in 1994 and stands at 6.3% of GDP in 1998 (See Figure 2.6).

**Figure 2.6: Fiscal Structure**



**SOURCE: Calculated from World Development Indicators CD-ROM, (2000)**

The strict fiscal indiscipline was adhered to by the popularisation of the Structural Adjustment Program supported by the World Bank and The International Monetary Fund. Civil service

efficiency improvement and strengthening the capacity to provide essential public services was the focus. Public sector employees with the exclusion of the military and police were reduced by over 50% (over 37000) between 1991 and 1995. This was done through the removal of ghost workers from the payroll and the retrenchment of redundant daily workers. In 1996, a reform of the salary and grading system was introduced in order to motivate and retain key professional and managerial staff.

The escalation of the rebel activities has been a key factor in undermining the revenue base of the government. Government revenue fell from 12.4% of GDP in 1994 to 8.7% of GDP in 1998. Emergency defense expenditures have also increased sharply as the government intensifies its effort against the rebels.

## **2.5 Monetary Policy**

The prime objective of the authorities' monetary policy just after 1965 was to tighten the expansion of the money supply to amounts consistent with the reserves policy<sup>4</sup>. The increase in expansion for these periods was set to finance the budget deficit and the remainder for the satisfaction of private sector bank credit requirements.

Monetary and credit development has been expansionary since 1970, emanating mainly from the rapid expansion in credit to the government from the Bank of Sierra Leone. Narrow and broad money grew by 15.8% and 17.3% respectively in 1969 to 27.2% and 31.6% in 1978

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<sup>4</sup> The reserves policy was that monetary expansion should be below 7.5 million leones in fiscal year 1966/67, 3.0 million leones in 1967/68 and about 2.0 million leones in fiscal year 1968/69.



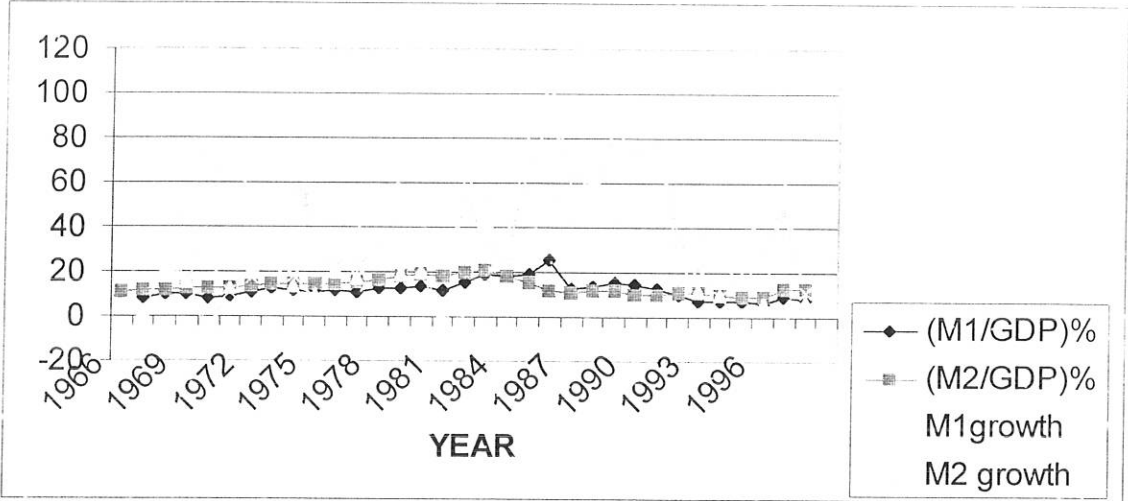
respectively. In 1986 the growth in narrow and broad money were 105.9% and 88.4% respectively. The private sector was crowded out. The rate of inflation became very high to 179% in 1987 and decreased in 1988 to 34.3%. With the emergence of the Economic Recovery Program narrow and broad money fell from 64.3% and 74% respectively in 1990 to 10% and 9% in 1994 (see figure 2.7). Financial deepening measured as; the ratio of money supply (both narrow and broad) has been fairly stable but not improving (see figure 2.7). The main objective of the authorities in the economic recovery period was the reduction of monetary growth to a level consistent with government inflation and balance of payments objectives. The provision of more bank credit to the private sector in order to bolster private sector activity was attached to this key objective. The central bank used open market operations to carry out monetary control through auctions of treasury bills on a weekly basis.

The improved government fiscal operation was the factor for the success in reducing the growth of broad money. This contributed to abating inflation from 110.9% in 1990 to 24.2% in 1994. The depreciation of the exchange rate and the rise in import price of rice however increased inflation to 26% in 1995. Inflation rate increased from 23.1% in 1996 to 35.5% in 1998 as a result of the huge domestic credit expansion through bank lending to the government during the most recent and short-lived military regime in 1997 and the huge depreciation of the exchange rate in the same year.

An expansion was made to the auction system by including a one-year government bonds in march 1995 in addition to the establishment of a clearing facility for official debt. The clearing

facility was set up to better the secondary inter-bank money market. It was supervised by the central bank, The Bank of Sierra Leone (BSL).

**Figure 2.7: Trends in monetary growth**



**SOURCE: Calculated from World Development Indicators CD-ROM, (2000)**

In the beginning of 1994, an institutional development program with the aim of fostering the Bank of Sierra Leone’s role in promoting monetary stability and a sound financial structure was established. This preceded a comprehensive management audit of the Bank of Sierra Leone.

With the aim of improving the operating efficiency of the banking sector, a diagnostic study of the commercial banks was undertaken. The banks thus took measures to restructure their operations. Bank spreads increased. But the alarming destructions of the ongoing rebel war in various parts of the country have made banks to exist only in the city, Freetown, and in the second and third cities (Bo and Kenema respectively). The banking sector, which was dominated by foreign banks, has been dwindling since the war started in 1991. By the end of 1999 after the military coup of 1997 and the rebel invasion of the city on January 6<sup>th</sup> 1999

foreign banks had been closed down in the city and capital repatriated though a domestic operation replaced one without change of name and another commercial bank was founded.

## **2.6 Exchange Rate Policy**

A fixed exchange rate regime was in play in the Sierra Leone economy until 1990. Balance of payments problems were basically attributed to large public sector deficits and the difficulty of the Sierra Leone Produce Marketing Board (SLPMB) instead of the non-competitiveness of the exports of Sierra Leone.

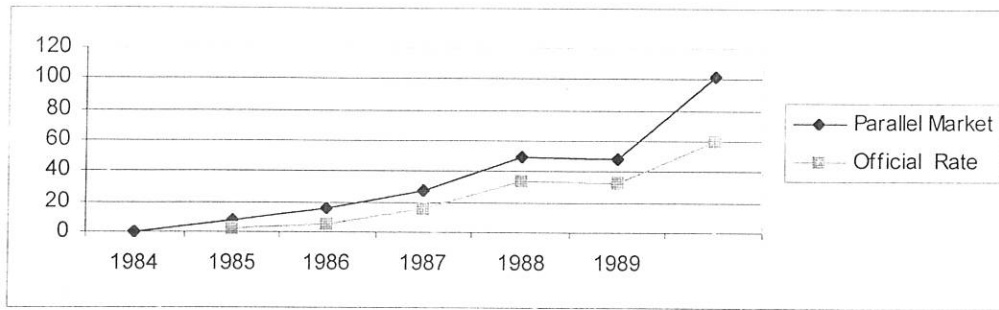
In November 1967, when the pound sterling was devalued by 14.3% the Leone was also devalued in an effort to avoid outflow of capital. The Leone was then pegged to the British pound until 1978 at a rate of le 2.00 per British pound. The delinking of the Leone from the pound in 1978 was done for a pegging of the Leone at a rate of le 2.25 to the SDR.

The government revalued the Leone from le53.00 per United States dollar to le23.00 per United States dollar by the end of August 1987 after a reintroduction of a unified exchange rate regime (in 1984) that succeeded a failed dual exchange rate regime in 1983. The parallel market rate was Le52.00 per United States dollar at that time. Series of depreciations of the exchange rate followed until March 1989 when the Leone was devalued from le44.00 to le65.00 per United States dollar. The parallel market rate however skyrocketed up to a rate of le120.00 per U.S dollar by the end of 1989. The government then devalued the Leone on January 15, 1990 to le 120.00 per United States dollar.

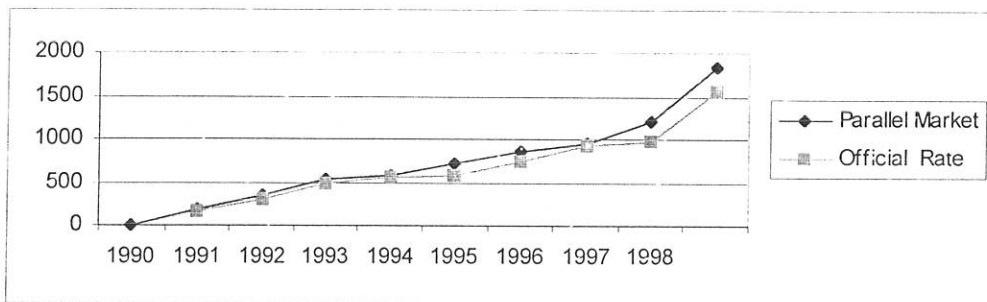
On April 25, 1990, the Leone was floated and most current account transactions were liberalised. The market determined exchange rate regime had to be undertaken in April 1990 with one of the reasons being that the previous fixed exchange rate system encouraged the smuggling of diamonds, gold and other produce abroad due to the huge overvaluation of the Leone. For another, the continuation of the previous system could have undermined people's confidence in the Leone and condoned more outflow of capital, which could have denied the government the benefit of the Economic Recovery Program. Figures 2.8a, 2.8b and 2.8c picture the differences between the fixed exchange regime and floating exchange rate regime in terms of the degree of misalignment (specifically, overvaluation) of the Leone. Herein, the parallel market rate is used as proxy for the equilibrium exchange rate because this is the appropriate reflection of the equilibrium exchange rate for countries with large parallel market for foreign exchange. The figures show that the overvaluation of the Sierra Leonean Leone was very high during the fixed exchange rate regime relative to the floating exchange rate regime. Even in the floating exchange rate regime, the intensified period of the ongoing war (after 1994) has higher overvaluation.

Succeeding the introduction of market-determined exchange rate system was the acceptance of the existence of foreign exchange bureaus in November 1991. The private sector is now handling a larger portion of the total foreign transactions and the operation of the foreign exchange market has improved markedly.

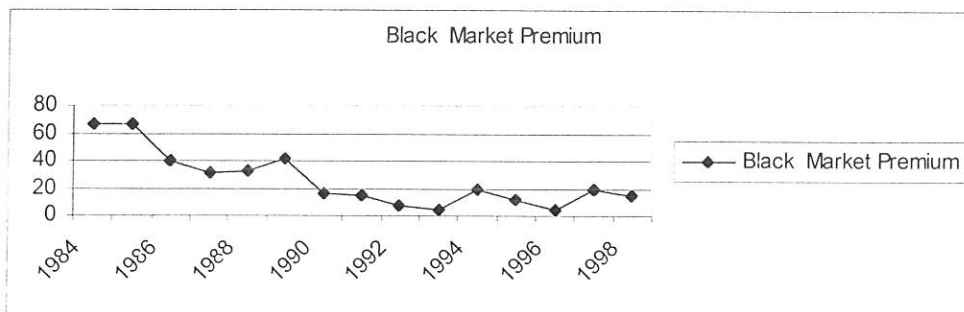
**Figure 2.8 Exchange rate Misalignment**



(a) Fixed exchange rate regime



(b) Floating exchange rate regime



(c) The black market premium<sup>5</sup>.

**SOURCE: Bank of Sierra Leone Bulletin and IFS yearbook, various issues**

<sup>5</sup> The black market premium was estimated by the percentage by which the parallel market rate deviates from the official rate.

## SECTION THREE

### A SURVEY OF THE LITERATURE

A review of literature is done in this section of the study. This is done by considering both theoretical and empirical literature on the effects of fiscal restraint, monetary restraint and a depreciation of the nominal exchange rate on inflation, the balance of payments and real output. The theoretical literature is preceded by a brief review of theories of inflation, the balance of payments and economic growth.

#### **3.1 Theoretical Literature**

##### **3.1.1 Conventional Theories of Stabilisation**

In an effort to go through the objective of this study, an inflation equation, a balance of payments equation and a real output equation were estimated. It is against this backdrop that it is deemed necessary to review some conventional theories of inflation, balance of payments and growth in brevity.

##### **3.1.1.1 Theories of Inflation**

The monetarist Model is a well-known model of inflation that has its base from the quantity theory of money. According to the monetarist school of thought, inflation is purely a monetary phenomenon. The sense is that monetary expansion is the impulse and propagating mechanism

of inflation. The idea is that an increase in the supply of money in excess of what is demanded leads to an excess supply of money in hands of the agents. Thus economic agents strive to compete for goods and services, given an inelastic supply curve (at least in the short run), this puts pressure on the general price level to go up. Thereby resulting in inflationary pressure.

Their recommendation is therefore that the supply of money should be controlled in order to control inflation. Their leader, Milton Friedman, summarizes their view, as inflation is always and everywhere a monetary phenomenon.

The Inflationary Gap (Keynesian) Model is another conventional theory of inflation. The central tenet of this model is that inflation is rooted from conditions in the goods market rather than in the money market, as the monetarists believe it. The case is that excess demand (inflationary gap) gives rise to price increases. The model posits that money does not play any important relationship in causing inflation. "For one thing, it does not suggest that an increase in money is a uniquely important cause of the inflationary gap" (Harris 1981, P.376). A key assumption common to this school of thought and the monetarist model is the assumption of a neoclassical aggregate supply curve. They view excess demand for goods to be caused not by increases in money supply but that it results from sources such as increase in investment (owing to optimistic capitalist expectations), reduction of tax and/or increase in government expenditure (Harris 1981). They contend that if money supply increases cause inflation, it must be via the real balance effect, or its negative effect on interest rate, increased consumption and investment. Hence, increased domestic absorption.

The Structuralist Model is another conventional inflationary model. The thesis of the model is that developing countries are saddled with inflation because of the existence of structural imbalances in these countries. The rigidities include inelastic food supply, foreign exchange constraint and budget constraint (Barungi, 1997). “Inflation is therefore due to structural factors such as food prices and wage or exchange rate changes, and sustained by propagating mechanism, including increases in money supply” (Barungi, 1997; P.3). The role played by exchange rate changes in causing inflation via mark-up pricing is an issue tied down to the structuralist school. Another consideration is that the structuralist school credits increases in money supply leading to inflation. However, they contend that it is triggered by the fact that the fiscal revenue of governments of LDCs is limited owing to the structure of their economies. Their belief is that increase in money supply that consequently causes inflation is not due to fiscal indiscipline but that it is due to the fact that the structure of the economy is such that money creation, which is an inflation tax, is the only avenue left for financing the deficit (to the extent that there are tax collection lags).

### **3.1.1.2 Theories of Balance of Payments**

The Elasticity Approach<sup>6</sup> to the balance of payments is one of the oldest conventional theories of the balance of payments. This approach is a theory that provides proviso under which a depreciation of the exchange rate can improve the balance of payments (specifically, the

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<sup>6</sup> It neglects by assumption, trade in services and investment-income flows, so that the current account balance equals the trade balance. It further assumes domestic price level varies with world price and that the trade balance is initially in equilibrium. Moreover, it assumes the law of one price does not hold. Income, domestic price and foreign price are assumed constant in this approach.

current account). This condition is referred to as the Marshall-Lerner-Robinson (MLR) condition. It states that:

“ A depreciation of a country’s currency will improve its current-account balance if the sum of the price elasticities of domestic and foreign demands for imports is larger than unity” (Kenen; 1994 P.352).

In the case of the LDCs, it has been argued that this condition is not fulfilled (as in Miles, 1979 and Saidi 1987). This phenomenon is known as the elasticity pessimism. A familiar/popular argument for this is that the LDCs exports are mostly primary products, which have high foreign price elasticity of demand. The argument continues, their imports constitute more of capital and intermediate goods, which have low domestic price elasticity of demand.

Another argument, which is common to even the MDCs, for this elasticity pessimism is that these elasticities relate to long-run scenarios. The short run elasticities are low and hence can hardly satisfy the MLR condition. For one thing, it takes time for consumers and producers to take actions so that they can find new supplies and customers. Thus in the short run, the current account balance worsens but improves in the long run. Thus tracing a J-shaped curve over time. This phenomenon is referred to in the literature as the J-curve effect of devaluation or depreciation on the current-account balance.

The elasticity approach ignores the effect of devaluation on domestic prices. But, it is the case that import prices are increases spill over to domestic prices. In addition, the case increases in

the price of imported consumer goods increase the cost of living. Thereby bringing rise in nominal wages (if trade union is strong) and cost of production increases. This generates price increases domestically. Thus, competitiveness declines. Hence, the trade balance declines. In sum, the elasticity approach ignores the adverse effect of the bilateral exchange rate depreciation on the competitiveness of the domestic tradable sector and hence on the trade balance.

