

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FACULTY OF BUSINESS AND ECONOMICS

REAL EXCHANGE RATE AND TRADE BALANCE IN SIERRA LEONE:

AN EMPIRICAL INVESTIGATION

BY:

ABU BAKARR TARAWALIE

Advisor

Dr. Subhash Narula

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL

**FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE
OF MASTER OF SCIENCE IN ECONOMICS (ECONOMIC POLICY ANALYSIS)**

JUNE 2003

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DEDICATION

This work is dedicated to my dear mother- Madam MARIE TARAVALIE, and to my late father- PA KARIFALA TARAVALIE; may his soul rest in perfect peace- amen!!

ACKNOWLEDGEMENT

I wish to render my heartfelt gratitude to the Almighty Allah for seeing me through. May His name be praised.

My special thanks must go to my enterprising advisor, Dr. Subash Narula for his assistance and detailed professional advice in all process of the research work. Furthermore, my sincere gratitude goes to all the staff members of the Economics Department for their help, encouragement and support throughout my studies. I am grateful to Ato Daniel Zerfu, who gave me useful ideas in this study.

I am also indebted to the following people for their moral support; T.K, DUSU, ZAINAB, MAMY SAIO, FATMATA, MOHAMED, BASCO, ABT, KELLO, MADINA and SAMMY J.

I am grateful to the Sierra Leonean community in Addis Ababa especially His Excellency Ambassador Chalobah, Aunty Jennifer, Mr. Tamba, Mr. Komba, Mr. Falla, Mr. Bob-Gray and Dr. Kalokoh for their moral support.

I would like to express my profound gratitude to B.I.B, Lansana and Sheka for their valuable support.

Also, I would like to express my joy and appreciation to AERC and its able staff for their sponsorship.

Finally, I am indebted to my Fiancée- LUCIA JUSU for her love, affection and encouraging emails.

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ABSTRACT

This study has analysed time-series models of trade balance and real exchange rate in the economy of Sierra Leone. More specifically, an attempt has been made to analyse the impact of exchange rate misalignment on the trade balance. The study also examines the role of real and nominal disturbance in explaining the movement of the real exchange rate in Sierra Leone.

The study employs the Johansen maximum likelihood procedure in multivariate model to arrive at the long run model. Also, the Hendry's general-to-specific method was used in order to get the short run model.

Results of the study suggest that net capital inflow tends to appreciate the real exchange rate, while both the terms of trade and openness (which is a proxy for trade policy) tends to have a depreciating effect on the real exchange rate. Moreover, the error correction model shows that nominal devaluation and excess supply of domestic credit have significant effects on the real exchange rate. Nominal devaluation tends to depreciate the real exchange rate, while excess supply of domestic credit tends to appreciate it. Further more, the impact of the civil war has a depreciating effect on the real exchange rate. The study also reveals that the real exchange rate has been misaligned.

In the trade balance equation, real income tends to improve the trade balance, while real money supply has a deteriorating effect on the trade balance. Also, the real exchange rate misalignment variable was found to have a deteriorating effect on the trade balance. In the

error correction model, both the real exchange rate misalignment and the dummy for war variables tend to have a deteriorating effect on the trade balance

CHAPTER ONE

1.1 INTRODUCTION

The study of exchange rate determination has gained much prominence in economic policy discussions in most developing countries (these are countries associated with low per capita income). This is because exchange rate impacts on most macroeconomic variables in the economy and it affects the long run growth trend of the economy. It is argued that exchange rates in most developing countries have exhibited excessive volatility and large persistent misalignments. These have disruptive effects on international trade and specialization and lead to unstable international financial conditions. Therefore, there is a need to undertake efforts to co-ordinate economic policy in order to maintain medium term exchange rate misalignment and the use of monetary policy to reduce short-term exchange rate volatility.

During the period 1970-2000, Sierra Leone like many other African countries, experienced negative external shocks (terms of trade, interest rate, worldwide recession etc.). A deficient national policy environment and a weak industrial base increased the negative effects of these shocks. These shocks led to a loss of competitiveness of the domestic economy, materialized by deteriorating balance of payment, slow growth and unemployment. Imports rose steadily but exports did not follow that rise, leading to worsening of the trade balance. As a result, the current account deficit became unsustainable and with it the debt burden rose as well. The issue of the real exchange rate is of interest for policy planners because it sends the signals to the economy that facilitate adjustment. Thus, to improve the balance of payments and to

achieve sustainable economic growth, a real devaluation of the exchange rate was needed in Sierra Leone. It was hoped that a depreciated exchange rate would increase the competitiveness of exports, make imports more expensive and shift resources from sectors producing non-tradables to those producing tradables¹.

The question of whether macroeconomic imbalances such as balance of payments deficit and fiscal deficit in developing countries are due to factors within the jurisdiction of domestic policy makers has been widely debated in the analysis of both economic growth and inflation in Sierra Leone. Where as some studies ascribe the fluctuations in Sierra Leone's output, hyperinflation and balance of payment deficit to monetary expansion, others argue that exchange rate misalignment, domestic and external shocks are responsible for that performance

Real exchange rate, which is defined as a relative price of tradables to that of non-tradables, is an important determinant of economic performance. It reflects the set of economic fundamentals as well as macroeconomic, trade and exchange rate policies, which have major influence on the path of an economy's development. For an open economy like Sierra Leone, the real exchange rate is a compact index of the structure of incentives, which agents respond to, in their optimizing decision-making.

Developing countries have continuously been vulnerable to various economic shocks. Their macroeconomic crises share several common features such as acceleration in the rate of inflation, an increase in the balance of trade deficit, continuous depletion of foreign exchange reserves and a rising premium in the black market for foreign exchange. This situation forced

1) Goods that are traded internationally. They include all those items that are exportable and importable.

a number of countries to adopt the IMF and World Bank stabilization and adjustment policies. Thus in November 1989, Sierra Leone adopted its first Structural Adjustment Program (SAP). This policy package includes price liberalization, exchange rate adjustment, trade policy reforms, and public enterprise and fiscal reforms, including reduced subsidies and rationalization of public spending. The major component of this program at the time was exchange rate adjustment (devaluation). A devalued exchange rate, it is argued, increases the competitiveness of exports, making imports more expensive, and shift resources from sectors producing non-tradables to those producing tradables. Implicit in the recommendation of devaluation is the view that the real exchange rate is out of equilibrium. But by how much is it out of equilibrium? What is the equilibrium exchange rate? Policy makers need answers to these questions to determine how large the exchange rate adjustment must be and how large a shock the domestic price system must sustain.

The presence of real exchange rate misalignment is shown by an unsustainable current account deficit and the depletion of foreign reserves. The available literature on real exchange rate distinguishes between two types of misalignment of the real exchange rate.

1) Macroeconomic induced misalignment, which occurs when the actual exchange rate departs from its equilibrium value because of inconsistencies between macroeconomic policies and official nominal exchange rate.

2) Structural misalignment, which occurs when changes in the long run sustainable values of the real determinants (fundamentals) of the equilibrium real exchange rate are not translated in the short run into changes of the actual exchange rate. If for example, the terms of trade in an economy change, the actual real exchange rate will have to be adjusted to reflect the

change in the equilibrium real exchange rate. If this does not happen, the real exchange rate will become structurally misaligned due to the terms of trade shock (Edwards 1988, p.21)

Misalignment in the real exchange rate has many adverse effects on the economy as a whole. It distorts the incentive structure facing economic agents. It therefore has negative effects on aggregate economic performance. It can reduce economic efficiency, misallocate resources, undermine the performance of the agricultural sector, and increase capital flight, too (Edwards 1988, p.44).

1.2 STATEMENT OF THE PROBLEM

Sierra Leone like most developing countries in Africa has experienced a slow and sometimes negative economic growth. It reflects, to a large extent, poor macroeconomic performance and conflict in the country. Some of the macroeconomic indicators include the ratios of imports and exports to GDP, the ratio of investment to GDP, the ratio of savings to GDP and the growth in real per capita GDP.

In Sierra Leone, the exchange rate is a major determinant of the balance of payment position and external competitiveness. It affects decisions to save and invest, and hence influence the nature and direction of capital flows. As a relative price, the real exchange rate reflects the impact of trade and macroeconomic policies on price of tradable and non-tradable goods and can serve as a nominal anchor for price movement (inflation). Changes in the exchange rate has direct effect on demand, supply, price stability, capital flows, government revenue and expenditure, investment, employment, as well as distribution of income and wealth. It affects economy-wide fundamentals such as terms of trade, openness of the economy, government consumption, money supply and growth in output.