The Absorption Approach is also recognised as a conventional theory of balance of payments. This approach to the balance of payments, derived from the equilibrium in the goods market of an open economy holds the view that as long as devaluation does not reduce absorption, it cannot improve the balance of payments. This is pointing to the fact that the MLR condition alone is not a sufficient sine qua none for devaluation to improve the trade balance. The fundamental proposition of the absorption approach is that:

“When resources are fully employed, a change in the nominal exchange rate cannot affect the current-account balance unless absorption is adjusted to accommodate the expenditure-switching effect of the exchange-rate change” (Kennedy; 1994. P.362)

This basic proposition of the absorption approach has both direct and indirect effects. The direct effect (expenditure reducing) proponents of the approach is that exchange rate changes affect absorption automatically and this is the key way in which exchange rate depreciation improves the balance of payments. The idea of the direct effect goes: First, devaluation reduces real income by worsening the terms of trade; such a reduction in the real income reduces

absorption, to the extent that imports are reduced (as a consequence of the reduction in income). Thus improving the balance of payments. Second (some others hold this view), devaluation raises the price level, thus reducing absorption by raising the demand for money<sup>7</sup>. This is the (real) cash–balance effect.

The indirect proponents hold the view that absorption approach is complementary to the elasticity approach rather than a substitute. They believe that monetary and fiscal policies must be jointly used with exchange-rate change to maintain internal and external balance.

The Monetary Approach to the balance of payments (MABP)<sup>8,9</sup>, which is another conventional theory of balance of payments is derived from the money market clearing mechanism. This approach can be traced back to the middle of the eighteenth century based on the work of David Hume (1752). It considers external imbalance as arising from imbalances between the demand and supply for money engendered by increase in the domestic credit. Thus the prediction of the model is that balance of payments is a monetary phenomenon (but not a real phenomenon).

The central thesis is that under a system of fixed exchange rates, excess money supply induces increased expenditure, as economic agents buy foreign goods and services and financial assets with the excess of money demanded. Buying foreign currency finances these purchases. This in

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<sup>7</sup> The demand for money is homogenous of degree one in price level. This is because as the price level increases, economic agents in an effort to maintain the real value of their financial assets (including currency) hold on to more money than before.

<sup>8</sup> The MABP does not decompose the external effects of domestic credit in to current account and capital account components.

<sup>9</sup> The basic assumptions of the model are: money demand is a function of the price level, real domestic income and the rate of interest; the law of one price (PPP) holds both in the goods and the assets (money) markets; the real income is fixed (the neoclassical aggregate supply function holds) and the money demand function is stable.

turn involves running down reserves. Thus deteriorating the balance of payments by an equal amount as the increase in domestic credit (starting from an equilibrium in the money market). That is, the additional money supply leaks out abroad. A fundamental problem of the MABP is that it focuses mainly on the money stock rather than the whole portfolio of assets in the asset market analysis.

### **3.1.1.3 Theories of Economic Growth**

The Harrod-Domar Model (one sector growth model) is one of the oldest conventional growth models. It is based on a production function with no substitution between capital and labour. It assumes investment is equal to net savings and net savings is a constant function of output.

An issue in the model is that maintaining full utilisation of capital requires that output grows at a rate equal to the ratio of saving rate to the capital-output ratio. This ratio is called the “warranted” rate of growth of full-utilisation of the capital stock. It is believed that: this is a ratio that will cause investors expectations to be realised.

Another consideration of the model is that maintaining full employment of labour requires that output grows at a rate equal to the growth of the labour force. If effective (rather than total) labour force is considered, the condition remains the same but it will be in terms of the growth of the effective labour force. This they refer to as the natural growth rate of labour (or effective labour force, accordingly).

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The central tenet of the Harrod-Domar Model is that for both capital and labour to be fully employed while the economy grows, the “warranted” growth rate equals the natural growth rate. This is called the Harrod-Domar (equilibrium) condition<sup>10</sup>.

If the Harrod-Domar condition does not hold, the economy sustainably keeps away from moving on its equilibrium. That is, the economy is in a state called the knife-edge. Another weakness of the model is its assumption of fixed coefficient of production (factors cannot be substituted-that is, capital and labour are combined in a fixed proportion), which is not practical though intuitively appealing.

The Neo-Classical Growth Model is another focus in the conventional growth models. In the Neo-Classical growth model unlike in the Harrod-Domar model, the assumption of the existence of the Leontiff type (fixed coefficient, i.e. no substitution of factors) production function is relaxed.

By holding a Cobb-Douglas type production function and an equation for capital accumulation, Solow (1956) and Swan (1956) undertook independent work and came up with a new type growth model called exogenous growth model. The heart of the Solow-Swan model (also called the Solow model) is that per capital income is determined by growth rate of the population (proxy for the growth rate of the labour force) and growth rate of investment. Technological progress is not captured in this model. The model assumes diminishing returns to capital. The assumption of diminishing returns to capital is one of the cornerstones of the convergence or

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<sup>10</sup> If natural rate exceeds warranted rate, unemployment exists and if the reverse occurs, idle capacity exists.

catch-up hypothesis. This states that for countries with high/abundant capital per effective labour, capital per effective worker tends to decrease (vice versa) because the productivity of capital is inversely related to its level). Thus, capital scarce economies tend to catch up. The reason is that return to capital is high in capital scarce countries thus capital inflow is encouraged, thereby increasing capital per effective worker.

With this, per capita income can grow because of policies that affect investment. Nevertheless, this effect holds only within the transition period but not at the steady-state level. That is, policy does not matter for long-run growth.

With a modification in 1957, technology that serves to augment labour (called Harrod-neutral) was introduced into the paradigm. This technology is however assumed neutral. With this, the prediction of the model is that per capita output level depends on the level of technology, rate of investment and population growth while long run growth rate is determined by technological changes. Exogenous policy effects are believed to have only a transitory effect on growth until a new long run equilibrium level (steady-state level) is attained.

Endogenous Growth Model is the relatively new model of growth. “Solow (1991) marks the origin of endogenous growth theory with Romer’s doctoral thesis of 1983, emerging as Romer (1986), and Lucas’ Marshall Lectures of 1985, giving rise to Lucas (1988)” (Fine, 2000).

While the Neo-Classical growth model considers the importance of technology in the growth process, it presupposes that technology is to augment labour. On top of this, it considers technology to be exogenous. Externality from capital is ignored in the Neo-Classical growth model; hence there are diminishing returns to capital. In the Endogenous Growth Model

however, there is no diminishing returns to capital because of the belief that externalities may arise from R&D (Lucas 1988) and knowledge spills over (Romer 1986). This is also a cornerstone of the convergence hypothesis in the sense that the laggards benefit from the international technological diffusion innovated by the leaders. Thus bringing higher prospect to catch-up, Frantzen (2000).

The endogenous growth model (Romer, 1986; Lucas, 1988 and Solow, 1991) underscores the fact that technology has its determinants rather than being exogenous, and there are no diminishing returns to capital. Principally, the contention is that investment in research and development (R&D) brings technology. In addition to this, the growth rate of researchers and other determinants of the stock of ideas determine the long-run growth.

The Technology Transfer Model which is basically for the 'disadvantage' countries has its main thesis as: for the laggards, the prospect for innovation is blink thus they have to rely on international technological diffusion which is innovated by the leaders. The point then is that, in order to bolster long run growth, these countries need improve the rate at which they adapt new technology as they do have limited ability to develop new technology. The improvement of local institutions is one such method.

### **3.1.2 Theoretical Studies on Budgetary and Financial Policy Instruments**

The literature on the efficacy of budgetary and financial policy instruments in alleviating /attaining internal and external imbalance/balance is tantamount to the efficacy of

macroeconomic policy in an open economy. In discussing the theoretical literature satisfactorily, attention must not be taken away altogether from the Hicksian IS-LM mainstream Keynesian model developed by Flemming (1962) and Mundell (1962, 1963).

In the familiar Hicksian IS-LM model<sup>11</sup>, fiscal and monetary expansions increase output but are inflationary. The more inelastic is supply the more is the inflationary effect.

In the mainstream Keynesian model, a monetary restraint policy increases the interest rate and decreases income. Thus, the balance of payments improves unambiguously. However, in the case of fiscal restraint, the balance of payments improves provided the income-reduction effect on the current account outweighs the interest-rate reduction effect on the capital account.

These models are however based on a wide range of unrealistic assumptions, which hardly hold at least in the LDCs<sup>12</sup>. Thus, they can be regarded safely as textbook models.

The theoretical literature on the impact of depreciation of the nominal exchange rate on the balance of payments is mixed though dominated by those that have established an improvement in the balance of payments. The studies of Dornbusch (1982), Krugman and Taylor (1978), Porter and Ranney (1982) and Khan and Montiel (1989) fall in this category unlike that of Taylor (1981), which posits that, the depreciation of the exchange rate has an unclear effect on

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<sup>11</sup>The model assumes a small country, world real income and world price are given; net exports are function of domestic real income (reflecting Keynesian assumption that imports are a positive function of income) and competitiveness (defined as real exchange rate). It also assumes that the law of one price does not hold and the capital account is a positive function of the difference between domestic and world interest rate.

<sup>12</sup> The Mundell –Flemming model for example assumes: the capital account is a function of the difference between domestic and foreign interest rate rather than the changes. The wealth effect of a persistent balance of payments is ignored in this model. The model assumes monetary authorities do sterilisation. But this is a matter of not only willingness but also even the ability to effectively sterilise, which depends among others on the presence of a developed financial market.

the balance of payments and Wignbergen (1986). The likely adverse effect of a devaluation of the nominal exchange rate on the balance of payments found by Wignbergen (1986) is attributed to the fact that the channel via which devaluation is contractionary is contrary to the negative effect on aggregate demand (Krugman-Taylor effect). The Wignbergen effect goes: in the short run aggregate supply shrinks<sup>13</sup>, as a result of the devaluation, thus exacerbating inflation and hence pressure on the balance of payments to worsen owing to the deterioration of competitiveness.

Most of the theoretical literature on the effect of devaluation on inflation has established an inflationary-effect conclusion. These include the studies of Taylor (1981), Dornbusch (1982), Wignbergen (1986) but contrary to the work of Khan and Montiel (1989), who found a disinflationary effect and Porter and Ranney (1982) who established that the effect of a devaluation on the price level is ambiguous for the LDCs while inflationary in the MDCs.

With respect to the theoretical literature on the impact of devaluation on real output, the literature converges on the focus that devaluation is contractionary at least in the short run. This is revealed in the work of Díaz-Alejandro (1963), Krugman and Taylor (1978), Wignbergen (1986), Dornbusch (1982), Taylor (1981) and Khan and Montiel (1989) but contrary to the study of Porter and Ranney (1982) who arrived at an ambiguous effect for the LDCs<sup>14</sup> but expansionary result for the case of MDCs.

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<sup>13</sup> Three channels via which devaluation is contractionary were identified. These are: the role of intermediate input; the assumption of real wage indexation on the consumer price index (this arises through formal contracts, implicit arrangements or social pressure) and the reduction of the real volume of bank credit, hence increased working capital.

<sup>14</sup> The justification given for this ambiguity is that devaluation directly increases variable costs, thus a contraction of aggregate supply and maybe with an increase in the price level. To the extent that tax revenues from trade

Though much theoretical work does not exist on the direct impact of fiscal restraint on the balance of payments, Dornbusch (1982) has shown that fiscal restraint improves the balance of payments while the work of Khan and Montiel (1989) shows an ambiguous effect of fiscal restraint on the balance of payments. In the latter, fiscal restraint is however established to improve the balance of payments when the substitution effect on the trade balance is strong relative to the income effect, with the existence of large price effects<sup>15</sup>.

Fiscal restraint is found in most of the theoretical literature to lower inflation as found in Taylor (1981), Khan and Montiel (1989), Dornbusch (1982) and Porter and Ranney (1982).

Theoretical considerations have shown that fiscal restraint is expansionary, as in Taylor (1981), Khan and Montiel (1989) while others have found it to be contractionary. The studies of Dornbusch (1982) and Porter and Ranney (1982) fall in the latter category though Porter and Ranney (1982) found fiscal restraint to be expansionary in the case of MDCs.

The work of Khan and Montiel (1989) posits that monetary restraint improves the balance of payments as established in Dornbusch (1982) and Taylor (1981). In Taylor (1982: p486): “Stabilisation tools normally applied –monetary restraint, fiscal control and devaluation- all have stagflationary impacts to a greater or lesser extent. Moreover, their efficacy in improving the balance of payments may be small”.

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increase in domestic currency terms while the balance of payments surplus declines, the net effect is thus ambiguous.

<sup>15</sup> Their argument for this is that a reduction in the government spending reduces fiscal deficit and increases the public sector savings, thereby increasing investment and output. The increase in output puts down pressure on domestic prices.

Taylor (1981) has found monetary restraint to be inflationary. This conforms to the likely inflationary effect of monetary restraint found by Porter and Ranney (1982) in the case of the LDCs. This does not however corroborate the disinflationary effect of monetary restraint established by Porter and Ranney (1982)-in the case of the MDCs, Khan and Montiel (1989) and the insignificant effect of monetary restraint on inflation found by Dornbusch (1982). According to Dornbusch (1982 p: 705): “since there is no direct link between money and inflation, a reduction in the growth of money and domestic credit cannot reduce inflation”. He notes that a reduction in the growth of domestic credit by shifting from money to debt financing of a high-unchanged fiscal deficit does not solve the problem of inflation and even if it does mitigate inflation this must be due to a cyclical dampening effect of a recession.

The theoretical literature on the effect of monetary restraint on real output is dominated by the fact that contractionary result obtains, as in Dornbusch (1982), Khan and Knight (1989), Taylor (1981), and Porter and Ranney (1982) though the latter found that in the long run real output is unaffected as a result of the monetary restraint and in general the contractionary effect on the MDCs is moderate.

## 3.2 Empirical Literature

### 3.2.1 Domestic Credit Restraint and Stabilisation

Khan and Knight (1982) performed controlled experiments in which the effects of two financial policy instruments (devaluation and domestic credit restraint) on prices, output and the balance of payments were analysed in the context of an explicit structural model. Their model was intended to capture the economic structure of a developing economy that is small relative to the world, open to international trade and maintains a pegged exchange rate<sup>16</sup>.

They found that domestic credit restraint thwarts the price level and improves the balance of payments. The improvement in the balance of payments was found to be more than proportionate to the decrease in domestic credit. Domestic credit restraint was found to have contractionary effect on output<sup>17</sup>.

Unlike the results of Khan and Knight (1982) and Agénor (1990)<sup>18</sup>, Khan (1990) found that in the short run and long run, domestic credit restraint worsens inflation, though Agénor (1990) underscores domestic credit restraint to the private sector. The positive impact of domestic credit restraint on the balance of payments found by Khan and Knight (1982) as in Dhliwayo

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<sup>16</sup> Their model also assumes that a number of financial assets other than money are limited. Thus wealth decisions are mainly substitution between money and goods. They used the Full Information Maximum Likelihood (FIML) method to estimate their equations, based on pooled sample of 29 developing countries. A simulation experiments was the basis of their results.

<sup>17</sup> An unspecified supply-side policy that succeeds in increasing the level of capacity output (thus increasing output) was found to improve the balance of payments.

<sup>18</sup> He estimated and simulated a macroeconomic model for a developing country that has a sizable parallel market for foreign exchange. A consistent two-step procedure for a group of eight countries using a fixed effect estimation of pooled time-series, cross-sectional data set covering the period 1974-86 was applied. Forward-looking expectations were a key assumption of his model.

(1996) and the negative impact on output are in conformity with the studies of Khan (1990)- both in the short run and long run and Agénor (1990)-in the short run. This is however contrary to the long run results of Agénor (1990). Agénor's model is monetary in the sense that it emphasizes the role of monetary disequilibrium in explaining movements in the relevant variables considered. However, in his model, as opposed to the standard monetary approach to the balance of payments, foreign reserves do not move instantaneously to adjust supply and demand. This disequilibrium is created in the official market for foreign exchange. Thus excess demand for foreign currency at an official exchange rate spills over the parallel market. Thereby making the latter play a crucial role in the determination of the efficacy of stabilisation policies in developing countries.

From the long run perspective, Khan (1990) found that the positive effect of domestic credit restraints on the balance of payments and inflation were strengthened and the inimical effects on growth were allayed<sup>19</sup>.

The work of Edwards (1986) in relation to monetary policy was from the point of view of money surprise (unanticipated money growth). His result suggests that unanticipated decrease in the money supply (say via decreasing domestic credit) decreases real output. The result of Edwards (1986) is the same as the short run and long run effects of anticipated and unanticipated monetary shocks on real output found by Chrishti et al. (1992).

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<sup>19</sup> The Khan (1990) model was based on a group of 69 developing countries that implemented programs during the period 1973-88. He used the before –after approach, the with-without approach and the generalized evaluation estimator approach. The results of the former two methodologies were rejected for the latter.

### 3.2.2 Devaluation and Stabilisation

Solimano (1986) examined the effects of devaluation based on a simple computable general macro model, which incorporates the following. The structure of the trade sector in terms of the response of trade flows to changes in relative prices, the relative intensity of domestic value added with respect to imported inputs in production across export and import competing industries and the degree of wage indexation. His simulation experiments carried out under the assumption that the trade balance is initially in equilibrium proved that for the Chilean data, currency devaluation is contractionary in the short-run to the medium run but expansionary in the long run. “It takes roughly two years and a half for the contractionary effect of a devaluation on output and employment to disappear” (p.148).

The Solimano (1986) finding that devaluation has contractionary effect at least in the short run, (his study found devaluation to be contractionary in the short run but expansionary in the long run) is akin to the studies of Khan and Knight (1982), Khan (1990), Taye (1999), Díaz-Alejandro (1965)<sup>20</sup>, Edwards (1986), Agénor (1990) and Cooper (1971) who received 24 devaluations for 19 developing countries during the period 1959-1966. In Khan (1990), the short run contractionary effect is found to be worse than the long run contractionary effect. Stimulating supply-side policies were identified by Khan and Knight (1982) as a way of offsetting the contractionary effect of devaluation. In Edwards (1986), the contractionary effect of devaluation is a short-run phenomenon. As noted in the study “After one year...devaluation has an expansionary effect on output growth. In the long run devaluations were found to be

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<sup>20</sup> Díaz-Alejandro (1965) studied the Argentinian experience of the period 1955-1961. His result supported the 1963 theoretical framework he offered.

neutral” (p.507)<sup>21</sup>. In the case of Agénor (1990), the contractionary effect of devaluation was found to be valid only in the short run, in the long run; devaluation was found to be expansionary.

On the other side of the coin, Green and Murinde (1992) found devaluation to be expansionary (under fixed exchange rate regime) as Horton and McLaren (1989) found. In Horton and McLaren (1989) “Devaluation (whether one-shot or crawling peg) initially causes growth, both because of the incentives to export (which in turn enable increases imports and hence higher domestic production) and lower real wages (which gives an incentive to increased sectoral output)” (p.311). According to Green and Murinde (1992), devaluation is expansionary because it lowers the curb-market interest rate. The reason given for this is that, devaluation increases the incentives for agents to move funds out of the curb markets to the official markets. Thus depressing the curb-market interest rate. They referred to this phenomenon as devaluation curb-market result. The Log-linear macro model of an open economy evaluated for ten countries<sup>22</sup> by Gylfason and Schmid (1983) supports the expansionary effect aspect of devaluation in all but two of the economies considered-United kingdom and Brazil.

The impact of devaluation on the inflation rate and the balance of payments (current account balance) was considered by Taye (1999). His case study was on a subsistence economy, Ethiopia, and he used a medium-sized macroeconometric model pertaining to four sectors of the economy (output, labour demand, domestic aggregate demand and external sectors). His model was specified such that it captures structuralist hypothesis in which supply constraints

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<sup>21</sup> Edwards (1986) used a fixed-effect procedure to estimate a model of real output behaviour using data on 12 developing countries from 1965-1980 (with only South Africa from Africa, the rest from Asia and Latin America.

<sup>22</sup> The sample comprised both industrialized and semi-industrialised countries.

dominate economic activities. For instance, he incorporated the role of capital and intermediate input on output supply, owing to the importance of resource constraints on the supply side of the economy.

His simulation results revealed that devaluation improves the current account balance and worsens inflation. He concluded, "...an improvement in the current account balance, while output and employment are decreasing, suggests that such improvement is due to the expenditure reducing rather than the expenditure-switching effect of a devaluation"(P.494). He added that "such a reduction mainly falls on imported intermediate and consumption goods" with the consequence on the supply of basic food items and on the supply of intermediate inputs and hence future economic growth.

### **3.2.3 Fiscal Restraint and Stabilisation**

Agénor (1990) found that fiscal restraint decreases output in the short run while the balance of payments improves. He found fiscal restraint to be expansionary in the long run. The short run contractionary and balance of payments improving effect of fiscal restraint found by Agénor (1990) is common in the studies of Khan (1990) and Horton and McLaren (1989). Chrishti et al. (1992) also found that fiscal restraint is contractionary in the short run but more contractionary in the long run. The contractionary result of fiscal restraint found by Chrishti et al. (1992) is similar to the work of Edwards (1986) and Green and Murinde (1992). This result is contrary to that of Ghura and Hadjimichael (1986) though Ghura and Hadjimichael (1986) restricted the fiscal restraint only to government consumption but not to government expenditure in general.

Chrishti et al (1992) applied a Vector Autoregression (VAR) technique to ten key macroeconomic variables in the Pakistan economy (including the real GDP, consumer Price Index, money stock and real government expenditure) and found that fiscal restraint increases the price level both in the short run and in the long run as found by Khan (1990). This result is akin to that of Green and Murinde (1992) in the long run but contrary to it from the short run perspective. Unlike Chrishti et al (1992), Khan (1990), Horton and McLaren (1989) and Agénor (1990) found fiscal restraint to be disinflationary.

Both the theoretical and empirical literature on the potency of budgetary and financial policy instruments is split. That is, a given instrument has been shown to have positive impact on a particular target (balance of payments, inflation or real output) by some authors but negative impact according to some others. The other thing is that, a study that considers the impact of budgetary and financial policy instruments on the three usual targets of stabilisation from a country specific setting is uncommon. It is thus necessary to examine whether a certain instrument is effective in solving a particular problem but has cost in terms of its effect on another target from a country specific perspective. This study bridges this gap, which exists in most studies of the existing literature.

**SECTION FOUR**  
**METHODOLOGY, ESTIMATION AND ANALYSIS OF RESULTS**

**4.1. Model Specification**

The objectives of any stabilisation program are to reduce the inflation rate and improve the balance of payments with the ultimate aim of increasing output. Accordingly, three equations are estimated. These equations are, an inflation equation, a balance of payments equation and a real output equation.

**4.1.1 The Inflation Equation**

The estimated inflation equation incorporates the monetarists, the Keynesian and the structuralists formulation of the causes of inflation. The specified equation is given in equation (1).

$$\pi_t = f (Pm_t, ERD_t, (BUD/GDP)_t, EXD_t) \text{-----(1)}$$

+        +        +        +

Where:

$\pi$  = INFLATION RATE

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Where:

$\pi$  = INFLATION RATE

$Pm$  = PRICE OF IMPORTS

ERD= EXCHANGE RATE DEPRECIATION

(BUD/GDP) = BUDGET DEFICIT TO GDP RATIO

EXD = EXCESS DEMAND

t= time subscript

The equation is linear in its parameters. The expected sign of each variable is shown below the variable.

The coefficient of price of import is positive because an increase in the price of imports increases the domestic general price level to the extent that most of the goods imported are intermediate and capital goods. Thus increases in prices of such goods are translated into domestic inflation. This variable shows the impact of external (world) inflation on domestic inflation.

The coefficient of exchange rate depreciation is expected to be positive owing to the fact that the depreciation of the exchange rate spills over to domestic prices by increasing the import price in domestic currency terms.

The coefficient of the budget deficit variable is expected to be positive. This is because in LDCs budget deficit is typically financed by domestic credit creation given that their capital markets are thin and access to foreign borrowing is not easy in the face of huge current debt. For one thing, access to continued borrowing depends on the perceived notion of creditors about debtors' probability of default and this default probability is a positive function of current debt stock. This domestic credit creation in excess of what is the required demand is

inflationary as this excess money demand spills over into the goods market as excess demand for goods. Apart from this, the Flow of Funds Model (see Gowland, 1991) shows that an increase in Public Sector Borrowing Requirements (PSBR) increases the domestic credit and hence the money supply.

The coefficient of excess demand is expected to be positive because when aggregate demand exceeds aggregate supply in the goods market, the consequence is an increase in the price level until disequilibrium is eliminated.

#### 4.1.2 The Balance of Payments Equation

The estimated balance of payments equation is based on the monetary approach to the balance of payments, as in Dhiliwayo (1996). The specified balance of payments equation is given in equation (2).

$$\text{LnF}_t = f(\text{LnRGDP}_t, \pi_t, \text{LnDC}_t, \text{ERD}_t) \text{-----}(2)$$

+            -            -            +

Where:

F = FOREIGN RESERVE (EXCLUDING GOLD)

RGDP = REAL GROSS DOMESRIC PRODUCT

DC= DOMESTIC CREDIT

All other variables and symbols are defined as earlier and the equation is linear in its parameters. The expected sign of each variable is shown below the variable.

The coefficient of output is expected to be negative because an increase in output increases import as the marginal propensity to import increases. This therefore worsens the balance of payments.

The coefficient of inflation is expected to be negative because an increase in the inflation rate dwindles the competitiveness of the domestic economy to the extent that it appreciates the real exchange rate. Thereby worsening the balance of payments.

The coefficient of domestic credit is expected to be negative since an increase in the domestic credit increases money supply. This increase in money supply in excess of what is demanded is used to buy goods abroad. In the bid to buy goods abroad agents have to buy foreign currency, this therefore reduces the foreign reserves and hence the balance of payments.

The coefficient of exchange rate depreciation is expected to be positive because a nominal devaluation of the exchange rate is expected to bring the switching of expenditure away from imports to domestically produced goods. To this end, resources are transferred from the production of non-tradables to tradables, thereby boosting exports. The reduction of imports as well as the increase in exports which implies improvement in competitiveness improves the trade balances and hence the balance of payments, *ceteris paribus*.



### 4.1.3 The Real Output Equation

The estimated real output equation is based on the endogenous growth model and the technology transfer model, which recognise the role of technological innovation and technology diffusion respectively, in the growth process. This is akin to the model of Edwards (1986) with the addition of the labour force variable and a measure of openness, which captures the impact of international technological diffusion on the domestic economy. The specified real output equation is given in equation (3)

$$\text{LnRGDP}_t = f(\text{LnlabF}_t, \text{Ln(G.EXP/GDP)}_t, \text{TOT95}_t, \text{ERD}_t, \text{OPEN}_t) \text{-----}(3)$$

+                    ?                    ?                    ?                    +

Where:

labF = THE SIZE OF THE LABOUR FORCE

(G.EXP/GDP) = RATIO OF GOVERNMENT EXPENDITURE TO NOMINAL  
GDP

TOT95= TERMS OF TRADE (WITH 1995 AS THE BASE YEAR)

OPEN = THE RATIO OF THE SUM OF EXPORTS AND IMPORTS TO GDP  
(WHICH MEASURES OPENESS)

All other variables and symbols are defined as earlier and the equation is linear in its

parameters. The expected signs of each variable is shown below the variable and ‘?’ indicates an ambiguous sign.

The expected sign of the coefficient of labour force is positive because an increase in the labour force, *ceteris paribus*, increases real output.

The coefficient of the government expenditure variable is indeterminate a priori. On the one hand, if government expenditure is dominated as a norm by unproductive government expenditure (government consumption), and this action is viewed by the private sector to be permanent this accentuates the non-credibility of economic policy and thus dampens private sector and real economic activity. On the other hand if as a norm government expenditure is dominated by government investment (which includes expenditure on physical and social infrastructure), private investment would be stimulated, given the complementarity between private and public investment. Thus real output is stimulated.

The coefficient of terms of trade is indeterminate. It is the case that an improvement in the terms of trade, which reduces input prices relative to output, would give firms the incentive to produce more thereby increasing output. On the other hand, an improvement in the terms of trade would appreciate the real exchange rate (Ghura and others, 1995) thus undermining the profitability of tradable goods and hence lowering output.<sup>23</sup>

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<sup>23</sup> It has been stressed in the literature that the effect of terms of trade on the real exchange rate is ambiguous. It depends on the substitution and income effect. If the income effect dominates the substitution effect, an improvement in the terms of trade will appreciate the real exchange rate.( see Edwards, 1989 for more details)

The expected sign of exchange rate depreciation is ambiguous. On the one hand, an increase in the domestic price of foreign currency is expected to increase export earnings in domestic currency terms. In addition to this, the depreciation increases the price of imports in domestic currency terms. Thus on the supply side more tradables are produced and on the demand side expenditure is switched from imports to domestically produced goods. Thereby increasing output. On the other hand, in an economy where domestic demand for goods cannot be switched to domestically produced goods possibly due to weak substitutability between imports and home products, output can be expected to fall because expenditure is reduced on imports but not switched to domestically produced goods. Typically, in the LDCs, the expenditure reduction is on intermediate and capital goods by domestic producers while the non-switching of expenditure from imported to domestic goods is done by the importers of final goods with weak domestic substitutes.

The coefficient of openness is expected to be positive. The degree of openness of an economy measures the extent to which import protection and other trade barriers have been eliminated. According to Ghura and others (1995) the key channels through which openness increases real output is via the positive externalities resulting from access to improved technology and its virtuous effect on the efficiency of resource allocation triggered by increased competition and access to trade opportunities. Grossman and Helpman: 1989a, 1991) has noted that outward-orientation trade policies promote competition, raise the efficiency of resource allocation and enhance positive externalities resulting from access to improved technology. Krueger (1974) has argued that productive resources are diverted to rent-seeking activities as a result of the existence of import quotas. Thus debilitating economic activity. Romer (1986 and 1990) has

also noted that increased openness encourages growth owing to the promotion of the availability of technology and the accompanying knowledge spillovers. In Lucas (1988), access to essential production inputs from abroad is found to stimulate the positive externality that is obtained from learning by doing.

## **4.2 Estimation Technique**

The Johansen (1988) maximum likelihood procedure was used to estimate the long-run parameters for each of the equations. This method was used because it tests for the number of cointegrating vectors and provides long-run coefficients by considering all variables to be potentially endogenous rather than taking some variables to be exogenous to the system, though variables that are exogenous from theoretical consideration can be restricted to be exogenous. Hendry's general-to-specific method is used to arrive at the short-run final preferred models.

Cointegration technique is at the heart of the methodology used in this study, it is therefore high time we discussed the issue of cointegration in a multivariate setting (as in this study) in brevity.

Cointegration involves testing whether a certain group of variables move together over time. In the context of multivariate model, this test should go along with testing for the number of cointegrating vectors (Hendry and Doornik, 1997). This is necessary because failure or ignorance to capture the existence of more than one cointegrating vector, when that is the case, yields to misleading long run estimates of the coefficients. In which case, the estimated

parameters of the long run coefficients would be only a linear combination of the parameters of the two or more cointegrating long run relationships (Harris, 1995).

Accordingly, the Johansen (1988) maximum likelihood method, which nests the original Engel-Granger (1987) was used for the cointegration tests and estimation of the long run parameters of each of the equations. The choice of this method is due to the fact that it is the only available technique as the current state of the issue of cointegration in a multivariate context is concerned. Though Kleibergen and Van Dijk (1994) came out with a new technique. “ However, it is yet to be seen whether this new approach has any particular advantage over Johansen’s ....” (Harris, 1995 P.120).

The single equation ECM can be extended to the multivariate scenario by considering all the variables to be potentially endogenous. Thus a VAR can be formulated. Such a VAR can be reformulated into a VECM form by reparameterisation. If all the variables of the VAR are I(1), then the corresponding VECM will have two parts. The first contains I(0) variables as all the variables there would be the first difference forms of each of the variables of the multivariate system. The second part contains information on the long-run relationship. Johansen (1988) based on a method known as reduced rank regression (which involves canonical correlations) factorised the term containing the long run relationships in to speed of adjustment coefficients to disequilibrium (loading vectors or feedback coefficients) and the long run coefficients. If  $Z_t$  is a vector of all the variables of a model under consideration, then the term containing the long run parameters can be written as  $\Pi Z_{t-1}$ .

Thus  $\Pi = \alpha\beta'$ .

Where  $\alpha$  is the loading vector and  $\beta'$  is the vector of long run parameters.

Testing for cointegration in the Johansen context, involves testing for the rank of  $\Pi$ . If the rank of  $\Pi$ ,  $r$ , is zero, then there is no cointegration among the variables constituting  $\mathbf{Z}_t$  (no long run relationship). If the rank of  $\Pi$  is equal to the number of variables in  $\mathbf{Z}_t$  less one (the maximum possible), then all the variables in the vector  $\mathbf{Z}_t$  are stationary. In which case we do not talk about cointegration (because it is an isomorphism worth talking about for variables that have stochastic trend). If however, the vector  $\Pi$  has rank other than these two extreme cases (reduced rank), then there is cointegration. Thus the rank of  $\Pi$  represents the number of cointegrating vectors (the number of linearly independent rows of the  $\beta'$  vector. Which is the same as the number of columns of the  $\alpha$  matrix that are effectively zero (See Hendry and Doornik (1997), Harris (1995), Johansen (1988), Deadman and Charemza (1992), Enders (1995), Bhaskara Rao (1994) and Hendry (1995) for more details on these issues).

### 4.3 Time Series Properties of the Variables and Granger Causality Test.

As already discussed, the Johansen maximum likelihood procedure was used to estimate the long run parameters of each of the equations. Exploring the time series properties of the variables precedes this method. This involves testing whether the finite sample data used for each variable exhibits stationary or non-stationary attributes along a constant mean or trend.

Dickey-Fuller (1979) class of test and the non-parametric Phillips-Perron test were applied to each of the variables. Both tests are applied because the Dickey-Fuller class of test assumes the residuals from the auxiliary ADL regression are homogenous and independent, unlike the latter.

The null hypothesis of the existence of stochastic trend against the alternative of the existence of deterministic trend was not rejected for any of the variables. Thus the first differences were subsequently used in the unit root tests. All the variables are  $I(1)$ , according to the unit root tests. Table 4.1 presents the results of the unit root tests. The tests were not carried on for the case of non-deterministic component in the auxiliary regression because we do not know the true mean of any of the variables, as this is the case for economic variables.

The correlation coefficient between the budget deficit and domestic credit was found to be 0.96 implying that these two variables are highly multicollinear. Granger Causality tests were carried out using both the Granger test and the Sims test. The result shows that budget deficit Granger cause domestic credit with no feedback effect.