In Sierra Leone, the issue of exchange rate management has been one of the greatest challenges to macroeconomic policy since independence. The fact that balance of payment adjustment typically requires an adjustment in the exchange rate has necessitated the adoption of an exchange rate regime whose adjustment mechanism should be consistent with external and internal equilibrium. However, the role of exchange rate policy in economic adjustment has been the subject of considerable debate.

Edward's (1989) analysis suggests the need to identify the influences of economic fundamentals on the real exchange rate and distinguish these from other factors, which determine the observed path of the real exchange rate. This calls for active exchange rate management strategy, especially for an open economy like Sierra Leone, which is prone to external shocks, including aid flow.

Active exchange rate management is necessary to maintain a stable pattern of relative prices. Given the critical need for Sierra Leone to increase its degree of export orientation, there is a case for continuing with a gradual real effective exchange rate management in order to gradually improve the country's export competitiveness.

As part of the balance of payment, the balance of trade is largely affected by foreign exchange rate, so it is natural that most governments try to influence the foreign exchange market in ways they think are favorable for their political and economic health. Hence, looking at the performance of the balance of trade as a result of exchange rate misalignment is found to be important.

Furthermore, Sierra Leone's balance of trade has been in deficit for a long period, and hence payments adjustments with devaluation as a central policy for correcting balance of trade deficit and maintaining macroeconomic stability.

In summary, Sierra Leone's real exchange rate has been out of equilibrium for quite a long time, that is, it has been misaligned. This has adversely affected the trade balance and external competitiveness of the country. Thus, it is of vital importance to conduct a study in order to establish the equilibrium exchange rate for Sierra Leone, and identify the factors that causes the real exchange rate to be out of its equilibrium path.

1.3 OBJECTIVES OF THE STUDY

From the forgoing discussion, real exchange rate is viewed as one of the main determinants of a country's economic performance. Given the problems at hand, the broad objective of this study therefore is to use both theoretical and empirical framework to identify the relationship between exchange rate misalignment and trade balance in the Sierra Leonean context.

The specific objectives of the study are:

- 1) To establish the long run equilibrium real exchange rate for the economy of Sierra Leone
- 2) To identify the determinants of the real exchange rate and show the direction of their Influences.
- 3) To estimate the degree of misalignment in the real exchange rate.
- 4) To analyze the likely impact of real exchange rate misalignment on the trade balance.

1.4 SIGNIFICANCE OF THE STUDY

The theme of this study is relevant for a number of reasons. First, real exchange rate is one of the important factors that determine macroeconomic performance of a country like Sierra

Leone. Secondly, its movement can achieve and maintain international competitiveness and ensure a viable balance of payments. Further more, a stable exchange rate can serve as a nominal anchor for price movement.

Finally, this study may also serve as a foundation for further research in this area in the Sierra Leone economy, where no research on this topic has been done.

1.5 ORGANISATION OF THE STUDY

This paper is organized as follows:

Chapter one highlights the issues to be investigated in this study. Chapter two reviews some recent empirical and theoretical literature on the determinants of real exchange rate. Definition and measurement of real exchange rate and exchange rate misalignment are also addressed in this chapter.

Chapter three tries to provide a brief overview of the Sierra Leone economy with particular reference to exchange rate and trade policies. Chapter four addresses the methodology to be used in the study. The chapter also gives a brief description of the variables and their expected signs. Finally, the estimation technique (model specification) and the data sources are discussed.

Chapter five makes an attempt to provide empirical results and interpret the coefficients obtained from the estimated models. The time series properties of the data are also discuss in this chapter. Finally, chapter six provides the conclusion to the study as well as the policy implications emerging from the study.

CHAPTER TWO

2.1 AN OVER VIEW OF THE SIERRA LEONE ECONOMY

Sierra Leone is a small, non-oil producing country with an estimated population of 4.8 million and an average GDP per capita of 140 US \$ (1998)². The country's largest sector, the agricultural sector, is characterized by largely subsistence farming. It employs approximately 75 per cent of the working force and contributing an average of 45 per cent to the country's GDP. Sierra Leone's agricultural exports are mainly primary commodities such as cocoa, coffee, piassava and fish. It also depends on other export like diamonds, bauxite, iron ore, rutile and gold in the mining sector, which provides the largest share of foreign exchange earnings. The manufacturing sector is rather small. About 6 per cent of GDP consists of import substituting industrial products and this sector employs about 2 per cent of the labor force. The services sector which comprises mainly of transportation, communication, insurance and finance, account on average for about 40 per cent of GDP.

Despite its rich endowment of natural resources, Sierra Leone's development potential has not been realized fully. Between the periods 1970-2000, the country's financial and economic conditions have deteriorated drastically. Both internal and external factors are supposed to be responsible for this economic decline. Internal factors include poor governance, economic incompetence, rebel war and the fiscal indiscipline, which resulted in an uncovered budget deficit of Le 164 million in 2000³. Consequently, the huge budget deficit led to expansion of government borrowing from the banking system leading to crowding-out of credit to the

2) African Development Indicators, 2000 (World Bank)

3) Government of Sierra Leone, Economic bulletin, Ministry of finance, August 2002, vol 9 private sector. The main external factors that contributed to the economic decline include, the oil crisis in the 1970's, deteriorating terms of trade and the consequent foreign exchange crisis which reflect a drop in revenue from diamond exports, the high foreign interest rates, rising debt problem and a fall in capital inflow. On the domestic front, macroeconomic ineptitude and the prolonged civil war resulted in severe economic contraction, hyperinflation and disinvestments.

According to official statistics, during the decade of the 1990's, the domestic economy contracted by an average of some 7.0 percent⁴ annually, amid double-digit inflation for the most part. Furthermore, the economy was characterized by large budget deficits and persistent deficit in the balance of Payment (BOP). Fiscal deficit was largely due to money creation and high domestic bank borrowing. Such financing led to an increase in price of non-tradables, while the domestic price of tradables increased roughly at the lower international rate. Hence, the real exchange rate declined. Thus, these internal and external factors affected the real exchange rate of the country. It is therefore important to look into the performance of the economy during the period 1970-2000.

2.1.1 ECONOMIC GROWTH

Sierra Leone's economic growth has not been stable since 1970. From a contraction of over 8.0 percent recorded in 1999, real GDP grew by a respectable 3.8 percent in 2000(see table 1). From table 1, real GDP growth over the years fluctuated from a high of 11.8 per cent in 1970, to a low of -20.0 per cent in 1991. Such fluctuations are expected in an economy like Sierra Leone in which agriculture plays a predominant role, because agriculture is largely dependent

4) UNDP Sierra Leone, Salone review, March 2

on climatic conditions. The overall growth of the economy is, however, dependent on the performance of the agricultural sector, which accounts for about 45 per cent of the country's GDP. Agriculture expanded by 2.2 percent in 2000 (-5.4 percent in 1999), while the industrial sector grew by just over 5.0 percent in 2000. Much of the growth in the industrial sector is attributed to the rehabilitation and subsequent resumption of production by the Brewery, with an increased production of cement, soft drinks, confectionary and flour. More over, increased production occurred for beer and stout, and maltina, by a margin of 108.43 thousand cartoons (32.76 percent), and 8.87 thousand cartoons (12.64 percent), respectively

In the export agricultural sub-sector, an estimated 3,355 metric tons of crop was produced in the year 2000. Moreover, piassava production declined by an estimated 45 percent in 2000, and a slight drop of 5.0 percent in cocoa production was observed during the same period. However, coffee output expanded by an estimated 63 percent in the year 2000. In the mining sector, completely dominated by diamond, total diamond production in 2000 was 126.57 thousand carats. Production of gem diamonds went up by 13.6 percent while that of industrial diamonds was significantly up by 46.2 percent.