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**Table 4.1: Results of the Unit Root Tests.**

Variable	Dickey-Fuller Class						Phillips-Perron	
	Dickey-Fuller		Augmented Dickey-Fuller					
			Lag Length of 1		Lag length of 2			
	$\tau_{\mu}$	$\tau_{\tau}$	$\tau_{\mu}$	$\tau_{\tau}$	$\tau_{\mu}$	$\tau_{\tau}$	$\tau_{\mu}$	$\tau_{\tau}$
(BUD/GDP)	-7.62**	-7.64**	-5.05**	-5.20**	-5.41**	-6.15**	-10.11**	-10.57**
EXD	-7.09**	-7.06**	-3.77**	-3.63*	-2.91	-2.82	-7.55**	-7.52**
ERD	-4.98**	-4.86**	-5.87**	-5.75**	-3.66*	-3.60**	-5.88**	-5.71**
$\pi$	-7.02**	-6.97**	-5.20**	-5.25**	-4.20	-4.34**	-7.96**	-8.10**
Pm	-3.25*	-3.07	-3.73**	-3.35	-4.26**	-3.92*	-2.67	-2.47
LnRGDP	-6.62**	-7.35**	-3.32	-4.05*	-2.67	-3.59*	-6.70**	-7.87**
LnF	-4.99**	-5.22**	-3.13*	-3.37	-2.71	-2.99	-5.50**	-5.42**
LnDC	-6.07**	-5.96**	-5.12**	-5.11**	-4.62**	-5.00**	-6.50**	-7.13**
OPEN	-4.81**	-4.99**	-3.43*	-3.63*	-3.31*	-3.58*	-5.19**	-5.15**
Ln(G.EXP/ GDP)	-6.90**	-6.87**	-4.47**	-4.50**	-4.57**	-4.67**	-7.62**	-7.63**
LnlabF	-6.30**	-6.19**	-3.93**	-3.86*	-2.07	-2.03	-6.44**	-6.34**
TOT95	-7.78**	-7.90**	-5.39**	-5.68**	-4.49**	-4.82**	-8.88**	-9.11**

Note:

\*\* and \* means rejection of the hypothesis of unit root in the first difference of the variable at 1% and 5% respectively.

In the Phillips Perron test:

Lag truncation for Bartlett Kernel: 3 (New- West suggests: 3)

The 1% critical values are the mackinnon critical values for rejection of the hypothesis of a unit root.

$\tau_{\mu}$  is the estimated value of the test statistic when drift term is included in the auxiliary regression for the unit root test.

$\tau_{\tau}$  is the estimated value of the test statistic when drift term and trend are included in the auxiliary regression for the unit root test.

## **4.4 Estimation Results**

Having discussed the specification of the models and the estimation technique, we estimate these models in this section using both the long run and short run versions of the models. This starts by first estimating the inflation equation followed by the estimation of the balance of payments equation and finally the real output equation. From these equations, the impact of the stabilisation instruments used in this study is then analysed.

### **4.4.1 Modelling The Inflation Equation**

The estimation of the inflation equation from which the impact of budget deficit and hence domestic credit creation and the depreciation of the nominal exchange rate on inflation is done in this part. This is considered by estimating both short run and long run versions of the model.

The long run parameters are estimated from the use of the Johansen Maximum Likelihood Procedure while the short run estimation is done in the context of the Hendry's general-specific method.

#### **4.4.1.1 The Long-run Inflation Equation**

In estimating the inflation equation, test for the appropriate lag length of the vector autoregression (VAR), which the Johansen long-run parameter estimates must start with was undertaken. The lag length of the VAR was chosen based on nested tests involving the use of F-tests, Schwarz Information Criteria (SIC) and Hannan Quinn (HQ) statistics. A Vector

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Autoregression of order two, VAR (2), proved to be the most appropriate one for the cointegration test. In order to save the degrees of freedom, the highest lag-length considered in the test was three.

The individual equation diagnostic tests of the preferred system show that: the residuals are Gaussian Spherical (normal white-noise). This test summary is not reported here in order to save space. From the vector perspective also, the residuals are, normally, independently and identically distributed. This is shown by the Jarque-Bera test for normality, the Lagrangean Multiplier test and the Ljung-Box Portmanteau Q-statistics for Serially Correlated residuals and the White Heteroscedasticity tests based on squares of the variables. The lower block of Table 4.2 shows the vector diagnostic test. The constant term entered the VAR restricted. The price of imports also entered the VAR restricted because the price of import is not determined by domestic factors. The VAR was re-estimated using recursive least squares in order to test for stability. The null hypothesis of overall parameter constancy from the VAR cannot be rejected based on the 1-Step Residuals recursive graphics from the VAR. Thus supporting the accuracy of the VAR. These graphs are shown in figure A1.1 of Appendix 1 within the 95% bounds.

The cointegration test reveals that the null hypothesis of one cointegrating vector cannot be rejected by the maximum eigenvalue and the trace statistics. This is the case from the use of both the Johansen statistic and the Reimers adjusted statistic. The upper block of Table 4.2 shows the results of the cointegration tests.

**Table 4.2: Results of the Cointegration Test for the Inflation Equation**

eigenvalue $\mu_i$	loglik for rank							
	-42.2576		0					
0.81411	-17.0186		1					
0.458836	-7.80809		2					
0.227736	-3.93166		3					
0.156408	-1.38037		4					
-6.36336e-017	---							
-1.67098e-016	---							
<b>H<sub>0</sub>:</b>	<b>Maximum Eigenvalue Statistics</b> ( $\lambda_{max}$ )				<b>Trace Statistics</b> ( $\lambda_{trace}$ )			
	<b>Test Statistics</b>		<b>Critical Value</b>		<b>Test Statistics</b>		<b>Critical Value</b>	
	<b>Johansen's</b>	<b>Reimers'</b>	<b>5%</b>	<b>1%</b>	<b>Johansen's</b>	<b>Reimers'</b>	<b>5%</b>	<b>1%</b>
r=0	50.48**	37.02**	28.17	33.12	81.75**	59.95*	53.35	60.05
r ≤ 1	18.42	13.51	21.89	26.40	31.28	22.94	35.07	40.20
r ≤ 2	7.753	5.685	15.75	19.83	12.86	9.427	20.17	24.99
r ≤ 3	5.103	3.742	9.09	12.74	5.103	3.742	9.09	12.74
<b>System Diagnostic Tests</b>								
Vector portmanteau 4 lags= 43.269								
Vector AR 1-2 F(32, 34) = 1.4377 [0.1499]								
Vector normality $\chi^2(8)$ = 8.4323 [0.3924]								
Vector Xi <sup>2</sup> $\chi^2(180)$ = 166.37 [0.7587]								

\*\* means rejection of the null hypotheses at 1%.

\* means rejection of the null hypothesis at 5%

r is the rank of the long-run matrix ( that is, the number of cointegrating vectors).

The cointegration-relation graphics support the non-rejection of the null hypothesis of one cointegrating vector (one long run relationship) because the first vector is stationary. Though the second vector is also seemingly stationary, there is no evidence of two cointegrating vectors from the formal tests of Johansen and Reimers Statistics. The graphs of the cointegrating relations are shown in Figure A2.1 of Appendix 2. The first vector corresponds to the inflation variable, according to the way the variables are ordered.

The only cointegrating vector is thus necessarily the first vector of the standardised  $\beta'$  eigenvectors (of the PCFIML output) from the cointegration test. The relevant standardised  $\beta'$  eigenvector and the corresponding feedback coefficients are therefore as follows.

**standardized  $\beta'$  eigenvectors**

$\pi$	(BUD/GDP)	EXD	ERD	Pm	Constant
1.000	-1.1780	0.0000	-0.7787	-0.0001	-0.02369

**standardized  $\alpha$  eigenvectors**

$\pi$	(BUD/GDP)	EXD	ERD
-0.1003	-0.3852	-0.0004	2.7050

Normalisation is done here with respect to inflation.

The recursive eigenvectors checked the stability of the parameters of the long run inflation equation. These vectors show that the parameters of the model are stable. The plots of these recursive eigenvectors are shown in figure A3.1 of Appendix 3. The graphs show that the first recursive eigenvector is stable. Thus inferring that the parameters of the long run inflation equation are stable.

Tests of significance were carried out in order to know the variables that uniquely span the cointegrating vectors. The results of the tests are shown in Table A4.1 of Appendix 4.

The excess demand variable was consequently dropped as it produced a coefficient of zero and showed to be insignificant. All the other variables are significant and have the expected signs.

The insignificant nature of the excess demand could be due to the fact that excess demand is calculated as domestic absorption minus output. This domestic absorption includes gross domestic investment and data on gross domestic investment is not accurate in a typical LDC. The insignificant nature of excess demand could also be partly owing to the fact that the process by which budget deficit causes inflation is through high money supply in excess of money demand, thus causing agents to compete for goods in order to get rid of the excess money supply. In this process, excess demand for goods is created thus spilling over into higher prices. When budget deficit was dropped from the equation, and retaining excess demand, excess demand became significant, though the coefficient was almost zero (this result is not shown here).

The result of the final long-run inflation equation when excess demand is dropped is shown in equation 4.

$$\pi = 0.01814 + 0.7991ERD + 1.005(BUD/GDP) + 0.0002Pm \quad (4)$$

(0.0000)    (0.0000)        (0.0000)        (0.0000)

Figures in parentheses are p-values.

#### 4.4.1.2 The Dynamic Inflation Equation

Before estimating the short-run model, test for exogeneity was done in order to know whether we need to resort to simultaneous equation estimation methods. The result shows that there is no simultaneity bias. Thus OLS is appropriate to estimate the short run model.

In estimating the Short-run dynamic inflation equation, the error correction mechanism was used. All variables were differenced, allowing for delayed responses and augmented by including the lagged residuals (cointegrating vector) from the estimated cointegrating equation obtained from the long run estimation. “ The ECM could be entered at any lag” (Hendry, 1995) but one period lag was used here to save the degrees of freedom. The final preferred model of the dynamic inflation equation is shown in Table 4.3. This was estimated using the Hendry’s general-to-specific modelling technique.

The results show that in the short run, the price of imports and excess demand are not significant in influencing the inflation rate. The exchange rate depreciation and the budget deficit are the variables that are significant in influencing the inflation rate. Both the significant variables have detrimental effect on the inflation rate.

The speed of adjustment to disequilibrium is found in the relevant range in terms of sign (negative) and magnitude (less than unity). This value is  $-0.70849$ . Thus the short-run dynamics converges on the long-run cointegrating relationship. The coefficient of multiple determination is 86.7% Implying that 87% of the variability in inflation is explained by the

budget deficit and the exchange rate depreciation. As established by the F-test for overall significance, all variables are simultaneously significant.

**Table 4.3: The Dynamic Inflation Equation**

Modelling $\Delta \pi$ by OLS					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR <sup>2</sup>
Constant	-0.0031	0.014400	-0.214	0.8322	0.0018
$\Delta$ ERD	0.47715	0.052777	9.041	0.0000	0.7658
$\Delta$ (BUD/GDP)	1.9621	0.43216	4.540	0.0001	0.4519
CV1_1	-0.70849	0.17741	-3.994	0.0005	0.3895

R<sup>2</sup> = 0.867233 F(3, 25) = 54.433 [0.0000] DW = 1.73

AR 1- 2F( 2, 23) = 1.0076 [0.3807]  
 ARCH 1 F( 1, 23) = 0.073243[0.7891]  
 Normality Chi<sup>2</sup>(2)= 5.6667 [0.0588]  
 Xi<sup>2</sup> F( 6, 18) = 2.1036 [0.1035]  
 Xi\*Xj F( 9, 15) = 2.5742 [0.0509]  
 RESET F( 1, 24) = 0.39904 [0.5336]

Forecast Chi<sup>2</sup>( 1)= 0.14359 [0.7047]  
 Chow F( 1, 24) = 0.12885 [0.7228]

CV\_1 is the lagged cointegrating vector saved from the estimated long-run equation.

Mis-specification tests were done to check the data coherency of the model. The diagnostic-test results show that there is no problem with normality as established by the Jarque-Bera test; there is no problem of serial correlation as established by the Lagrangean Multiplier (LM) test; there is no problem of Heteroscedasticity as established by the White's tests. The LM tests for ARCH effect shows that there is no Serial Correlation among the variances of the error term (no ARCH effect)<sup>24</sup>. The Ramsy's (1969) RESET statistics show that there is no functional

<sup>24</sup> The absence of ARCH effect in the model means that the volatility of the variables is correctly reflected in the model (Hendry, 1995).

mis-specification problem. The parameter stability test shown by the Chow statistics shows that there is no parameter instability. The lower block of Table 4.3 shows the results of the test summary.

#### **4.4.2 Modelling The Balance of Payments**

The balance of payments is modelled in this section. This is done by first applying the Johansen (1988) Maximum likelihood procedure to find the number of cointegrating vectors and hence the long run parameters. This is followed by the application of an ECM to obtain the short run parameters. Based on this, the impact of budget deficit, domestic credit and nominal depreciation of the exchange rate on the balance of payments is analysed.

##### **4.4.2.1 The Long-run Balance of Payments Equation**

The long run balance of payments equation was preceded by the estimation of a VAR (1) model. The lag length of the VAR was chosen to be one because this proved to be the most appropriate lag length based on the lag length test. The constant term entered the VAR restricted. A dummy that takes the value of one between 1981 and 1991 and zero otherwise was introduced and this entered the VAR unrestricted. This dummy was used to capture the structural break in the foreign reserve of the Sierra Leone economy from 1981 to 1991, leading to very low international reserve. This period was the period when the Leone was highly overvalued, thus provoking an increasing proportion of diamond and gold (the countries main foreign exchange source) to be traded in the parallel market rather than in the official banking

system. Thus international reserves were at negligible levels<sup>25</sup>. The high overvaluation was abated with the introduction of a floating exchange rate regime on April 25, 1990 and the establishment of foreign exchange bureaus in 1991.

The null hypothesis of overall parameter constancy from the VAR cannot be rejected based on the 1-Step Recursive Residuals. Confirming further that the VAR is appropriate. The recursive graphics, within the 95% bounds are shown in figure A1.2 of Appendix 1.

The test summary from the VAR shows that the residuals are white noise though vector normality could not be established. Thus the trace statistics is more appropriate for the cointegration test<sup>26</sup>. The test summary is shown in the lower block of Table 4.4.

The cointegration results show that the null hypothesis of one cointegrating vector cannot be rejected at the 1% significance level according to the Johansen maximum eigenvalue statistics and the Reimers' maximum eigenvalue statistics. From the perspective of the trace statistics, the Reimers adjusted (adjusted for small sample size) trace statistics also cannot reject the null hypothesis of one cointegrating vector. However, the Johansen's trace statistics suggests that there are three cointegrating vectors. Since the sample size of this study is not large, the Johansen statistics is therefore not appropriate as the Reimers' adjusted one is<sup>27</sup>. Thus there is

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<sup>25</sup> Trends in Developing Economies, 1995 (World Bank)

<sup>26</sup> According to the Monte Carlo experiment reported in Cheung and Lai (1993), the trace statistics is more robust to both skewness and excess kurtosis (non-normality), in the residuals, than the maximal eigenvalue test for cointegration, in Harris (1995).

<sup>27</sup> According to Reimers (1992), when the sample size is small, the Johansen procedure over-rejects when the null is true, in Harris (1997, P.88). Thus account must be made for the number of parameters to be estimated in the model. Hence the Reimers adjusted statistics.

one cointegrating vector. The cointegration-test results are shown in the upper block of Table 4.4.

**Table 4.4: Results of the Cointegration Tests for the Balance of Payments Equation**

eigenvalue $\mu_i$	loglik for rank	
	225.103	0
0.845155	254.015	1
0.564192	266.889	2
0.499471	277.616	3
0.385868	285.173	4
0.181919	288.285	5
-2.35081e-013	---	

Ho:	Maximum Eigenvalue statistics ( $\lambda_{max}$ )				Trace statistics ( $\lambda_{trace}$ )			
	Test statistics		Critical value		Test statistics		Critical value	
	Johansen's	Reimers'	5%	1%	Johansen's	Reimers'	5%	1%
$r=0$	57.83**	48.5**	34.4	39.67	126.4**	106**	75.33	82.97
$r \leq 1$	25.75	21.59	28.16	33.12	68.54**	57.49	53.34	60.05
$r \leq 2$	21.45	17.99	21.89	26.41	42.79**	35.89	35.07	40.20
$r \leq 3$	15.11	12.68	15.75	19.83	21.34	17.9	20.17	24.05
$r \leq 4$	6.225	5.221	9.09	12.74	6.225	5.221	9.09	12.74

Vector portmanteau 4 lags=	127.3
Vector AR 1-2 F(50, 48) =	1.256 [0.2147]
Vector normality $\chi^2(10)$ =	104.48 [0.0000] **
Vector $\chi^2$ F(150, 9) =	0.28659 [0.9994]

\*\* means the null hypothesis is rejected at the 1% level of significance.  
r means the rank of the matrix containing the long run parameters (the number of cointegrating relationships among the variables)

The non-rejection of the null hypothesis of one cointegrating vector is further supported from the cointegration graphics of the cointegration test. The cointegrating relations are shown in figure A2.2 of Appendix 2. Among the five cointegrating vectors, it is only the first one that is stationary and this corresponds to the balance of payments variable, based on how the variables are ordered. The third vector seems to exhibit stationary attribute but the first seems more so.

The only cointegrating vector is thus necessarily the first vector of the standardised  $\beta'$  eigenvectors (of the PCFIML output) from the cointegration test. The relevant standardised  $\beta'$  eigenvector and the corresponding feedback coefficients are therefore as follows.

**standardised  $\beta'$  eigenvectors**

LnF	ERD	$\pi$	LnDC	LnRGDP	Constant
1.000	-5.297	10.34	0.02002	-6.001	64.26

**standardised  $\alpha$  coefficients**

LnF	ERD	$\pi$	LnDC	LnRGDP
-0.03080	-0.03863	-0.1538	-0.02553	0.003461

Normalisation is done here with respect to foreign reserve.

Plotting the recursive eigenvectors checked the stability of the parameters. These vectors show that the long run parameters of the model are stable. The plots of these recursive eigenvectors are shown in figure A3.2 of Appendix 3. The graphs show that the first recursive eigenvector is stable. Thus inferring that the parameters of the long run balance of payments equation are stable.

In order to know which variables uniquely span the cointegrating space, tests of significance were carried out. The results of the tests are shown in Table A4.2 of Appendix 4.

From the long run balance of payments equation, the exchange rate depreciation and the real output have positive effect on the balance of payments while the inflation rate and the domestic credit have negative impact on the balance of payments. However, the tests of significance show that all but one, the domestic credit, have significant effect on the balance of payments.

Dropping this insignificant variable (domestic credit), the final long run balance of payments equation is therefore given as in equation (5).

$$\text{LnF} = -60.12 + 5.261\text{ERD} - 10.49\pi + 5.631\text{LnRGDP} \quad (5)$$

(0.0029)    (0.0000)    (0.0000)    (0.0018)

Figures in parentheses represent p-values.

#### 4.4.2.2 The Dynamic Balance of Payments Equation

Prior to the estimation of the dynamic model for balance of payments, tests for weak exogeneity was carried out. The test shows that there is no problem of endogeneity thus OLS is appropriate in estimating the short-run model.

In order to estimate the short-run dynamic balance of payments equation, the error correction mechanism was used. All variables were differenced, allowing for delayed responses and augmented by including the lagged residuals (cointegrating vector) from the estimated

cointegrating equation obtained via the Johansen Methodology. The final preferred dynamic balance of payments equation was arrived at using the Hendry's general-to –specific modelling approach. The upper block of Table 4.5 shows the results of the final preferred model.

**Table 4.5: The Dynamic Balance of Payments Equation**

Modelling $\Delta \text{LnF}$ by OLS					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR <sup>2</sup>
Constant	0.0047563	0.076032	0.063	0.9506	0.0002
$\Delta \pi$	-0.96741	0.50726	-1.907	0.0685	0.1316
$\Delta \text{LnRGDP}$	-2.9555	1.0289	-2.873	0.0084	0.2559
$\Delta \text{LnRGDP}_1$	-1.4603	0.99655	-1.465	0.1558	0.0821
CV1_1	-0.11034	0.073501	-1.501	0.1464	0.0858

$R^2 = 0.398455$   $F(4, 24) = 3.9743$  [0.0130]  $DW = 2.23$

AR 1- 2F( 2, 22) = 0.40673 [0.6707]  
 ARCH 1 F( 1, 22) = 0.45684 [0.5061]  
 Normality  $\chi^2(2)$ = 0.3751 [0.8290]  
 Xi<sup>2</sup> F( 8, 15) = 1.5906 [0.2088]  
 Xi\*Xj F(14, 9) = 0.8607 [0.6135]  
 RESET F( 1, 23) = 0.03335 [0.8567]

Forecast  $\chi^2( 1)$ = 0.030809 [0.8607]  
 Chow F( 1, 23) = 0.020757 [0.8867]

CV\_1 is the lagged cointegrating vector saved from the estimated long-run equation.

The results show that in the short run, while the inflation rate and the real output are significant in determining the balance of payments in Sierra Leone, the exchange rate depreciation and the domestic credit are not significance in determining the balance of payments. The inflation rate and the real output are found to have a detrimental effect on the balance of payments.

The speed of adjustment to disequilibrium is found to be in the relevant range in terms of magnitude and sign as it is negative and not greater than one in absolute terms (a value of -

0.11034). This indicates that the short-run dynamics converges on the long-run cointegrating relationship. The coefficient of multiple determination ( $R^2$ ) is 39.8%, this is appealing as this is a dynamic model, with all variables stationary. Hence low  $R^2$  is expected, as there is no room for spurious correlation. All variables are jointly significant as established by the F-test for overall significance.

To check whether the model is data coherent mis-specification tests were done. The test summary shows that there is no problem of residual non-normality as established by the Jarque-Bera test; there is no Serial Correlation in the residuals as established by the Lagrangean Multiplier (LM) test; there is no problem of Heteroscedasticity as established by the White's tests based on squares as well as the cross products of variables. The LM test for Autogressive Conditional Heteroscedasticity (ARCH) shows that there is no ARCH effect. The Ramsy RESET statistics also shows that there is no functional mis-specification problem. The parameter stability test shown by the Chow statistics shows that there is no parameter instability. The lower block of Table 4.5 shows the results of the test summary.

### 4.4.3 Modelling The Real Output

The real output equation is estimated in this part of this section. This is done by first establishing the number of long run relationships that exist among the variables of the model, using the Johansen Maximum Likelihood procedure and consequently presenting the long run real output equation. Following this is the estimation of the short run model of real output. The impact of government expenditure and a depreciation of the nominal exchange rate on the real output is consequently analysed.

#### 4.4.3.1 The Long-run Real Output Equation

The output equation was estimated by first estimating a VAR of lag length of one. This length proved to be the most appropriate lag based on the tests for lag length from the PCFIML output. The constant term entered the VAR restricted. The terms of trade and the labour force entered the VAR restricted, as these variables are exogenous to the economy. The recursive graphics show that the null hypothesis of overall parameter constancy of the VAR model cannot be rejected. Confirming further that the lag length is appropriate. The 1-step recursive graphics based on the VAR (1) model, within the 95% confidence bounds are shown in figure A1.3 of Appendix 1.

The test summary from the VAR shows that the residuals are Gaussian white noise from the individual equation perspective and the vector perspective. This test summary is shown in the lower block of Table 4.6.

The cointegration results show that the null hypothesis of one cointegrating vector cannot be rejected at the 1 % significance level. This holds from the use of both the Johansen maximum eigenvalue and trace statistics. According to the Reimer's adjusted maximum eigenvalue and trace statistics, the null hypothesis of one cointegrating vector cannot be rejected at the 5% level of significance. The cointegration test results are shown in the upper block of Table 4.6.

**Table 4.6: Results of the Cointegration Tests for the Real Output Equation**

eigenvalue $\mu_i$	loglik for rank							
	245.998	0						
0.688561	264.079	1						
0.328933	270.262	2						
0.220867	274.131	3						
0.183949	277.281	4						
2.1975e-013	---							
7.01459e-017	---							
-7.87728e-014	---							
<b>Ho:</b>	<b>Maximum Eigenvalue statistics (<math>\lambda_{max}</math>)</b>				<b>Trace statistics (<math>\lambda_{trace}</math>)</b>			
	<b>Test statistics</b>		<b>Critical value</b>		<b>Test statistics</b>		<b>Critical value</b>	
	<b>Johansen's</b>	<b>Reimers</b>	<b>5%</b>	<b>1%</b>	<b>Johansen's</b>	<b>Reimers</b>	<b>5%</b>	<b>1%</b>
r= 0	36.16**	31.5*	28.16	33.12	62.57**	54.49*	53.34	60.05
r≤ 1	12.37	10.77	21.89	26.41	26.4	23	35.07	40.20
r ≤ 2	7.737	6.738	15.75	19.83	14.04	12.23	20.17	24.05
r≤ 3	6.302	5.489	9.09	12.74	6.302	5.489	9.09	12.74
Vector portmanteau 4 lags= 71.541 Vector AR 1-2 F(32, 49) = 1.8001 [0.0311] * Vector normality $\chi^2(8)$ = 17.837 [0.0225] * Vector Xi <sup>2</sup> F(120, 30) = 0.53628 [0.9903]								

\*\* means the null hypothesis is rejected at the 1% level of significance.

\* means the null hypothesis is rejected at the 5% level of significance.

r means the rank of the matrix containing the long run parameters ( that is, the number of cointegrating relationships among the variables)

The cointegration graphics further support that there is only one cointegration vector as the first vector is the only stationary one. The cointegration relations are shown in figure A2.3 of

Appendix 2. The stationary vector corresponds to the real output variable, according to the ordering of the variables.

The only cointegrating vector is thus necessarily the first vector of the standardized  $\beta'$  eigenvectors (of the PCFIML output) from the cointegration test. The relevant standardised  $\beta'$  eigenvector and the corresponding loading vector are therefore given as follows.

**Standardised  $\beta'$  eigenvector**

LnRGDP	Constant	ERD	Ln(G.EXP/GDP)	OPEN	LlabF	TOT95
1.000	-10.55	-0.7761	-0.4406	-0.2784	-0.1933	-0.003063

**Standardised  $\alpha$  eigenvector**

LnRGDP	ERD	Ln(G.EXP/GDP)	OPEN
-0.06975	1.210	-0.1572	-0.03497

In this standardized  $\beta'$  eigenvector, normalisation is done with respect to LRGDP.

From this, the long-run real output equation is therefore presented in equation (6).

$$\text{LnRGDP} = 10.55 + 0.7761\text{ERD} + 0.2784\text{OPEN} + 0.4406\text{Ln(G.EXP/GDP)} +$$

$$(0.0617) \quad (0.0000) \quad (0.3468) \quad (0.0012)$$

$$0.1933\text{LlabF} + 0.003064\text{TOT95} \text{---(6).}$$

$$(0.5508) \quad (0.8722)$$

Figures in parentheses are p-values.

Re-estimating the VAR recursively and plotting the recursive eigenvectors checked the stability of the parameters. These vectors show that the long run parameters of the model are stable. The plots of these recursive eigenvectors are shown in figure A3.3 of Appendix 3. The graphs show that the first recursive eigenvector is stable. Thus inferring that the parameters of the long run real output equation are stable.

Tests of significance were then carried out in order to know the variables that uniquely span the cointegrating space. The results of the tests are shown in Table A4.3 of Appendix 4.

From the long run output equation, the results show that the exchange rate depreciation, government expenditure, the degree of openness of the Sierra Leone economy to international trade, the terms of trade and the labour force have positive impact on the economy in the long run. However, the tests of significance show that it is only the exchange rate depreciation and government expenditure that are significant among all the explanatory variables. This is seen from the large probabilities of rejecting the null hypothesis of valid zero restriction wrongly (p-values). Dropping the insignificant variables decreased the coefficient of the exchange rate marginally (to 0.7399) and the coefficient of the government expenditure variable also decreased marginally (to 0.4403). Thus the insignificant variables were not dropped as they have the right signs for a long run phenomenon. That is, openness, labour force and terms of trade have positive impact on the real economic activities of the economy in the long run.

#### 4.4.3.2 The Dynamic Real Output Equation

Test for weak exogeneity was carried out and the result shows that there is no problem of endogeneity thus there is no need to resort to simultaneous equation estimation of the short-run model. The OLS method is therefore appropriate for the estimation of the short run real output equation.

The short-run dynamic real output equation was estimated by saving the cointegrating vector obtained from the long run equation estimate using the Johansen methodology. All variables were differenced allowing for delayed responses. The Hendry's general-to-specific method was applied. The result is shown in the upper block of Table 4.7.

**Table 4.7: The Dynamic Real Output Equation**

Modelling $\Delta \ln \text{RGDP}$ by OLS					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR <sup>2</sup>
Constant	0.0096996	0.011775	0.824	0.4182	0.0275
$\Delta \text{ERD}_2$	-0.091309	0.043340	-2.107	0.0458	0.1561
$\Delta \text{OPEN}$	-0.23637	0.13180	-1.793	0.0855	0.1182
$\Delta \ln(\text{G.EXP/GDP})_1$	-0.094247	0.052921	-1.781	0.0876	0.1167
$\text{CV1}_1$	-0.19468	0.077510	-2.512	0.0191	0.2081

$R^2 = 0.340362$   $F(4, 24) = 3.0959$  [0.0345]  $DW = 2.06$   
 $\text{AR } 1 - 2F(2, 22) = 1.2904$  [0.2952]  
 $\text{ARCH } 1 F(1, 22) = 3.696$  [0.0676]  
 $\text{Normality } \chi^2(2) = 1.6901$  [0.4295]  
 $\text{Xi}^2 F(8, 15) = 0.31543$  [0.9479]  
 $\text{Xi} * \text{Xj } F(14, 9) = 0.86093$  [0.6133]  
 $\text{RESET } F(1, 23) = 2.2811$  [0.1446]  
  
 $\text{Forecast } \chi^2(1) = 0.26229$  [0.6085]  
 $\text{Chow } F(1, 23) = 0.23088$  [0.6354]

CV-1 is the lagged cointegrating vector saved from the estimated long-run equation.

The result shows that the exchange rate depreciation, the government expenditure and the openness of the Sierra Leone economy to international trade are all significant and contractionary in the short run. The labour force and the terms of trade are found not to be significant in determining real output in the Sierra Leone economy in the short run. The speed of adjustment to disequilibrium is found to be in the relevant range in terms of sign and magnitude, as it is negative and not greater than unity in absolute terms (a value of  $-0.19468$ ). This indicates that the short-run dynamics converges on the long-run cointegrating relationship.

The coefficient of multiple determination is 34%, this is plausible as this is a dynamic model, where all the variables do not have unit root (are stationary) and hence no room for spurious correlation. The F-test for overall significance of the model shows that all the variables are jointly significant. Misspecification tests were done in order to check whether the model is data coherent. The test summary shows that the residuals do not have problem of non-normality, Serial Correlation, Heteroscedasticity, AutoRegressive Conditional Heteroscedasticity (ARCH effect), and there is no problem of functional form misspecification. The parameter stability test shown by the Chow statistics shows that there is no parameter instability. The results of the test are shown in the lower block of Table 4.7.

## **4.5 Economic Interpretation of the Models**

A balance of payments equation, an inflation and a real output equation (for both the long run and the short run) for the Sierra Leone economy have been estimated. It is thus necessary to painstakingly discuss the economic interpretations of these models. This is undertaken in what follows in this section of this paper.

### **4.5.1 The Effects of Exchange Rate Depreciation**

The balance of payments equation shows that the exchange rate depreciation improves the balance of payments in the long run but in the short run it is found to be insignificant in affecting the balance of payments. This result corroborates with those of Khan and Knight (1982), Taye (1999), Green and Murinde (1992), Horton and McLaren (1989), Solimano (1986) and Agénor (1990) though it is only the last two that considered both the short run and the long run effects. While Agénor (1990) finds exchange rate depreciation to improve the balance of payments in the short run Solimano (1986) finds that exchange rate depreciation deteriorate the balance of payments in the short run.

The short run insignificant result of exchange rate depreciation on the balance of payments found in this study is not surprising because in the short run exporters and importers have to spend time in order to adjust their transactions to take advantage of the depreciation. Over and above, to the extent that most of the exports of Sierra Leone are primary commodities, they

require long gestation period. Thus in the short run increasing exports, from the exchange rate depreciation, to an extent of improving the balance of payments is difficult if not impossible.

The inflationary effect of the depreciation of the exchange rate found in this study parallels those of Horton and McLaren (1989), Green and Murinde (1992), Taye (1999), Khan and Knight (1982) and Agénor (1990). The inflationary effect of exchange rate depreciation in the long run as well as in the short run is owing to the fact that exchange rate depreciation necessarily increases import prices. Since in the Sierra Leone economy intermediate goods and capital goods constitutes majority of the imports, a depreciation of the exchange rate thus spills over the domestic goods market in terms of higher prices. This is owing to the fact that imports prices increases in domestic currency terms, which are then transferred into domestic final goods.

A depreciation of the exchange rate is found to reduce real output (contractionary) in the short run but expansionary in the long run. The contractionary result of the depreciation of the exchange rate found in this study is similar to those of Khan (1990), Khan and Knight (1982), Agénor (1990), Taye (1999), Solimano (1986), Edwards (1986), Diaz Alejandro (1965) and Cooper (1971). While Taye (1999), and Cooper (1971) did not distinguish between the short run and long run effects, the case of Edwards (1986) is that in the long run the contractionary effects is completely reversed and the depreciation is neutral on real output. The contractionary result found in this study is contrary to the studies of Green and Murinde (1992) and Horton and McLaren (1989) as in these studies the depreciation of the exchange rate is found to be expansionary. These two did not however distinguish the short run and long run effects.

The short-run contractionary effect of the depreciation of the exchange rate found in this is not surprising; the implication is that in the short run, a depreciation of the exchange rate increases the price of imports, which include intermediate goods and capital goods (with low substitutability). Thus a depreciation of the exchange rate reduces the volume of imports as this implies higher import cost in domestic currency units. Since output is a function of inputs used in production, output consequently reduces. In the long run however, though the volume of imports is reduced thereby reducing the industrial value added, the agricultural value added increases as gestation periods would be over and agents would want to increase their export earnings in domestic currency terms. This increase in value added more than offsets the decrease in value added in the industrial sector thus output increases.

#### **4.5.2 The Effects of Government Expenditure, Budget Deficit and Domestic Credit**

Budget deficit is found to be inflationary both in the short run and in the long run in the Sierra Leone Economy. This parallels the studies of Horton and McLaren (1989), Green and Murinde (1992), Agénor (1990) and Ghura and Hadjimichael that fiscal expansion is inflationary. But it is contrary to the studies of Khan (1990), Chrishti et al. (1992), that fiscal expansion is disinflationary.