Table 1: Aggregate and sectoral (growth rate) performance: percent

Year	Real GDP	Agriculture	Industry	Services
1970	11.8	0.1	18.3	13.9
1971	2.4	2.3	-2.7	7.1
1972	-1.2	-1.0	-4.6	1.5
1973	4.0	1.9	0.3	8.1
1974	3.1	-0.8	3.8	7.4
1975	3.1	4.4	-10.4	2.7
1976	-2.9	5.5	-8.5	-2.1
1977	2.1	5.2	-14.9	7.0
1978	-3.5	33.3	5.7	-16.3
1979	5.4	9.3	1.4	2.3
1980	5.1	-3.0	3.9	14.0
1981	4.3	0.8	-8.5	7.1
1982	4.7	3.2	-13.2	11.9
1983	1.7	-0.9	11.5	9.1
1984	-0.8	0.4	-15.9	-5.3
1985	-4.8	-7.4	7.3	-8.2
1986	5.5	12.4	14.5	-1.8
1987	-0.8	3.8	-16.2	-0.2
1988	3.2	-6.7	24.4	5.7
1989	5.4	7.7	-1.5	11.6
1990	-3.2	6.5	-8.8	-8.6
1991	-20.0	-35.5	5.2	-22.7
1992	1.3	2.0	1.9	3.9
1993	3.0	11.5	2.0	-1.6
1994	3.6	6.3	1.4	1.5
1995	-9.8	2.0	-20	-14.2
1996	5.0	5.8	5.5	5.0
1997	-17.6	-4.8	-7.5	-21.4
1998	-0.8	2.8	-6.1	-1.8
1999	-8.1	-5.4	-14.1	-7.6
2000	3.8	2.2	5.1	4.0

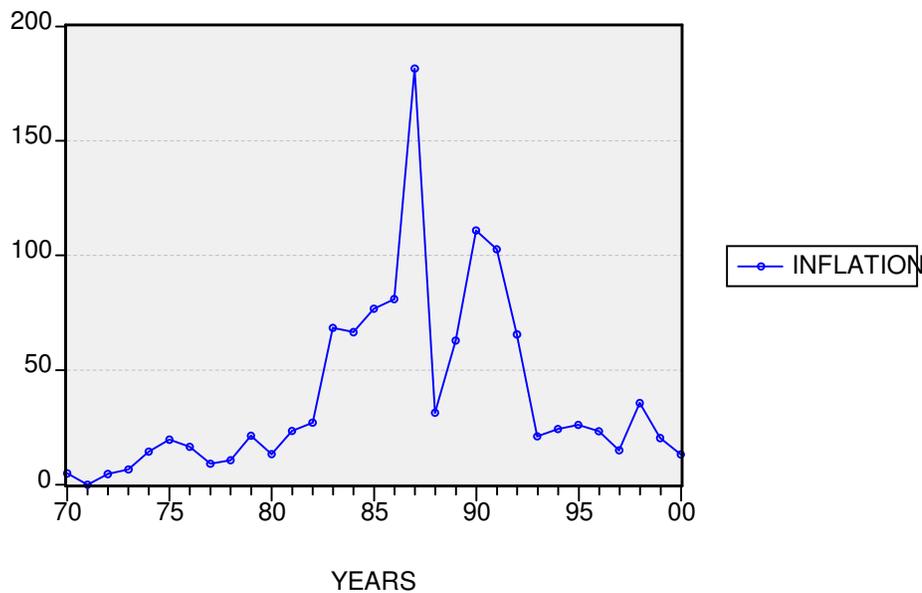
Source: Bank of Sierra Leone Bulletin, various issues and African Development Indicators, 2000

3.1.2 INFLATION

The most favorable macroeconomic outturn witnessed during the 2000 was in the area of price development. In the immediate post-independence period, Sierra Leonean inflation was that of the creeping type, hovering around single digit.

Annual inflation as measured by consumer price index averaged 4.0 percent between 1970-1973. The combination of fiscal prudence and relatively tight monetary policy helped to sharply rein-in inflation pressure. Between 1974 and 2000, inflation rates reached unprecedented levels as the average inflation rate stood at 45.7 percent. The surge in prices during this period was attributed to the rise in both broad money and narrow money growth, and decline in output growth in the economy. Moreover, inflation accelerated from 23 per cent in 1981 to 181 per cent (its highest in the history) in 1987 (see figure 1)

Fig 1: TREND IN INFLATION RATES



Source: International Monetary Fund's International Financial Statistics Yearbook 2002

2.1.3 FISCAL POLICY

The major emphasis by the 1970's was to reduce budget deficit in order to reduce the growth rate in money supply. The reduction of deficit was achieved by both the reduction of expenditure and increasing revenue.

Fiscal deficit has a direct and indirect effect on price, money supply and the trade balance of the country. Financing fiscal deficit through money creation may lead to an increase in money supply. This may lead to a rise in inflation rate and exchange rate appreciation, and hence impact negatively on the trade balance.

A number of initiatives have been rolled out to support attainment of the overarching policy objective of fiscal stabilization to rein-in inflationary pressures. Since 1990, the government has expanded the coverage of the sales tax, as the tax itself rose from 10 percent to 20 percent in March 1995⁵. In June 1994, the authorities embarked on a tax modernization programme by computerizing operations and upgrading the training of inspectors and procedures for the smooth collection of customs and excise duties. The excise tax was unified at 30 per cent and is levied on alcohol drinks, manufactures tobacco and passenger cars⁶.

Apart from the above measures taken to improve the fiscal situation of the country, government also revised its expenditure policy. The fiscal deficit as a ratio of GDP reduced from an average of 51 per cent per annum from 1971 to 1975 to 16 percent over 1976 to 1980. From 1981 to 1986 it declined by 20.4 per cent a year. From 1987 to 1999, fiscal deficit

5) Bank of Sierra Leone (BSL) Bulletin, April 1995

6) Ibid

as a ratio of GDP decline by 57.6 per cent a year. Over 1991 and 2000 it declined by only 0.2 per cent a year.

From 1981 to 1986, revenue as a share of GDP declined by 19 per cent a year. From 1987 to 1990 it grew by 0.23 per cent a year. The 1981 to 1986 decline in revenue was mainly due to overvaluation and restrictive economic measures, which led to the diversion of a larger share of transaction to the parallel economy with tax evasion being wide spread. Over 1991 to 2000, revenue as a share of GDP declined by 3.3 per cent a year. Sierra Leone's fiscal development over the years 1970-2000 could be viewed with the help of the trend in fiscal deficit (see figure 2).

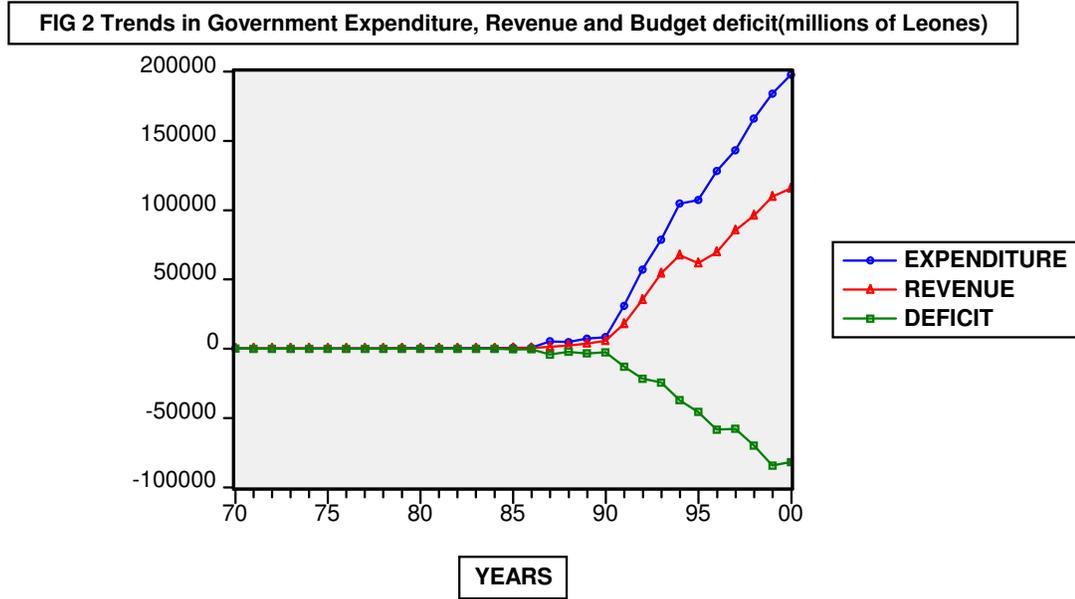
The overall budget deficit was Le 103.34 billion. Bank financing of Le 19.29 billion was 22.52 percent with Bank of Sierra Leone contribution increasing from Le 0.40 billion to Le 12.42 billion and commercial banks financing decreasing from Le 24.49 billion to Le 6.87 billion. External financing was Le 73.23 billion, of which Le 42.79 billion was a loan from the World Bank under the Economic Rehabilitation and Recovery credit.

Thus, the overall budget deficit rose from 6 per cent of GDP in 1989 to 7 per cent of GDP in 1994 and stands at 6.3 per cent of GDP in 2000.