Budget deficit is found to Granger cause domestic credit and inflationary. A very high correlation (0.96) is found to exist between the two variables. Domestic credit is found to be insignificant in affecting the balance of payments both in the short run and in the long run

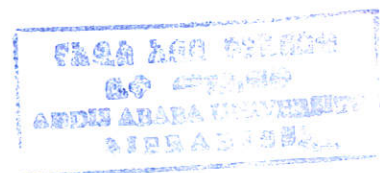
while inflation is found to deteriorate the balance of payments both in the long run and in the short run. This implies that *ceteris paribus*, fiscal expansion, which triggers budget deficit in the Sierra Leone economy (given the tax collection lags) triggers domestic credit creation. This in turn is inflationary; the inflation undermines the competitiveness of the domestic economy thereby deteriorating the balance of payments. This outcome is akin to the studies of Khan and Knight (1982), Khan (1990) and Agénor (1990) though contrary to the case of Agénor (1990) in the long run. Thus it is the case that in the Sierra Leone economy, the channel via which domestic credit creation undermines the balance of payments is via its inflationary effect (which is inimical to domestic competitiveness) but not via a direct effect whereby excess demand for money leaks abroad (the main thesis of the monetary approach to the balance of payments).

Government expenditure is found to be contractionary in the short run but expansionary in the long run. What is to be borne in mind is that government expenditure comprises government consumption and government investment. Government investment includes expenditure on infrastructure and human capital building. Government consumption is government recurrent expenditure. This result parallels those of Khan (1990), Horton and McLaren (1989), Chrishti et.al (1992), Edwards (1986) and Ghura and Hadjimichael (1986). While Edwards (1986) and Ghura and Hadjimichael (1986) showed that government expenditure is expansionary, they did not distinguish between the short-run and the long-run effects. In the case of Chrishti et.al (1992) government expenditure is found to be expansionary in the long run as well as in the short run but this short run expansionary effect was found to be weak relative to the long run effect.

The short-run contractionary and long-run expansionary effect of government expenditure in Sierra Leone can be explained as follows. In the short run, the real output reduction effect of government consumption (which is not part of investment and thus discourages private investment) outweighs the real output increasing effect of government investment. But in the long run, the positive effect of government investment outweighs the negative effect of government consumption. The reverse is the case in the long run. For one thing, most government investment benefits are not realised immediately. Typically, it takes time to complete projects like construction of roads, electricity dams, and for a cohort of trainees to complete training so that they become (more) productive to the society.

#### **4.5.3 The Effects of Non-Budgetary and Financial Policy Instruments**

Real output is found to improve the balance of payments in the long run but deteriorates the balance of payments in the short-run. This is owing to the fact that in the short run, an increase in real output increases imports (which is resource outflow). In the long run, these imports, which are used to strengthen domestic production including the agricultural sector, increase exports. The openness of the Sierra Leone economy is found to have inimical impact on real output in the short run. This is possibly because the more open the economy is the more is capital flight, given the existence of macroeconomic instability, political instability and low level of technologically adapted manpower. In the long run, domestic institutions would have been able to significantly adapt transferred technology. Hence the positive effect of openness on real output in the long run.



The labour force is not found to be significant in influencing real output in both the short run and the long run. This can be attributed to the fact that in an economy (like Sierra Leone) where there is abundant labour but effective labour is scarce, the productivity of the labour force will be insignificant.

The terms of trade is found to be insignificant in influencing real output both in the short run and in the long run. This is as found in Barro (1979), Edwards (1983) and Edwards (1986) that terms of trade has no significant effect on real output in developing countries. For one thing, the manufacturing base of Sierra Leone is weak. For another, her infrastructure is in a debilitating state.

## SECTION FIVE

### CONCLUSION AND POLICY IMPLICATIONS

#### 5.1 Conclusion

This paper has sought to estimate time-series models of inflation, balance of payments and real output in Sierra Leone. This is done in an effort to determine: the effect of government expenditure on real output, the effect of budget deficit and domestic credit on inflation and the balance of payments and the effect of exchange rate depreciation on the balance of payments, inflation and real output. The reason being that budgetary instruments (government expenditure and budget deficit herein) and financial policy instruments (domestic credit and exchange rate herein) are central policy variables in stabilisation programs. Stabilisation programs normally focus on improving the balance of payments and lowering inflation with the ultimate objective of raising the real output.

Though these models may not be problem-free, they however provide a case where modern time-series methods are applied and conclusions consequently drawn from the results without diverting attention from the economics. In doing so we have successfully estimated from both long run and short run perspectives models which include the variables normally targeted in any stabilisation program as well as the usual policy instruments. A number of important results have been obtained.

First, fiscal restraint, which involves cutting down government expenditure can abate inflation but in the long run such fiscal restraint has cost on real output and hence employment though essential for raising real output in the short run.

Second, fiscal indiscipline spills over into monetary problem in the sense of causing higher domestic credit. The inflation that emerges as a result of this fiscal imbalance deteriorates the balance of payments both in the short run and in the long run.

Third, exchange rate depreciation (or devaluation) improves the balance of payments of the Sierra Leone economy though the result is not realised immediately. In any case, such depreciation has cost in the sense of being inflationary before (in the short run) and when (in the long run) the benefit is realised. Output reduction (in the short run) is also another awkwardness of such a nominal depreciation.

Fourth, government expenditure, which include government consumption and government investment stimulates real economic activity in the long run while in the short run real economic activity is dampened by government expenditure. Pointing to the fact that the positive effect of government investment, which is not normally realised immediately, outweighs the negative effect of government consumption (whose negative effects starts to be felt immediately) in the long run. Thus the effect of government expenditure on real output follows a J-curve shape in the Sierra Leone economy.

## 5.2 Policy Implications

For the conduct of monetary, fiscal and exchange rate policies, these results imply that in order to attain external balance, the depreciation of the nominal exchange rate is favoured for the Sierra Leone economy but the caveat is that it must be borne in mind that it is inflationary and this inflationary effect may not let the expected benefit to be realized. The inflationary effect may neutralise the positive impact of the exchange rate depreciation on the real exchange rate. Thus dwindling the competitiveness of the Sierra Leone economy's tradable sector in the international market and hence deteriorating the balance of payments. It is therefore appropriate to undertake appropriate fiscal reforms in conjunction with policies that depreciate the exchange rate in the instance where external balance objective becomes the target.

Another consideration for policy is that in the case where inflation reduction is the target, exchange rate appreciation (or revaluation) and domestic fiscal discipline is the optimal policy. But, since governments normally target low inflation and healthy balance of payments simultaneously, condoning the current liberalised exchange rate system thereby reducing the extent of any real overvaluation and fiscal reform is the first best. Such fiscal reform may end up being beating a dead horse if it ends just with reducing government expenditure but not establishing efficient tax administration system that can lead to an improvement in the tax revenue.

Tooth and nail effort should be employed to bring the ongoing rebel war to an end, in which case the revenue base can be increased and expenditure on pursuing the war can be reduced or

frozen while destruction of infrastructure and human capital will be brought to an end with prospect for good fiscal situation and hence lower inflation and increased real output.

To the extent that government expenditure reduces real output in the short run and fiscal deficit is inflationary in both the short run and long run, for sustained increase in real economic activities and lowering of inflation, government consumption need be curtailed while government investment (which include expenditure on building of infrastructure and human capital) need be encouraged.

Since fiscal deficit is found to be inflationary and the channel via which fiscal deficit normally affects inflation is through the excess money supply effect of domestic credit creation, thus creating excess demand in the goods market, it is essential to employ supply-side measures that can increase real output. In which case pressure on excess demand in the face of any fiscal expansion is reduced. Such supply side policy can also improve the balance of payments in the long run given that real output has been found to have positive impact on the balance of payments.

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## APPENDICES

### Appendix 1: Recursive graphics of the estimated VAR

Figure A1.1: 1-Step Residuals  $\pm 2$ \*S.E. recursive graphics of the VAR for the inflation equation.

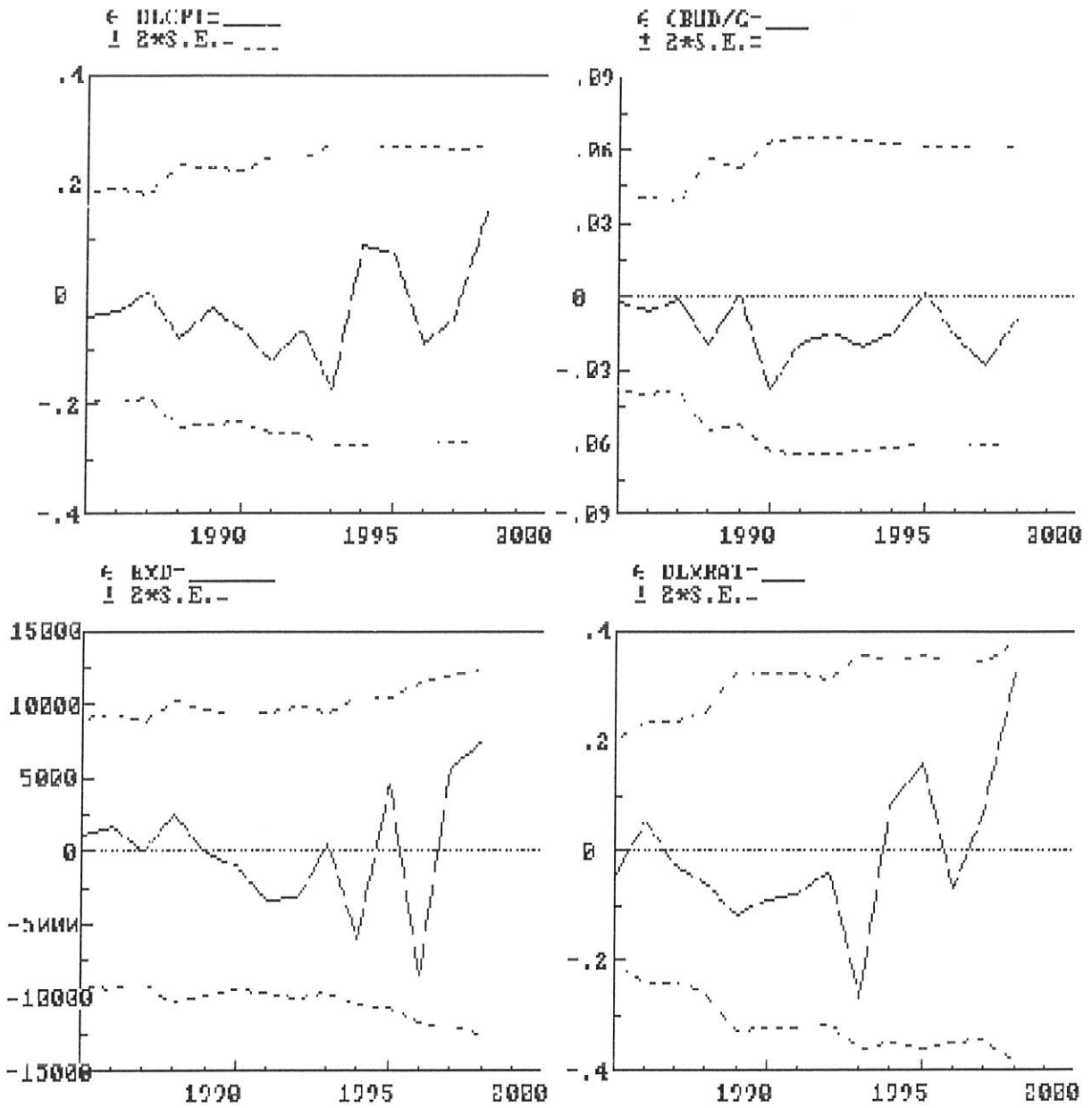


Figure A1.2: 1-step recursive graphics from the VAR for the balance of payments equation

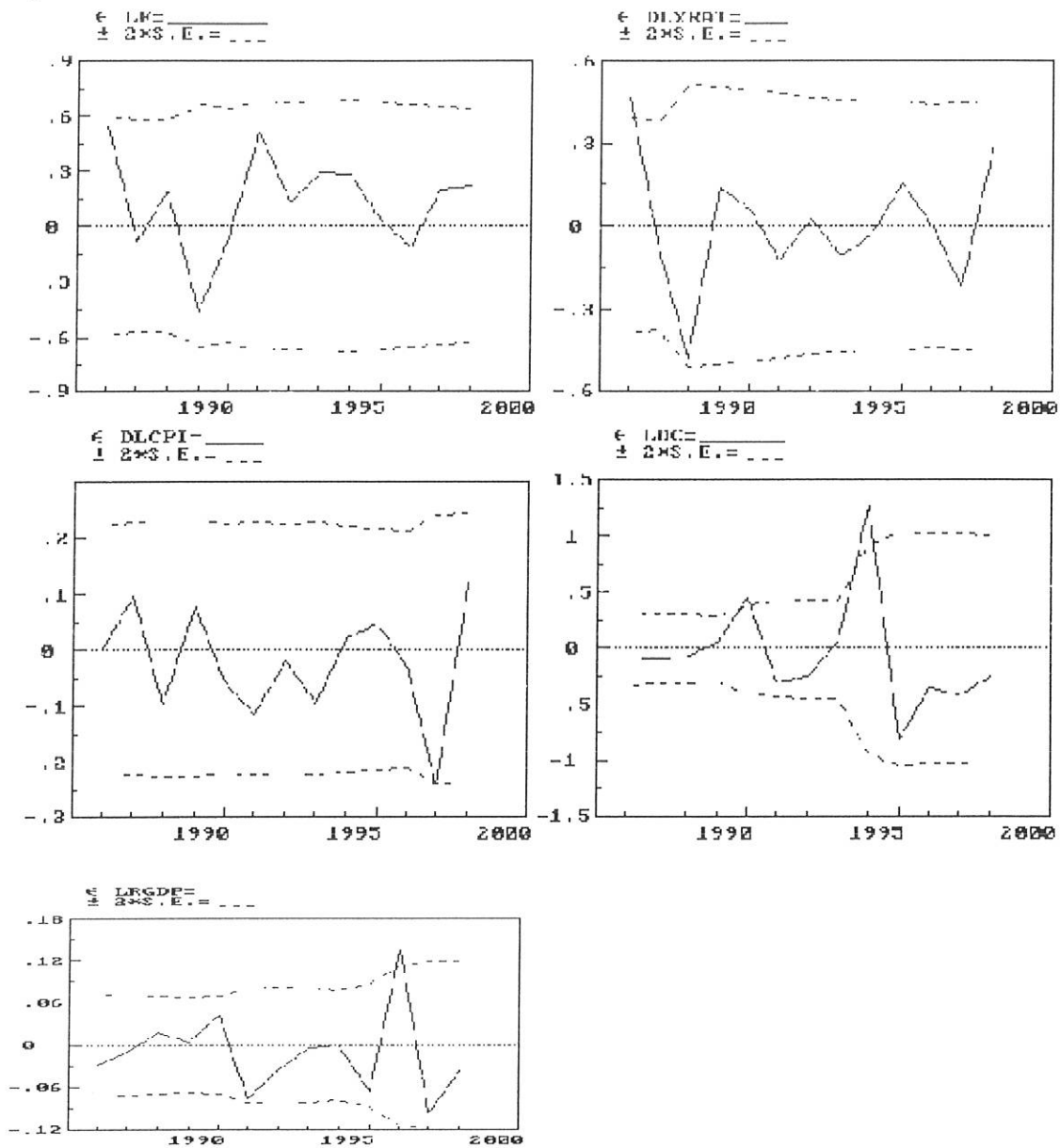
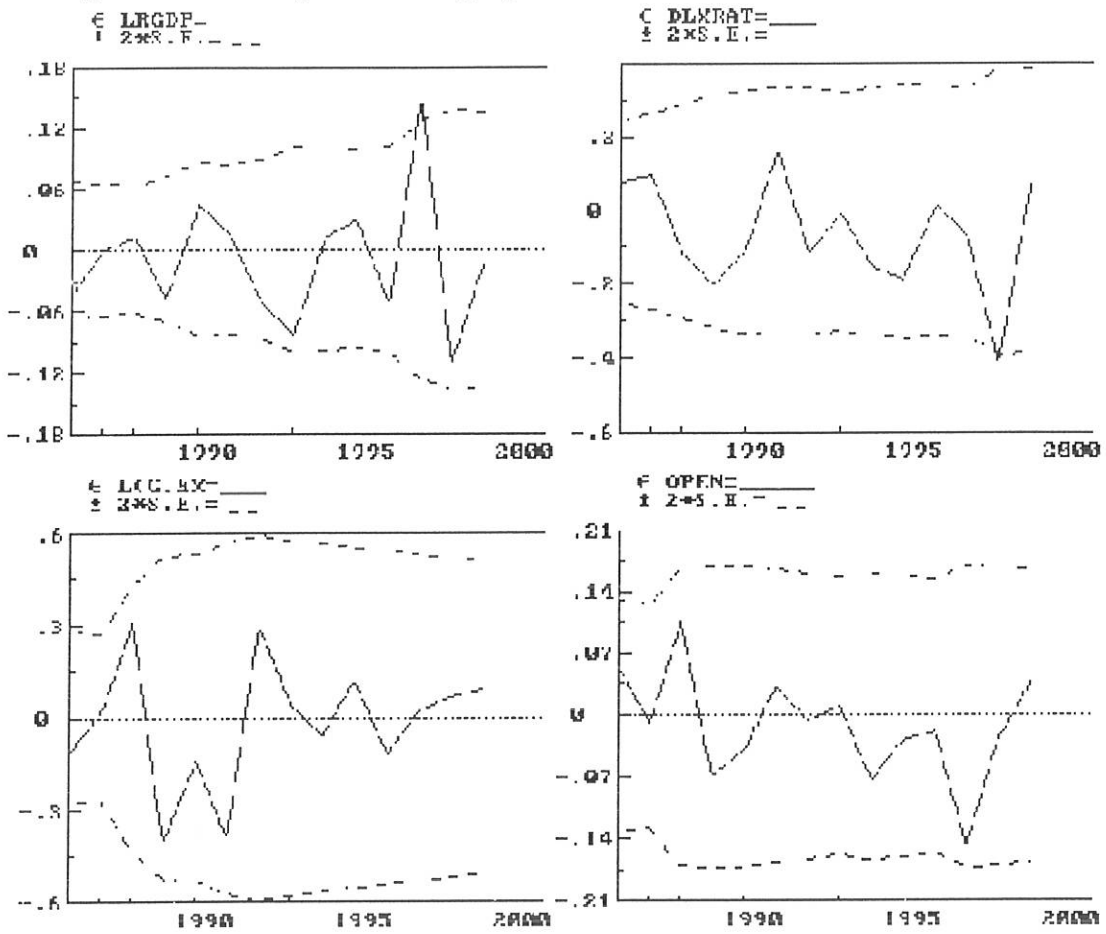


Figure A1.3: 1-step recursive graphics from the VAR for the real output equation



Appendix 2: The cointegration graphics

Figure A2.1 cointegrating relations from the VAR for inflation

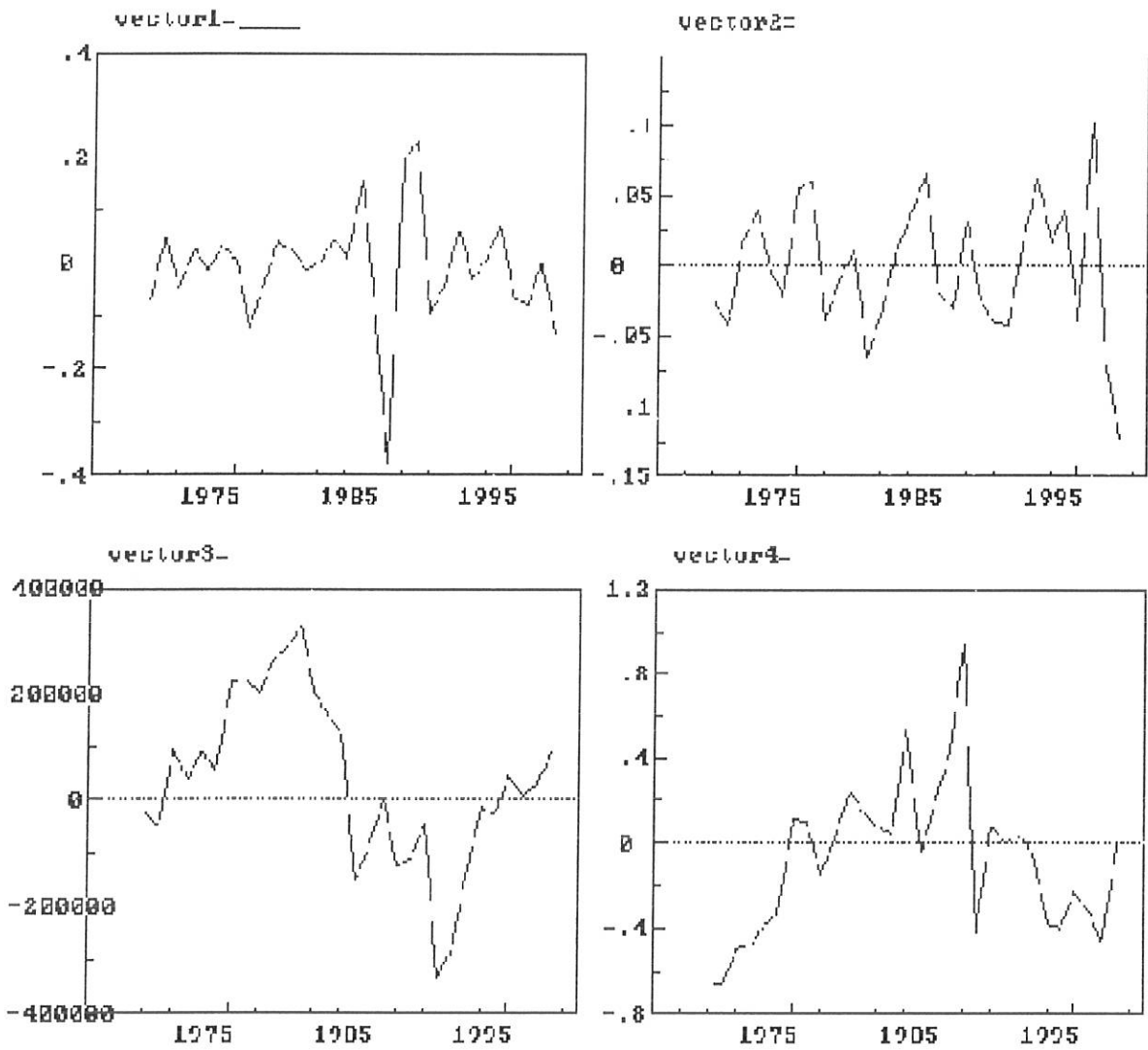


Figure A2.2: The cointegrating relations from the VAR for the balance of payments

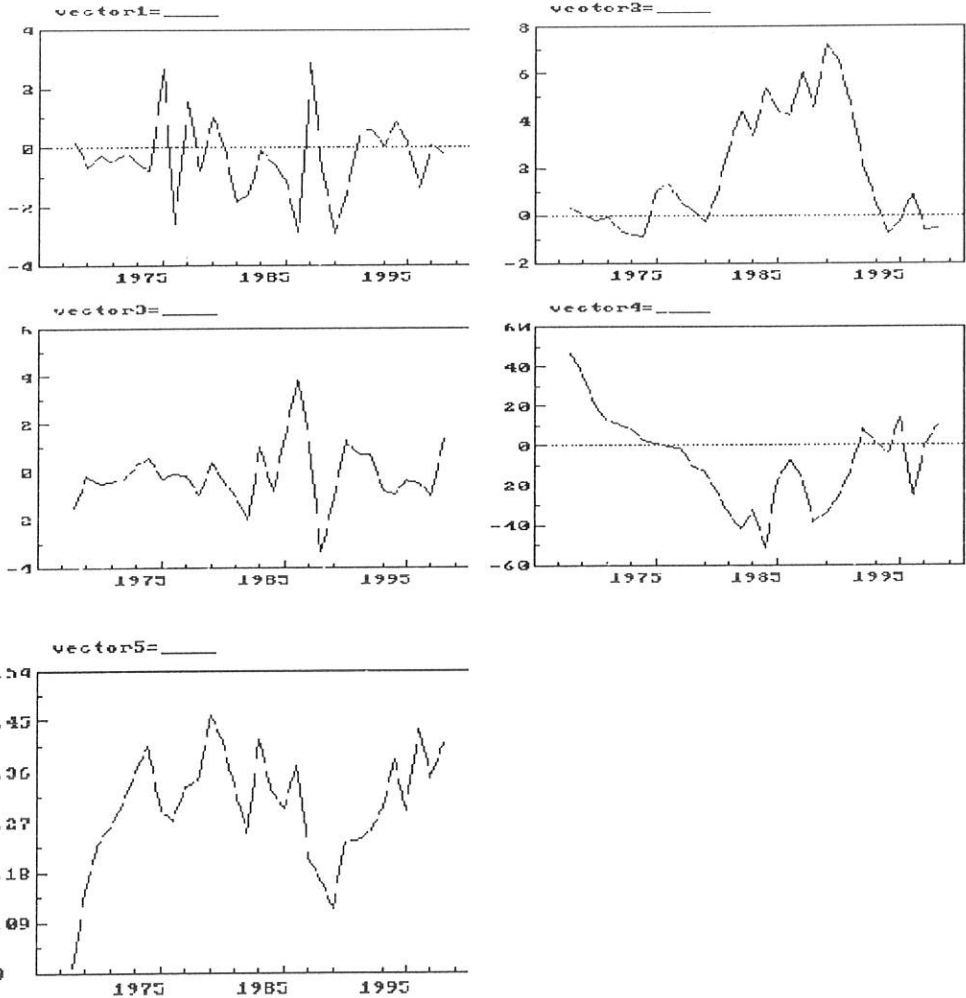


Figure A2.3: The cointegrating relations from the VAR for real output equation

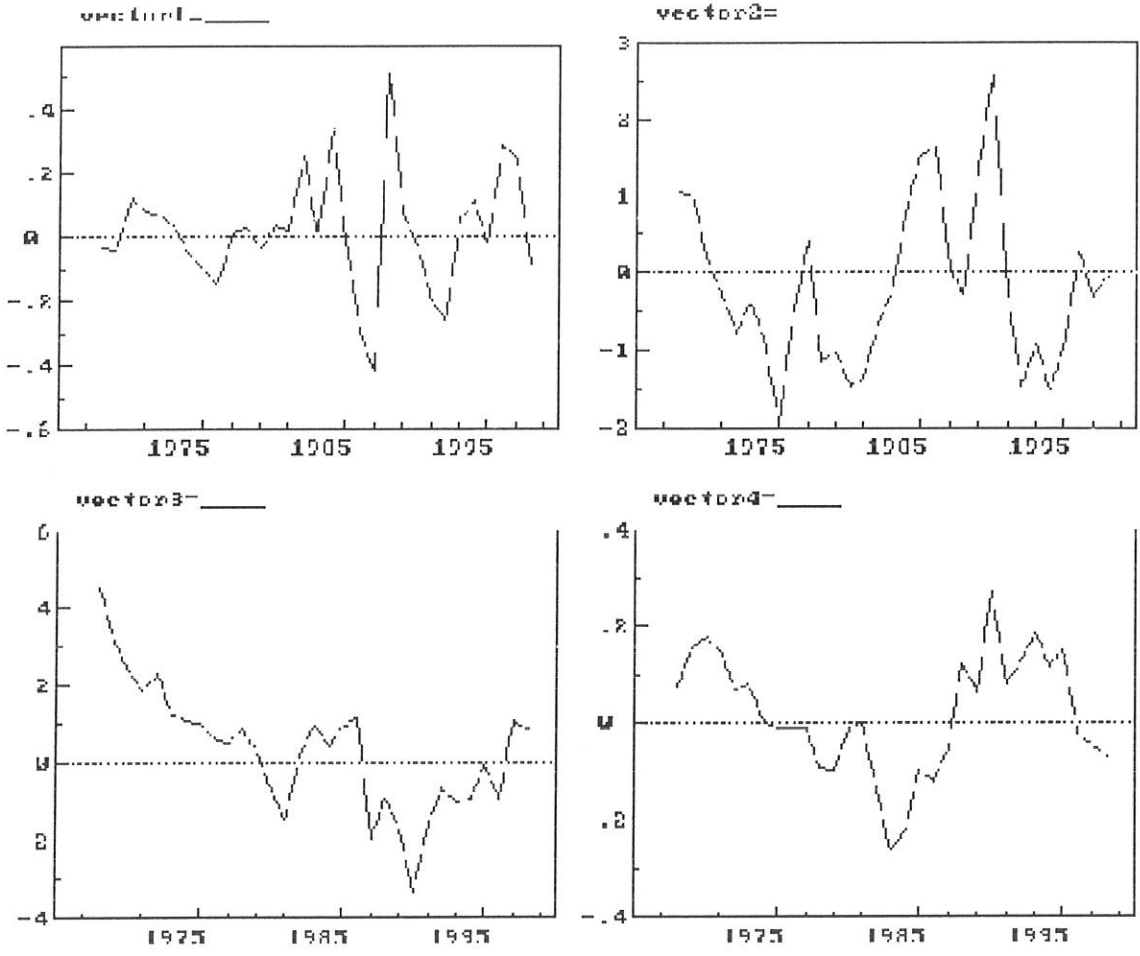


Figure A2.2: The cointegrating relations from the VAR for the balance of payments

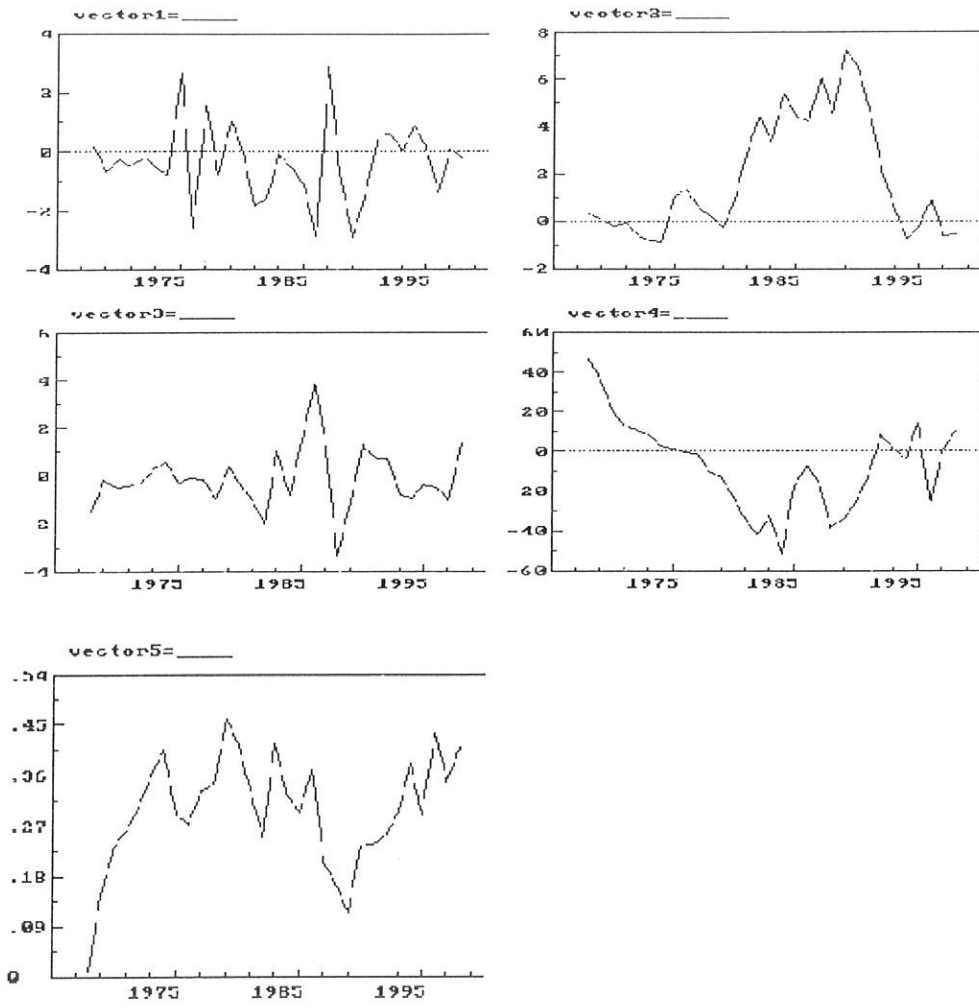
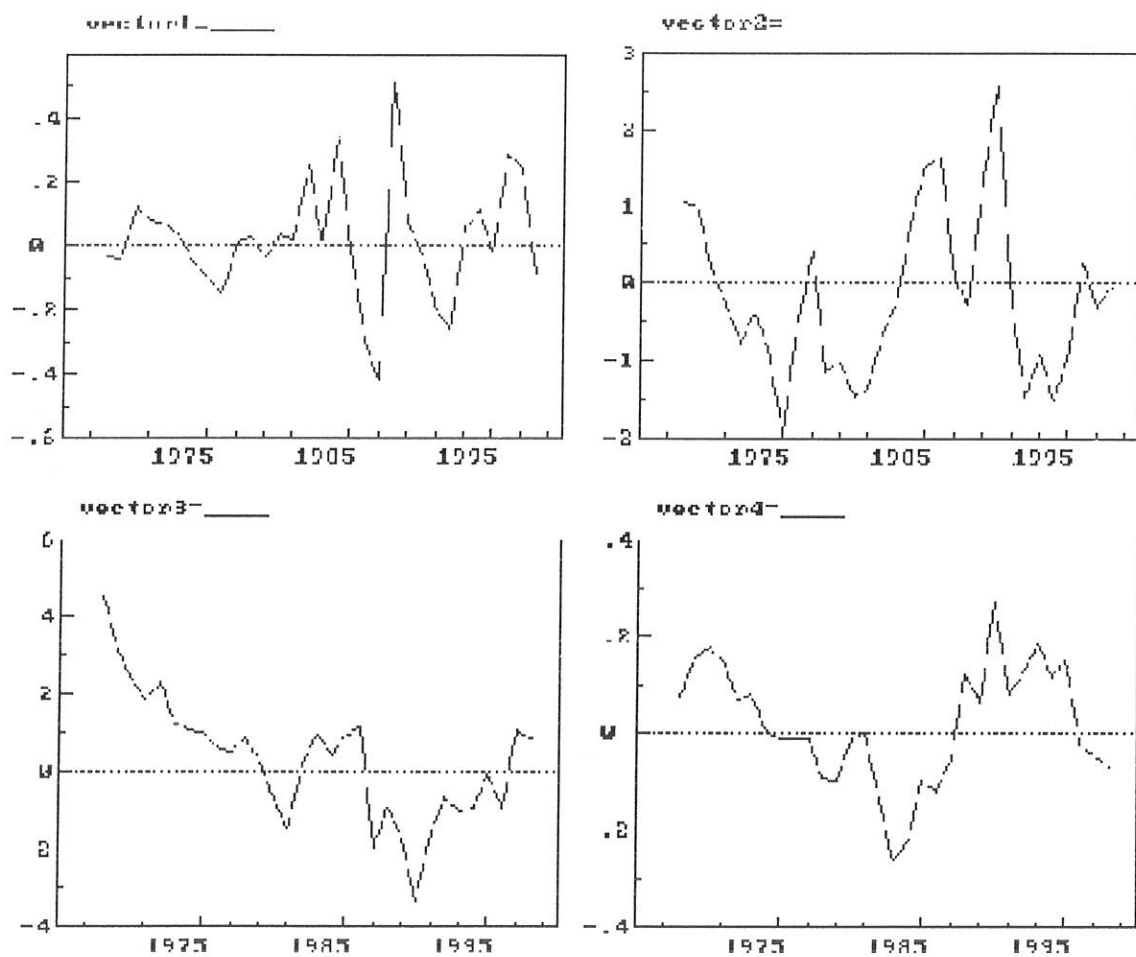