3.1.4 MONETARY POLICY

The prime objective of the authorities' monetary policy in the 1970's was to reduce monetary growth to a level consistent, not only with the government's inflation and balance of payment

objectives, but also with the objective of providing enough bank credit to promote the private sector. The central bank used open market operations as a weapon for monetary control through auctions of treasury bills on a weekly basis



Source: International Monetary Fund's international Financial Statistics,

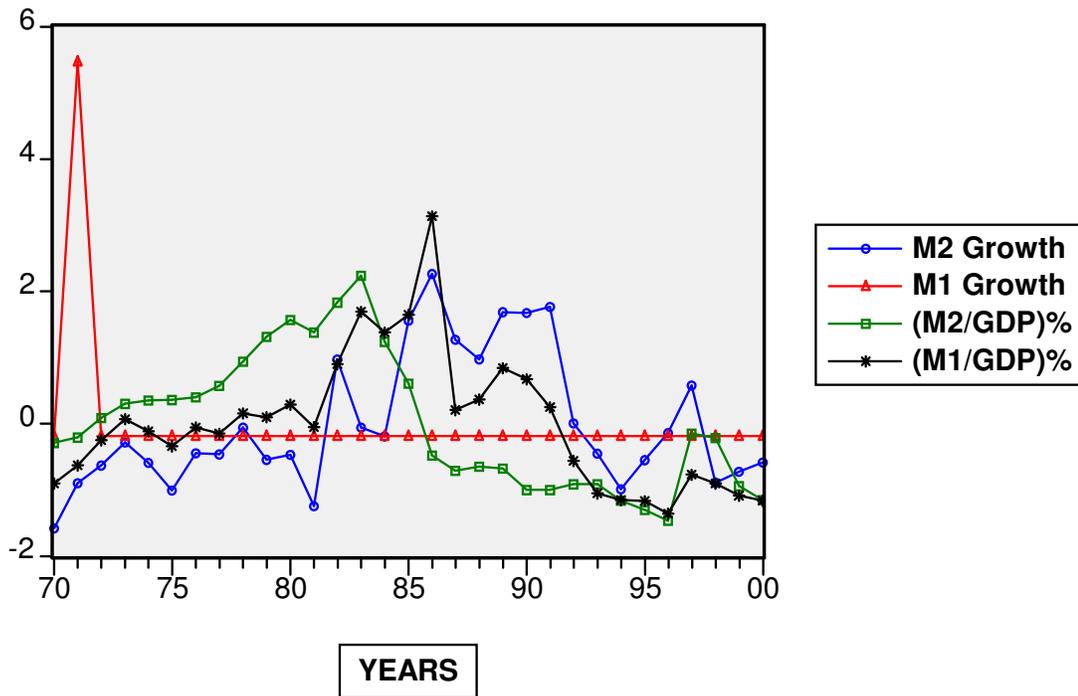
Various Issues

Monetary and credit development has been expansionary since 1970, arising mainly from the rapid expansion in credit to the government from the bank of Sierra Leone. Narrow and broad money grew by 27.2% and 31.6% respectively in 1978 to 105.9% and 88.4% respectively in 1986. Moreover, during the second half of 2000 monetary developments were therefore characterized by strong growth of Narrow money (M1), Broad money (M2) and Reserve money (RM), of Le26.85 billion (16.51%), Le 30.94 billion (11.90%) and Le 31.64 billion (28.64%) to Le 189.44 billion, Le 290.86 billion and Le 142.10 billion, respectively.

With the emergence of the Economic Recovery Programme, narrow money and broad money fell from 64.3% and 74% respectively in 1990 to 10% and 9% in 1994 (see figure 3). The

principal objective of this regulatory role was to reduce broad money growth in the economy to a level consistent with government inflation and balance of payment objectives.

Fig 3: TRENDS IN MONETARY GROWTH



Source: World Development Indicators, Various years

Apart from reducing the growth rate of broad money, government also launched a one-year Treasury bearer bond with a fixed coupon rate in order to permit the term structure of interest rate to be market determined. In addition, a clearing facility for official debt was set up to promote the development of secondary inter bank money market and to enable the central bank to pursue its major functions effectively.

In an attempt to achieve positive real interest rates and to enhance the mobilization of domestic savings, discourage the flight of capital to foreign countries and prevent

unproductive investment activities, a policy of credit contraction was pursued in the stabilization period. Thus, in August 1993, the authorities removed the last administered commercial bank interest rate.

In the beginning of 1994, an institutional development program was established with the aim of fostering the Bank of Sierra Leone's role in promoting monetary stability and a sound financial structure. This preceded a comprehensive management audit of the Bank of Sierra Leone. In addition to the support given to the central bank by the government, a test study concerning the operation of all the commercial banks was conducted in order to improve the operating efficiency of the banking system and identify the factors leading to the high cost of financial intermediation.

2.1.5 EXCHANGE RATE POLICY

In Sierra Leone, before 1982, a system of exchange control or fixed exchange rate was in force. Since then, the government has been embarking on a policy of exchange rate liberalization. In 1990, for instance, the government employed a liberal exchange rate system in which the exchange rate was allowed to float freely against other currencies in the foreign exchange market.

Six exchange rate regimes may be identified in Sierra Leone since 1964. The first lasted from 1964 to 1978 when the Leone was pegged to the pound sterling and the exchange rate was fixed at two leones to the pound⁷. 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 second regime started on the 2nd November 1978 when the Leone was pegged to the IMF's Special Drawing Right (SDR) at a rate of Le1=SDR 0.731556. In December 1982, the third regime started with the introduction of an auction system referred to as the "two-tier" or dual

7) Bank of Sierra Leone Bulletin 1997, p20.

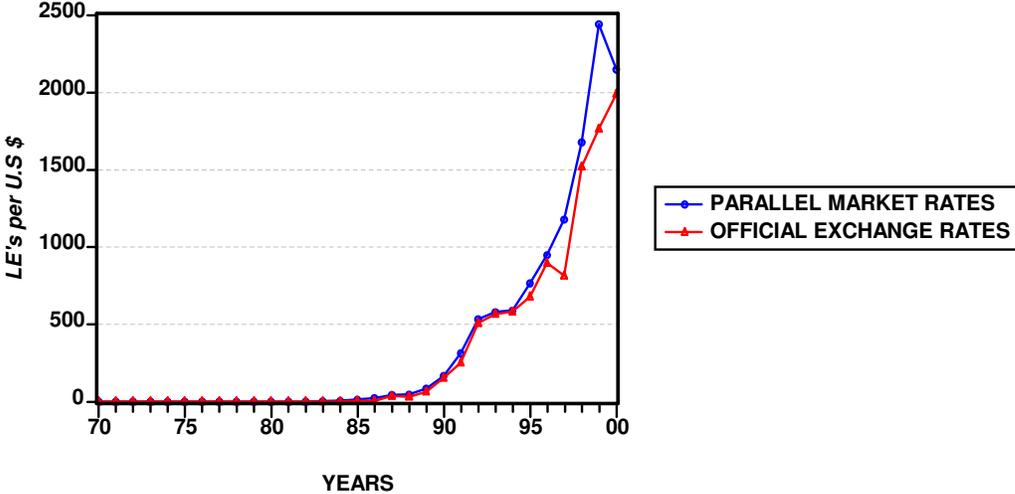
exchange rate system. While maintaining a fixed exchange rate for its own transactions, government introduced a commercial rate for all other transactions. The fourth regime started with the unification of the exchange rate, thus the link with SDR was broken. The Leone was pegged to the U.S dollar, and the official rate was Le2.50=\$1. On the 27th June 1986, the fifth regime started when the government institute a floating exchange rate structure. The floating exchange rate system peaked up to Le53=\$1 in April 1987. However, the government revalued the Leone from Le53.00 per U.S \$ to Le23.00 per U.S \$ by the end of August 1987 after a reintroduction of a unified exchange rate regime. Since 1991, the government has been embarking on a policy of exchange rate liberalization. Thus in April 1991, a “clean float” was introduced as the sixth regime 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. Furthermore, the continuation of the previous system could have undermined people’s confidence in the Leone and encouraged more capital outflow.

Thus, series of depreciations of the exchange rate followed until March 1989 when the Leone was devalued from Le44.00 to Le65.00 per U.S \$. However, the parallel market exchange rate shoots up to a rate of Le120.00 per U.S \$ by the end of 1989. In 1990, the Leone was also devalued at a rate of Le120.00 per U.S \$. Following the liberalization of the exchange rate was the formation of foreign exchange bureau in November 1991. Notwithstanding this measure, parallel market activities were still practiced. The ineffectiveness of the parallel market was quite evident as the black Market premium⁸ fell sharply from 31.64 per cent in June 1991 to 5.12 per cent the following year (see figure 4). In January 1995, the Leone depreciated against the dollar by 6.3 per cent. The depreciation of the currency did not only prevent the flight of capital to foreign countries, but also provided an occasion to increase

8) The black market premium is estimated by the percentage by which the parallel market rate deviates from the official rate (see figure 5)

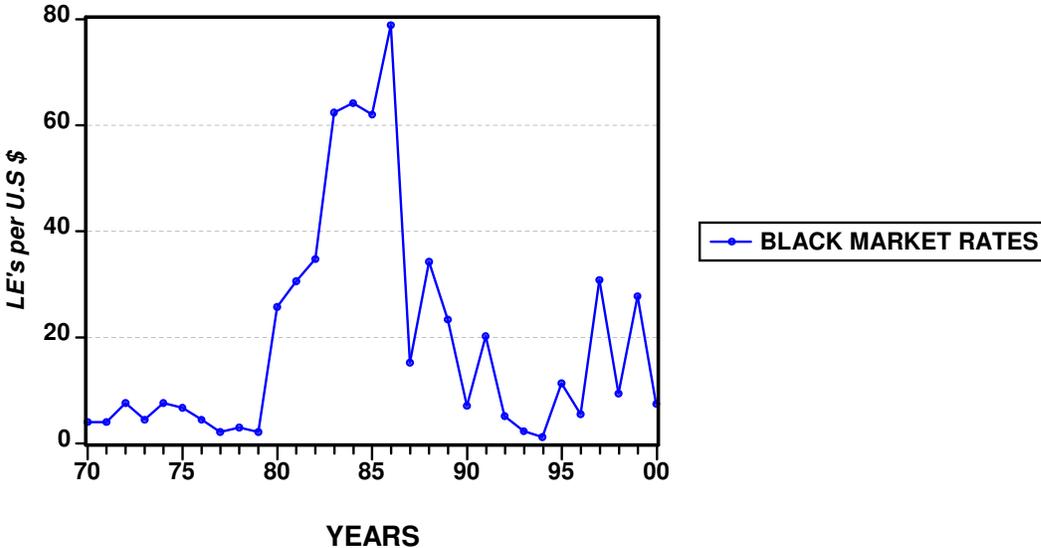
producer prices for agricultural exports.

FIG4: TRENDS IN PARALLEL MARKET AND OFFICIAL EXCHANGE RATES



Sources: BSL Bulletin (various issues) and IFS yearbook, various issues.

FIG 5: TRENDS IN BLACK MARKET PREMIUM EXCHANGE RATES



Sources: BSL Bulletin (various issues) and International Financial Statistics (IFS)

Yearbook, various issues

2.1.6 TRADE POLICY

Trade is important to most countries, because through it the process of specialization and development of a country's comparative advantage takes place.

After independence in 1961, Sierra Leone pursued import substitution industrialization (ISI) strategy. To aid the ISI strategy, the government pledged to pay particular attention to the protection of industries through import tariffs, import licensing and quantitative restrictions. The aim of such strategy was to improve the balance of Payment, through an increase in export and a decline in import.

The ISI pursued in the economy had a major influence on the structure of imports. Consumer imports decline from an average of 20 per cent of total imports in the late 1980's to about 15 per cent in the 1990's⁹. Exports also grew by \$6,489 thousand (+25.2 per cent). Food imports accounted for a decline in imports by \$4,040 thousand (-26.6 per cent). With imports reduced to bare essentials, the demand for imports has become inelastic, making the economy more vulnerable to unexpected reductions in the supply of foreign exchange reserves.

Furthermore, there was a reduction on import duty rate for social products, including all basic educational materials, and pharmaceutical products for primary health care and agricultural machinery and inputs to 5 per cent from 20 per cent. To enhance the efficiency of local industries and boost exports, the duty rate of 5 per cent applicable for all raw materials for industries with a market share of sixty percent or more of the market for that product was

abolished. The import duty rate on rice and baby food is 15 per cent, while that for intermediate and final products stand at 20 and 30 per cent, respectively. Excise tax is

9) Bank of Sierra Leone bulletin April 1995, pp 15.

applicable only to tobacco products, petroleum products and alcohol beverages, and stands at a rate of 30 per cent.

However, in the 1980's, the World Bank recommended a liberalization of the trade regime through tariff reforms and the adoption of a market-based product pricing, a liberalized exchange rate, a value-added tax and subsidies to industrial exports.

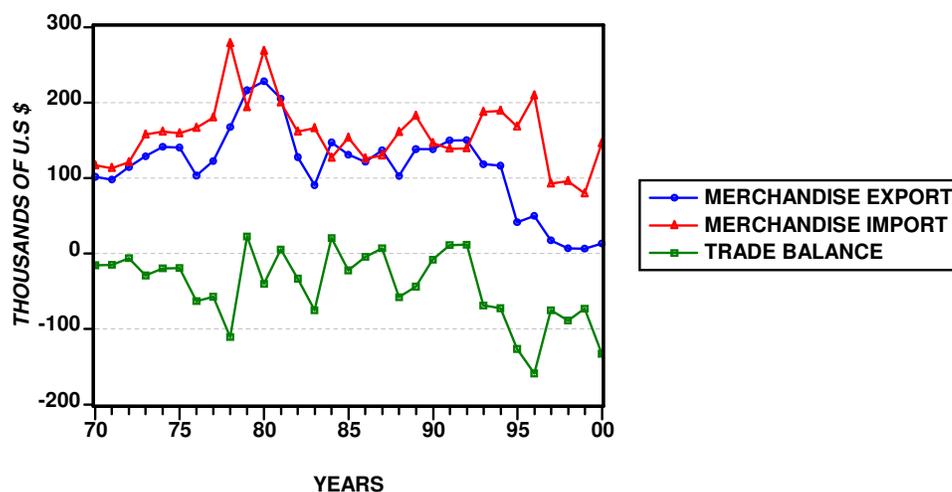
Sierra Leone's economy has been export led in recent years. This was as a result of growth in traditional exports such as diamonds, gold, coffee, fish; re-export activities (comprising used machinery and transport equipment, assorted spares of electrical appliances and scrap metals) are the dominant commodity exports. Import on the other hand, constitute mainly intermediate inputs such as machinery and transport equipment, mineral fuel and lubricants, chemicals, animal and vegetable oils, manufactured goods etc.

In 1995, merchandise exports decrease from an average of 44.9 per cent in 1994 to about 43.2 per cent in 1995-200. This was attributed to the decline in mineral exports.

In spite of adverse developments in International market including unfavorable price movements for major commodities, particularly for coffee and cocoa, receipts from exports were U.S \$ 151.1 million in 2000. This total included U.S \$13.3 million in receipts from diamond export of which Gem and industrial diamonds contributed U.S \$12.2 million and U.S \$1.1 million, respectively. Moreover, total earnings from agricultural export were U.S

\$177.0 thousand in 2000 (66.7 percent). As can be observed from figure 6, the period 1970-2000 shows a mixed performance in the traded sector and despite the effort to promote exports; the trade balance deficit recorded the smallest value of U.S \$4.4 Thousand in 1986 and the largest value of U.S \$159 Thousand in 1996. Export values rose over the entire period with imports maintaining higher values over the same period, therefore accounting for the deterioration of the balance of trade.

FIG 6: TRENDS IN MERCHANDISE EXPORTS,IMPORTS AND TRADE BALANCE



Sources: World Tables, various issues and Bank of Sierra Leone bulletin 2001

In brief, Sierra Leone's economic performance has not been encouraging during the review period. Economic growth has been very slow due to domestic and external factors. The economy was plagued with fiscal deficit, and money creation was used to finance such deficit, which resulted to an increase in the general price level. Furthermore, the country has embarked on devaluation as a means of improving the trade balance

CHAPTER THREE

LITERATURE REVIEW

3.1 *Theoretical framework*

3.1.1 EXCHANGE RATE: DEFINITION AND MEASUREMENT

The nominal exchange rate can simply be defined as the amount of the domestic currency required to purchase a unit of the foreign currency. Movements in the nominal exchange rate index indicate either an appreciation or depreciation of the domestic currency against the set or basket of other currencies. It is a price and, like other prices, it conveys information and incentives to guide decisions about what to produce and consume.

The importance of the nominal exchange rate is that, it is a policy intervention variable that the government can announce or fix at any time and as such it shows the intension of government in the foreign exchange rate market.