Figure A2.3: The cointegrating relations from the VAR for real output equation



Appendix3: Recursive eigenvalue graphics for the stability of the long run parameters

FigureA3.1: Graphs of the recursive eigenvalue from the long run inflation equation

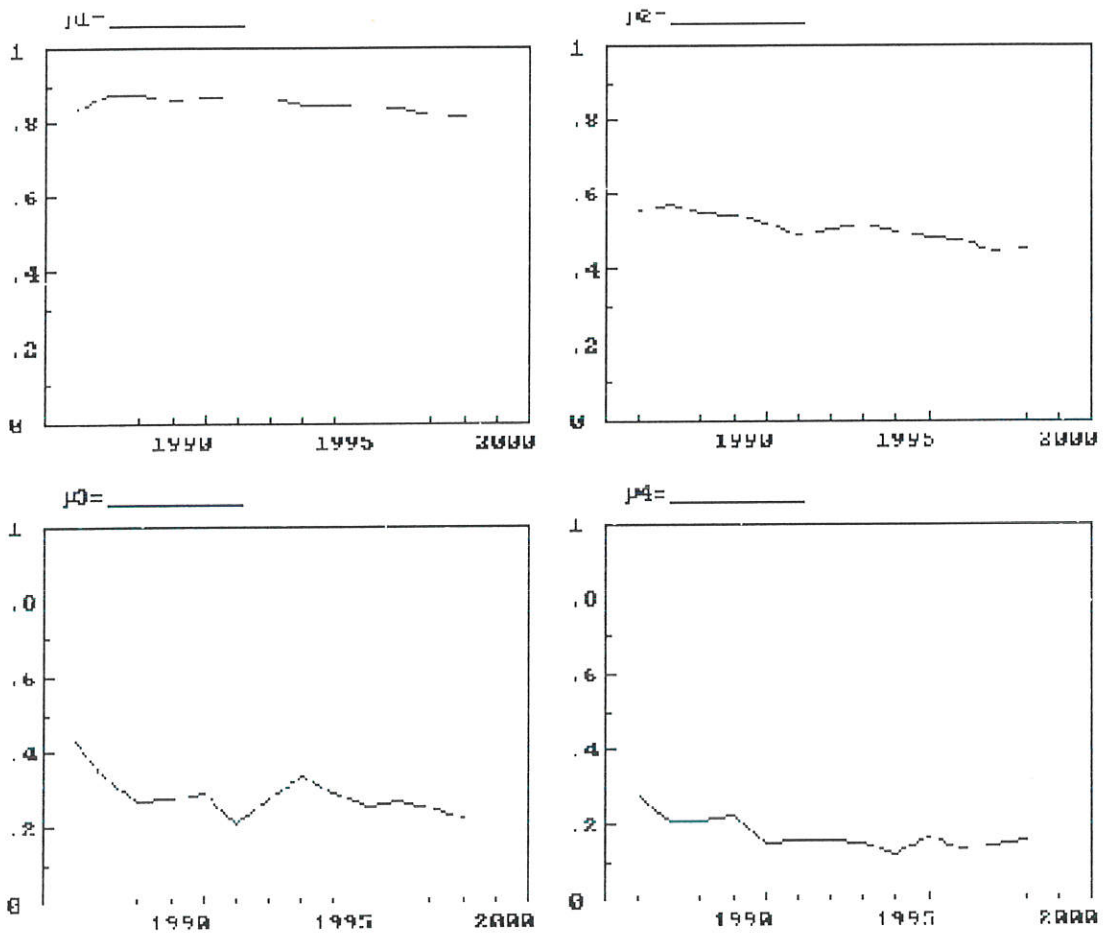


Figure A3.2: Graphs of the recursive eigenvalue from the long run balance of Payments equation

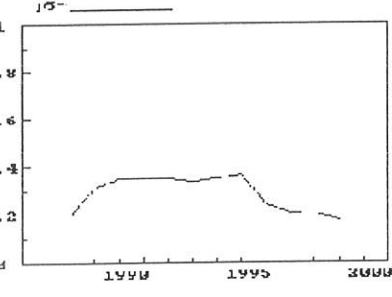
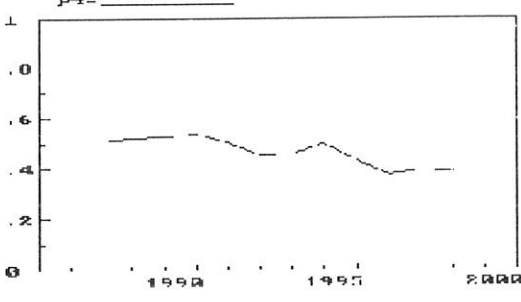
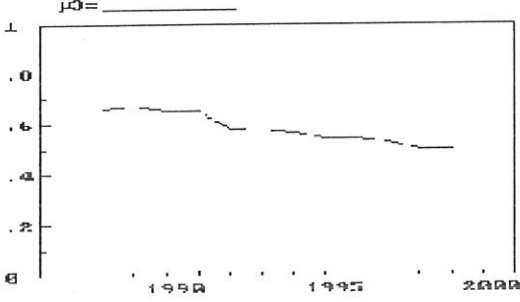
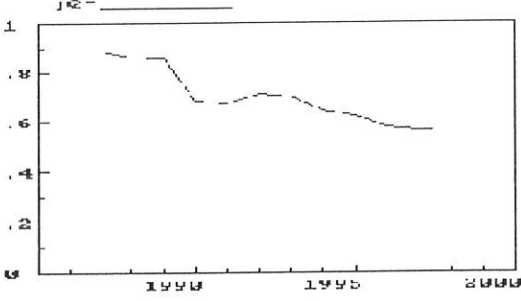
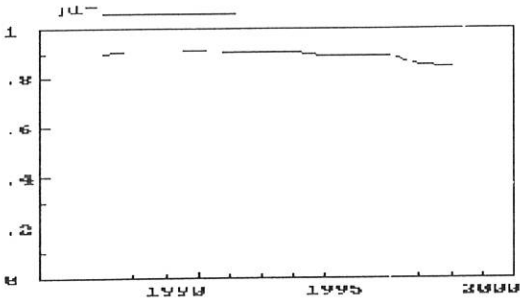


Figure A3.3: Graphs of the recursive eigenvalue from the long run output equation

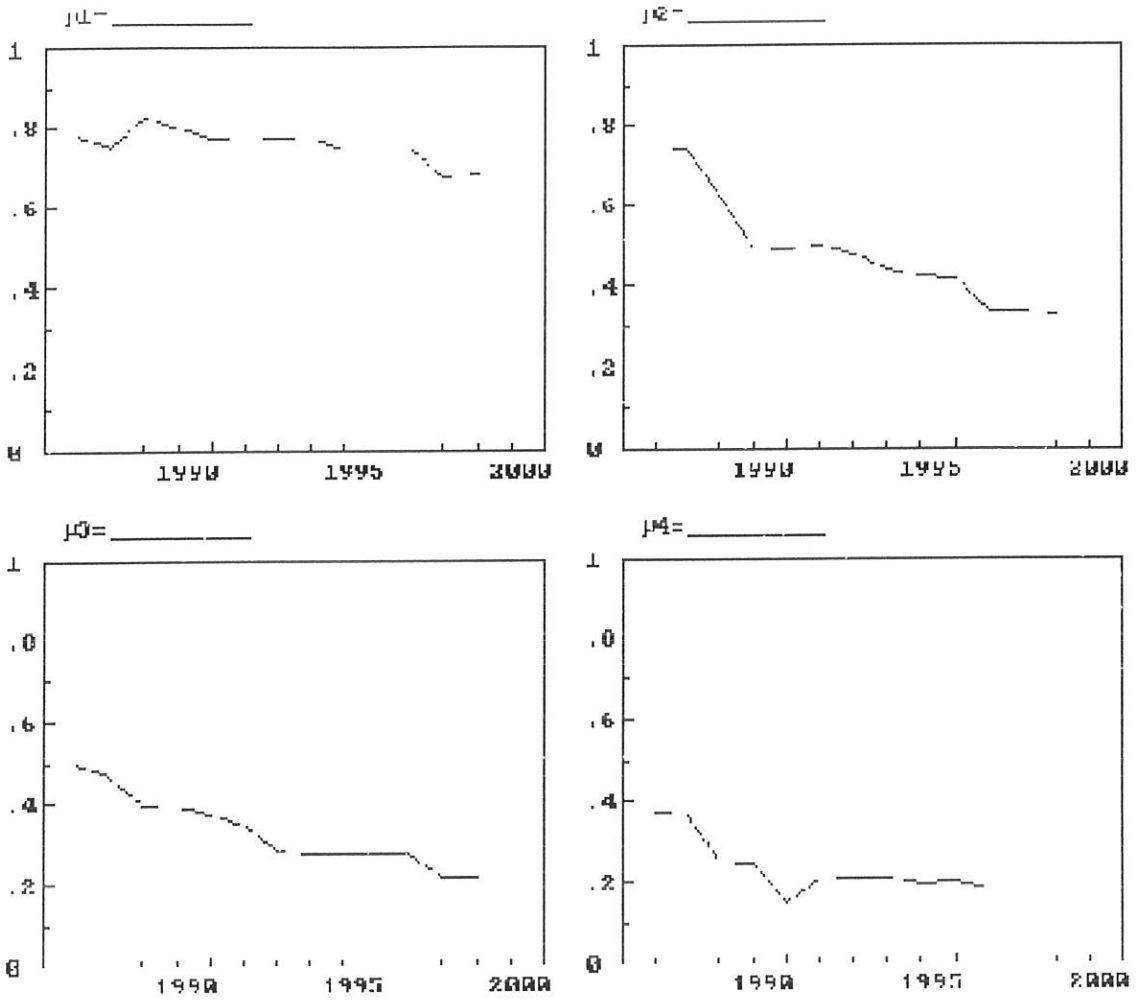
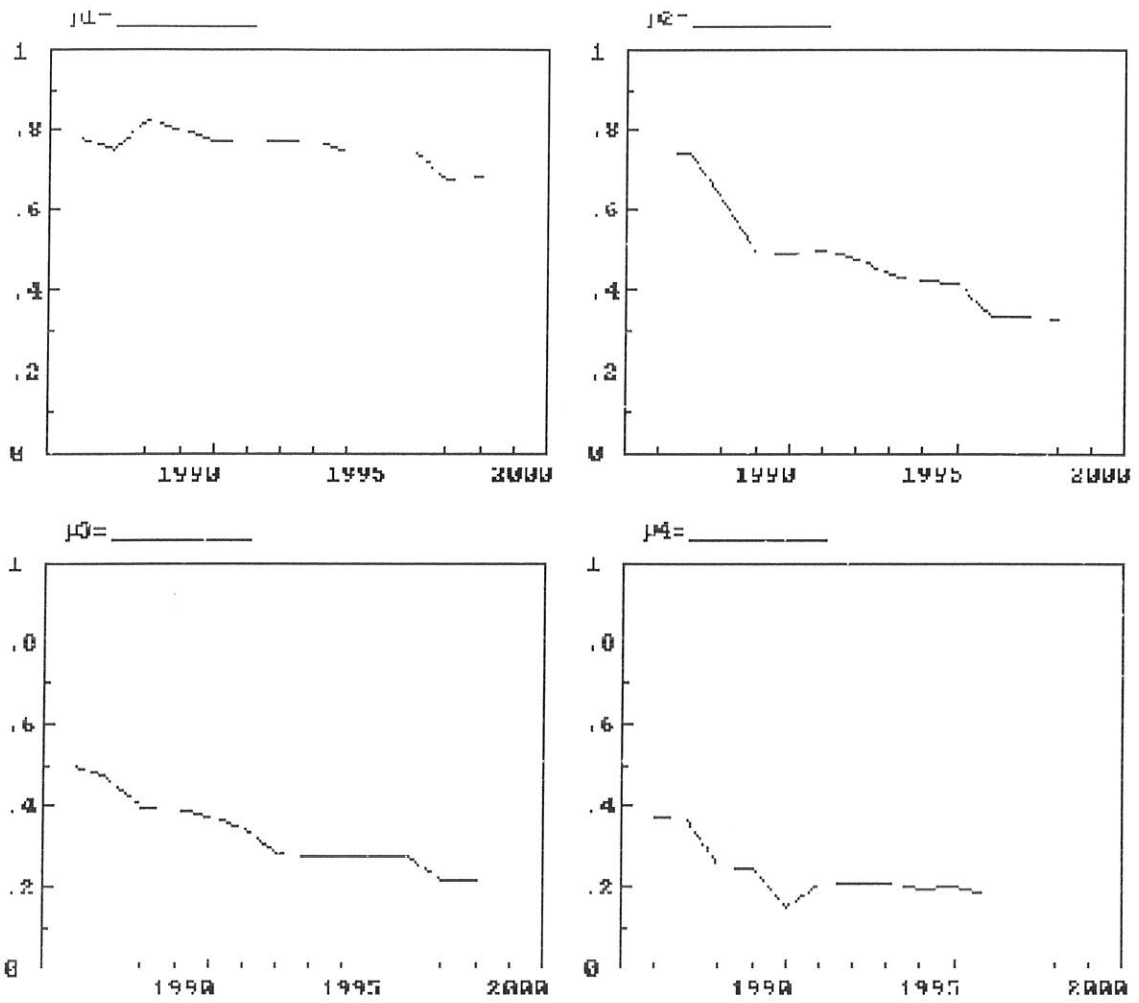


Figure A3.3: Graphs of the recursive eigenvalue from the long run output equation



#### Appendix 4: Significance test on the long-run parameters

**Table A4.1: Significance-test results for the long-run inflation-equation parameters**

VARIABLE	COEFFICIENT	LIKELIHOOD RATIO (LR) STATISTICS	P-VALUE
(BUD/GDP)	1.1780	38.431	[0.0000] **
ERD	0.7787	39.372	[0.0000] **
EXD	0.0000	0.44921	[0.5027]
Pm	0.0001	34.464	[0.0000] **

**Table A4.2: Significance-test results for the long run balance of payments parameters**

VARIABLE	COEFFICIENT	LIKELIHOOD RATIO (LR) STATISTICS	P-VALUE
ERD	5.297	24.569	[0.0000]**
DLCPI	-10.34	32.053	[0.0000]**
LDC	-0.02002	0.18934	[0.6635]
LRGDP	6.001	9.7579	[0.0018]**

**Table A4.3: Significance-test results for the long run real output parameters**

VARIABLE	COEFFICIENT	LIKELIHOOD RATIO (LR) STATISTICS	P-VALUE
ERD	0.7761	22.925	[0.0000] **
OPEN	0.2784	0.88521	[0.3468]
Ln(G.EXP/GDP)	0.4406	10.509	[0.0012] **
LnlabF	0.1933	0.35595	[0.5508]
TOT95	0.0003063	0.025894	[0.8722]

## Appendix 5

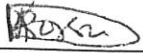
**Table A5: Data Description and Sources**

<b>Variable</b>	<b>Description</b>	<b>Source</b>
Inflation ( $\pi$ )	This is calculated as the first difference of the natural logarithm of the consumer price index (1995 =100)	International Financial Statistics (IFS)
Exchange Rate Depreciation (ERD)	Calculated as the first difference of the natural logarithm of the bilateral nominal exchange rate (Sierra Leonean leones per U.S dollar)	International Financial Statistics (IFS)
Import Price (Pm)	Taken as the import price index (1995=100)	World Development Indicators (WDI)
Budget Deficit (BUD)	Calculated as government expenditure minus government revenue (excluding grant)	International Financial Statistics (IFS)
Nominal Gross Domestic Product (GDP)	Taken as the gross domestic product at current market price	International Financial Statistics (IFS)
Real Gross Domestic Product (RGDP)	Taken as the gross domestic product at constant factor cost (at 1995 prices)	World Development Indicators (WDI)
Excess Demand (EXD)	Calculated as nominal GDP minus nominal domestic absorption	International Financial Statistics (IFS)
Foreign Reserve (F)	Taken as the total foreign reserve excluding gold	International Financial Statistics (IFS)
Domestic Credit (DC)	Taken as the total domestic credit to the private sector and the public sector	International Financial Statistics (IFS)
Labour Force (labF)	Taken as the total working population	World Development Indicators (WDI)
Government Expenditure (G.EXP)	Taken as the total government expenditure	International Financial Statistics (IFS)
Terms of Trade (TOT95)	Calculated as the export price index divided by import price index multiplied by 100 (1995=100)	World Tables (WT) and African Development Indicators (ADI)
Openness (OPEN)	This is calculated as the ratio of the sum of exports and imports to Nominal GDP	International Financial Statistics (IFS)

## DECLARATION

I, the undersigned, declare that this thesis is my own original work and has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged.

**Name:** Robert Dauda Korsu

**Signature:** 

**Date:** 16<sup>th</sup> July, 2001

**Place:** Addis Ababa