The term Real Exchange Rate (RER) can be defined in a number of ways:

According to Fosu (1992), the real exchange rate can be defined as the adjustment of a specified nominal exchange rate for relative inflation between a domestic economy and the

rest of the world to determine the effect on incentives to produce, purchase and store goods and services. Thus, the real exchange rate of a nation measures not only nominal changes in its exchange rates but also changes in relative inflation rates.

This definition is termed by some writers as “Purchasing Power Parity real exchange rate (RER_{PPP})”. According to this definition, real exchange rate is equal to the nominal exchange rate (E), multiplied by the ratio of the foreign price level (P*) to the domestic price level (P), that is:

$$RER = E \cdot P^* / P \text{-----} 1$$

This definition is appropriate for a country that is a price taker in the intermediate market, and whose exports are constrained by supply side problems. Moreover, it provides information on how relative prices impinge on the evolution of the external sector. However, it fails to capture changes in the relative incentives guiding resource allocation across tradables and non-tradables sector.

Edwards (1989b and 1990), defines real exchange rate as the domestic price index of tradable goods (P_t) relative to price index of non-tradable goods (P_n), that is:

$$RER = P_t / P_n \text{-----} 2$$

This definition is known as “the dependent economy concept of the real exchange rate”. It gives an incentive that guide resource allocation across the tradable and non-tradable sectors. Thus, it provides a good indicator of the country’s degree of international competitiveness. The real exchange rate measures the cost of producing tradable goods domestically. An increase in the real exchange rate is referred to as a real depreciation and it makes production

of tradables relatively more profitable, thus inducing allocation of resources from non-tradable into the tradable goods sector. If world prices remain constant, a real depreciation of the real exchange rate represents an improvement of the country's competitiveness in the world market.

However, this definition is faced with many problems. First, there is no clear distinction as to which goods are tradables and non-tradables. As such, the relation between tradable and non-tradable prices breaks down. Second, domestic demand pressures can change the relative prices between categories of tradables as well as between tradables and non-tradables. Hence, we cannot define P_t as a single aggregate.

The other way of defining the real exchange rate derives from the "Salter-Swan non-tradable goods model". Here the real exchange rate is defined as the ratio of the price of traded goods to non-traded goods. That is:

$$RER = E \cdot P_t / P_n \text{-----} 3$$

Where: E =nominal exchange rate, P_t =world price of tradables, P_n =domestic price of non-tradables.

This definition summarizes incentives that guide resource allocation across the tradable and non-tradable sectors. An increase in RER is referred to as real depreciation and will make the production of exportable goods more profitable, thus inducing resource movement from non-tradable into tradable goods sector.

Note: there is no direct measure as such for tradables and non-tradable goods separately. In his cross-sectional study for 33 Developing countries, Edwards (1989) used wholesale price indices (WPIs) of the country's trade partners to proxy P_t and the country's consumer price

index (CPI) to proxy P_n . The advantage of these proxies is that, the WPI contains mainly tradables and the CPI contains mainly non-tradable goods

There are two categories of real exchange rate. These are bilateral real exchange rate (BRER) and Multilateral real exchange rate (MRER). The concept of BRER is important where the computation of RER involves only two countries, those of the domestic country and another country. For example, the exchange rate between the Leone (Le) and the U.S dollar (\$). On the other hand, the concept of multilateral real exchange rate applies when the RER computation involves more than two countries, that is, the currency of the domestic country and those of other trading partners.

The BRER can be defined as shown in equation (1). The MRER on the other hand is defined as follows:

$$MRER_{jt} = \frac{\sum_{i=1}^K \alpha_{it} E_{it} P^*_{it}}{P_{jt}} \quad \text{-----4}$$

Where: $MRER_{jt}$ = index of the multilateral real exchange rate in period t for country j

E_{it} = nominal exchange rate between country j and country i in period t

K = number of trading partner countries.

α_{it} = weight corresponding to trading partner country i

P^*_{it} = price index of partner i in period t

P_{jt} = price index in the home country j in period t.

The advantage of using a multiple exchange rate is that it smoothes out most of the movements caused by fluctuations in the value of whichever currency enters into a bilateral rate.

The present study makes use of this measure of RER, as Sierra Leone has many trading partners.

Equilibrium RER (ERER) is commonly defined as that RER which simultaneously achieves internal and external equilibrium. Thus, “Edwards (1989) defined the ERER as the relative price of tradables to non-tradables that, for given sustainable values of relevant variables such as taxes, terms of trade, commercial policy, capital and aid flows and technology etc, results in the simultaneous attainment of internal and external equilibria”(Edwards 1989,pp16).

Internal equilibrium is achieved when the market for non-tradables is clear in the current period and is envisaged to be so in future with employment at its natural level. External equilibrium implies that the current account balances, both in the current and future periods, are compatible with long run capital flows (Elbadawi 1989,Edwards 1988,1989).

The ERER is considered as a path upon which an economy maintains both internal and external balance. The ERER is not an immutable number; it is rather influenced by some real variables. Thus, the path of the ERER is affected by the current values of the fundamentals, but also by anticipations regarding the future evolution of these variables. In addition, ERER is also influenced in the short to medium run by macroeconomic and exchange rate policies that are not part of the fundamentals.

Real Exchange Rate Misalignment (RERm) is defined as sustained deviations of the actual RER from its long run equilibrium level (Edwards 1988). It is important to distinguish between short-term volatility and persistent misalignments. Volatility refers to the amount of short run variability in the RER from day to day, week to week or month to month. By misalignment is meant a persistent departure of the RER from its long run equilibrium level.

The RER misalignment results from the fact that the equilibrium RER depends only on the real variables (fundamentals) while the actual or observed RER depends on both real and monetary variables. The actual real exchange rate will change in response to temporary changes in real variables and aggregate macroeconomic pressures generated by an excess supply of money or a fiscal deficit or both. In a small open economy with a unified foreign exchange market, the domestic price of tradables is largely determined by the world market price, the nominal exchange rate, and trade taxes. Excess demand generated by expansionary fiscal and monetary policies will increase the prices of non-tradables and hence lead to an appreciation of the actual RER. When the exchange rate is below its equilibrium value it is said to be overvalued, while under valuation occurs when it is persistently above the equilibrium level.

Different measures of the RER misalignment have been used in most empirical studies: a measure using the purchasing power parity (PPP) (Balassa 1990, Agarwala 1883), a model-based measure and finally, a measure using the black market nominal exchange rates (Edwards).

According to the PPP theory, deviations of the actual RER from some base year (when the RER is in equilibrium) are used to calculate the RERm. This theory uses the average of the three highest values of the RER as a proxy for the equilibrium RER. Hence, the PPP measure of misalignment is:

$$(RER_m)_{it} = \left\{ \left[\frac{\sum_{j=1}^3 \max RER_{ij}}{3} \right] / RER_{it} - 1 \right\} \text{-----5}$$

Where $\left[\frac{\sum_{j=1}^3 \max RER_{ij}}{3} \right]$ ($j=1,2,3$) is the average of the three highest values of RER for the i^{th} country, t is the time index, and i is a country index.

The second measure is the model-based, which is given as follows:

$$\text{RER}_m = (\text{ERER} - \text{RER}) / \text{RER} \text{-----}6$$

Where ERER=equilibrium real exchange rate,

RER= real exchange rate

The third measure of misalignment uses the premium of the nominal black market exchange rate (B) over the official rate (E) as a proxy for RER misalignment and is given by:

$$\text{RER}_m = [(B_{it}/E_{it}) - 1] \text{-----}7$$

This proxy is expected to measure (1) misalignment in the RER, (2) distortion in the foreign exchange market, and (3) degree of exchange control and import rationing in the economy.

However, this study makes use of the model-based measure of real exchange rate misalignment. An advantage of the model-based measure of misalignment is that it allows the equilibrium real exchange rate to change continuously to reflect changes in economic fundamentals and domestic macroeconomic, trade and exchange rate policies.

There are a large number of theoretical models that explain the process of exchange rate determination. In this study, we shall look at four of them; namely, the purchasing power parity (PPP), balance of payment approach, monetary models and the portfolio balance approach.

3.1.2 PURCHASING POWER PARITY (PPP) APPROACH

The PPP theory of exchange rate determination asserts that the exchange rate change between any two currencies over any period of time is determined by the change in the two countries'

relative domestic price levels. Exchange rate is determined at that level where the prices of the same bundle of goods in two countries are equal. The underlying assumptions are (i) there are no transaction costs, (ii) no trade barriers, (iii) tradable goods are homogenous, (iv) economies are at full employment level, and (v) the price system works, then the law of one price must hold due to commodity arbitrage.

A distinction is made between the absolute PPP and relative PPP. Absolute PPP extends the law of one price to the general price level. The theory asserts that the exchange value of a country's currency is determined by the ratio of the domestic to foreign price level. That is:

$$e = \alpha + \beta(P_i/P_i^*) + \varepsilon \text{-----8}$$

Where e =spot exchange rate, P_i^* =foreign price, P_i =domestic price, α and β are parameters.

Equation (8) relates exchange rate to the general price level of all goods in the two countries. Assuming that prices are stable in the period in question, then one would not expect exchange rate to fluctuate very much.

In a period of rapid inflation, it is possible for relative prices to fluctuate and hence the exchange rate. The absolute PPP is not useful because different countries use different price index weights to calculate price levels. This shortcoming is taken care of by the relative PPP.

Thus:

$$e_t/e_b = p_t/p_b$$

Where b =base period, t =current period

$$\text{Also: } P_b = (\sum P_i / \sum P_i^*)_b, \quad P_t = (\sum P_i / \sum P_i^*)_t$$

The theory states that if relative prices double between the base period and time t , the exchange rate will change by an equal opposite percentage that is, it will depreciate (see Cassel, G)

One of the major weaknesses of the PPP theory is biased productivity growth, popularly known as the Balassa-Samuelson thesis¹⁰. This thesis asserts that PPP exchange rate calculated using the general price measures; systematically undervalue currencies of less developed countries relative to those of developed countries. They argued that the technique of production of many non-tradable goods and services are similar in both developed and developing countries. Thus, the relative PPP theory tend to predict overvalued exchange rate for developed countries and undervalued exchange rates for developing countries with distortions being greater based on the differences in the levels of development.

Another failure of the PPP is the price index issue, which may not be appropriate since different countries assign different weights on goods and services. Moreover, existence of differential transportation and transaction costs affect the price and cost levels too.

2.1.3 BALANCE OF PAYMENT APPROACH TO EXCHANGE RATE

In this model, the exchange rate is treated just like any other price and hence the forces of demand and supply tend to determine the equilibrium value. The demand for and supply of foreign exchange are an outcome of the demand for and supply of imports and exports. Factors that determine the supply of foreign currency are the items which appear on the credit side of the balance of payment, that is, export of goods and services, inflow of foreign capital and running down of official reserves. Those that determine the demand for foreign currency are the items on the debit side of the balance of payment, that is; import of goods and services, overseas investment and addition to official reserves. The equilibrium exchange rate is determined by the interaction of the flow demand for foreign exchange arising from trade

transactions with speculative supply of foreign exchange provided by capital holders who are

10) See Balassa B (1964) for a more detailed discussion

prepared to undertake risks in exchange for expected gains.

A condition for stability is given by Marshall-Lerner condition. The Marshall-Lerner condition states that, on the assumption of high price elasticities of supply, a currency current devaluation or depreciation will improve the balance of payments on account, if the sum of the elasticities of domestic demand for imports plus foreign demand for exports exceed unity

The mathematical representation is given as follows:

$dCA/dE = M (\eta_x + \eta_m - 1)$. Where dCA/dE represent the change in current account with respect to a change in the exchange rate, η_x and η_m represent elasticities of export and import, respectively. The mathematical representation implies that $\{(\eta_x + \eta_m) - 1\} > 0$. If this condition holds, then devaluation will improve the current account balance.

3.1.4 MONETARY APPROACH TO EXCHANGE RATE DETERMINATION

The monetary approach to exchange rate determination may be viewed in relationship to the monetary approach to the balance of payment. This approach emphasizes the role of money and other assets in determining the balance of payment when the exchange rate is pegged and in determining the exchange rate when it is flexible.

Two variants of this model include: The flexible-price monetary model and the sticky-price model.

Flexible-price monetary model

This approach combines the quantity theory of money, where fully flexible prices are determined by monetary equilibrium between a stable real money demand and real money supply, with strict PPP. The model assumes that there are no barriers such as transaction costs or capital controls, which segment international capital markets. Furthermore, it is assumed that domestic and foreign bonds are perfect substitutes. Also, it assumes that the money supply and real income are determined exogenously, and that the income and interest rate elasticities for money demand are identical in both countries. The model involves the following equations:

The PPP hypothesis model is given as:

$$e = P - P^* \text{-----} 9$$

The money demand function is given as:

$$M = P + \alpha Y - \beta i \text{-----} 10$$

Where M, P, Y are in logarithmic form being money supply, price level and income respectively.

α = money demand elasticity with respect to income

β = money demand semi elasticity with respect to interest rate

i = domestic interest rate.

A similar money demand function for the foreign country is given as

$$M^* = P^* + \alpha Y^* - \beta i^* \text{-----} 11$$

Subtract (11) from (10)

$$(M - M^*) = (P - P^*) + \alpha (Y - Y^*) - \beta (i - i^*) \text{-----} 12$$

Substitute (9) into (12) and solve for e , we get the following expression of exchange rate.

$$e = \frac{(M - M^*) - \alpha (Y - Y^*) + \beta (i - i^*)}{\dots} \quad 13$$

In essence, this model states that; an increase in the domestic money supply leads to depreciation of the local currency against the foreign currency. This is because the increase in money supply creates negative excess demand in the money market. This increases absorption, generates a balance of payment deficit and is represented by a positive excess demand in the foreign exchange market. This leads to currency depreciation.

Also, a rise in domestic income will, by raising the demand for money, create positive demand for money and economic agents will reduce absorption to supplement their deficit liquidity. This creates balance of payment surplus, which is a negative excess demand for foreign exchange in the foreign exchange market, and hence appreciates the real exchange rate.

A rise in the domestic interest rate will lead to a depreciation of the currency because the rise in interest rates reduces the money demand which increases absorption, leading to a balance of payment deficit. This will require currency depreciation in order to restore equilibrium in the foreign exchange market.

Fixed-price monetary model

In contrast to the flexible price version of the monetary approach, Dornbusch (1976) assumed that the price is “sticky” in the short run and therefore the PPP holds only in the long run. With prices sticky in the short run, a monetary expansion will cause the domestic interest rate to fall and this will induce a capital outflow, which in turn will cause the exchange rate to depreciate. This model maintains monetary neutrality in the long run but allows money to

influence real variables in the short run. The model allows for overshooting of both nominal and real exchange rates beyond their long run equilibrium PPP levels under the assumption of efficient asset markets.

An unanticipated increase in money supply will result in an immediate decline in the interest rate. The decline in domestic interest rate induces investors to shift from domestic bonds to money balances and foreign bonds. Thus, prices in the goods market adjust sluggishly while in the asset markets they adjust instantaneously. As investors shift from domestic bonds to foreign bonds, the demand for foreign currency will increase rapidly. This will result to a depreciation of the domestic currency causing the short run exchange rate to jump its long run value. The depreciation will raise exports and reduce imports. The fall in interest rate in the domestic money market will increase investment. As this development take place, aggregate demand will increase and prices will rise and the exchange rate appreciates. The new long run equilibrium exchange rate will be lower than the short run adjustment.

3.1.5 PORTFOLIO BALANCE MODELS

Many version of this model have been developed by McKinnon (1969), Branson (1968,1975), Dornbusch (1980), Frankel (1983). This model is differentiated mainly in its assumptions regarding portfolio preferences of individuals in different countries. Portfolio model of exchange rate determination differs from monetary models because it assumes that bonds denominated in domestic money are imperfect substitutes to bonds denominated in foreign currency.

In this model the level of the exchange rate is determined, at least in the short run, by supply and demand in the market for financial assets. The exchange rate is the principal determinant of the current account of the balance of payment. The portfolio balance model is an inherent dynamic model

of exchange rate adjustment. Unlike the sticky-price model, it also allows for the full interaction amongst the exchange rate, balance of payment, the level of wealth and stock equilibrium.

Domestic residents can hold their wealth W , in domestic money M , domestic bonds B , and foreign bonds F .

Thus the portfolio balance model is summarized as follows:

$$M = m(r, r^*, s^e/s, y)W \quad m_1, m_2, m_3 < 0, m_4 > 0 \text{-----14}$$

$$B = b(r, r^*, s^e/s, y)W \quad b_1 > 0, b_2, b_3, b_4 < 0 \text{-----15}$$

$$sF = f(r, r^*, s^e/s, y)W \quad f_1, f_4 < 0, f_2, f_3 > 0 \text{-----16}$$

Where s is the exchange rate, s^e is the expected exchange rate, y is income, r is domestic interest rate, r^* is foreign interest rate and W is total wealth.

The equilibrium condition states that supply should equal demand, that is:

$$W = M + B + sF$$

A country can accumulate F by running a current account surplus and the authorities exogenously give the supply of M and B .

The portfolio shares must add to unity, that is

$$M + B + sF = 1 \text{-----17}$$

Changes in the portfolio shares must sum to zero.

$$\Delta M + \Delta B + \Delta sF = 0 \text{ -----18}$$

Suppose there is an increase in the supply of foreign bonds to domestic residents, assuming static expectations. This increase causes an instantaneous appreciation in the exchange rate. This is because the increase in supply, given the foreign currency price of the bonds, their domestic price has to fall if domestic residents have to hold more foreign bonds. This happens through the appreciation of the exchange rate.

3.2 THEORIES OF DEVALUATION (EXCHANGE RATE MISALIGNMENT)

Over valuation of exchange rate is believed to be a serious problem in many developing countries. According to Dornbusch (1988), in addition to artificially raising and lowering the prices of exports and imports respectively, overvaluation causes a loss in domestic production, employment and fiscal revenue.

According to World Bank (1992), currency overvaluation imposes an implicit tax on export and hence discourages the production of exportable goods. On the other hand, overvaluation imposes an implicit subsidy on imports and thereby encouraging the importation of foreign goods (World Bank, 1992; 20)

Devaluation on the other hand, means a reduction in the external value of a country's currency unit, undertaken by government fiat or official proclamation. The rationale for devaluation in many

countries among other policy packages is mainly to improve the external balance of a country, which in turn improves the overall performance, that is; improves a country's international competitiveness and foreign reserves. Analysis of currency devaluation proceeds under the following approaches.

ELASTICITY APPROACH: The analysis is based on the assumption that tradables have elasticities greater than one and that products prices are fixed in domestic currency. It is based on the exchange rate policy as an adjustment to external balance disequilibrium and utilizes the relationship between the elasticities of exports and imports. When the sum of the elasticities of demand for export (E_x) and import (E_m) is greater than unity [$(E_x + E_m) > 1$], the balance of trade disequilibrium is improved by the policy of devaluation. The above inequality is generally known as the Marshall-Lerner condition. If the sum of these elasticities is smaller than unity, then the trade balance can be improved by a revaluation (overvaluation).

ABSORPTION APPROACH: Alexander (1952) defines the trade balance as the difference between the total goods produced in a country and the total domestic absorption (domestic absorption equals the sum of domestic consumption and investment), that is:

$$B = X - M$$

Where B is the balance of trade, X is merchandise exports and m is merchandise imports. Devaluation can therefore, affect the trade balance either through the changes it induces on total production of goods or its direct effect on the domestic absorption. He identifies two channels through which a nominal devaluation can affect the trade balance; these are: Idle resources effect and the terms of trade effect.

Idle resource effects: the principal effect of devaluation on income is associated with the increases exports of the devaluing country and the induced stimulation of domestic demand through the multiplier, provided there are unemployed resources. From the point of view of a devaluing country that has unemployed resources, the effect of income, as well as the favorable effect on the terms of trade if the marginal propensity to absorb is less than unity, must constitute the most attractive potentiality of devaluation. If the country is at full employment, this potentiality does not exist and the effects of devaluation must depend on the direct effects on absorption.

Terms of trade effects: Devaluation has the effects of reducing a country's export prices and raising her imports prices, thus deteriorating the country's terms of trade. The deterioration of the terms of trade will improve the foreign balance since it reduces the real income of the country and hence the demand for imports as well as for domestic goods. The decline in income resulting from the change in the terms of trade will induce a reduction in absorption which will permit an equivalent improvement in the foreign balance partly through the direct reduction of imports and partly through the eventual transfer to the production of exports, or of imports substitute of the resources formally used to produce for domestic absorption.

After the reviewing of theoretical literature, we go to reviewing empirical literature.

3.2 *EMPIRICAL REVIEW*

Elbadawi, I (1992) estimated the equilibrium real exchange rate for Sudan and his results show that foreign prices have substantial influence on the equilibrium level of Sudanese real exchange rate. The result accommodates the possibility of an asymmetric effect on the equilibrium real exchange rate of a terms of trade worsening, depending on whether the source of the worsening is

brought about by a decline in export price or an increase in the price of imports. In the first case, equilibrium depreciation is predicted while in the later the equilibrium real exchange rate is expected to appreciate. This result supports the view that the source of the terms of trade depreciation matters and that there exists asymmetries in terms of the sources of the terms of trade shock.

Mlambo, K and Ncube, M.Z (1998), explore an empirical model in the case of Zimbabwe in order to find out the determinants of real exchange rate. They use fundamentals as explanatory variables. The result obtained, shows that the long run relationship between the real exchange rate and its fundamentals estimated has a negative signs for all the fundamentals employed suggesting that if these variables worsen, the real exchange rate will appreciate. The result also shows that in the long run, government consumption and commercial policy (openness) appears to have larger impacts on real exchange rate.

Edwards, S (1989) investigated the role of capital inflows in the process of determination of the real exchange rate in Chile during the period 1977-1982. The results obtained showed that an increase in net capital inflow is associated with a real appreciation. He also found that a deterioration of the terms of trade, that is, a decline in log (terms of trade), result in a real appreciation. These results are in support of the theoretical view that the opening of the capital account contributes to generating a real exchange rate appreciation and so does an increase in log (terms of trade).

Edwards (1988,1989,1990) further conducted a research based on twelve developing countries in which he sought to analyze the relative importance of monetary and real variables in the process of real exchange rate determination in both the short run and long run. According to Edwards' model, the most important "fundamentals" in determining the behavior of the real exchange rate are; the external terms of trade, the level and composition of government consumption measured as the ratio of government consumption of non-tradable to GDP, import tariffs, and capital inflows, where a negative value denote capital outflow and vice versa. Technological progress was included in the model to capture the possible role of the so-called Ricardo-Balassa effect on the equilibrium real exchange rate. According to this hypothesis, countries experiencing a faster rate of technological progress will experience an equilibrium real exchange rate appreciation (Balassa 1964). According to the model, macroeconomic policies used were: excess supply of domestic credit, which was measured as the rate of growth of domestic credit minus the lagged rate of growth of real GDP; and the ratio of fiscal deficit to lagged high-powered money, which was incorporated as a measure of fiscal policies. The general conclusions drawn from the results were that the variables were quite satisfactory and that they did provide support for the view that short run movements in real exchange rate respond to both real and nominal variables.

Moreover, Edwards (1989) formulated and estimated a current account analysis model using pooled data for 12 countries. He found that the current account and the real exchange rate have a positive relationship, that is, real exchange rate devaluation improves the current account

Miles (1979) in his study of the effect of a nominal devaluation on the trade balance and the Balance of payment for 14 countries (Developed and Developing countries), and by using the first difference variables, find that nominal devaluation has adverse effects on the trade balance in

the year of the devaluation but improves in the succeeding years. His findings confirm the existence of the J-Curve effect, which is the tendency of the trade balance to deteriorate initially after devaluation before it improves.

Bahmani-Oskooee (1994) using co integration and error correction modeling techniques on 19 DC's and 22 LDC's, found no long run relationship between the trade balance and the real effective exchange rate. However, in his study, he defines the trade balance as the ratio of a country's imports to its exports ratio, which for him, is not sensitive to units of measurement.

Sall and Ndiaye (1996) carried out a study investigating the relationship between the trade balance and the real exchange rate in Senegal for the period 1965-1995, using co integration and error correction techniques. A trade balance equation was established with real exchange rate as one of the independent variables. The result shows that real exchange rate has minor effect in causing trade balance deficit and the coefficient (t-statistics) was not significant.

Helmets (1987), in a survey of the studies on Latin American countries conclude that there is a remarkable relationship between the real exchange rate and the real trade balance, although sometimes with a time lag for the latter. According to Helmets, when the real exchange rate increases, exports increase and import falls, and thus the trade balance improves.

Another study by Favaro and Spiller (1989), analyzes the dynamics of real exchange rate behavior in Uruguay with data for the period 1950-1984 in their estimation. Their regression result

showed that an increase in capital inflow in Uruguay resulted in real exchange rate appreciation.

Connolly, M and Devereux, J (1992) used data for seventeen Latin American countries to analyze the determinants of equilibrium real exchange rate in those countries. Their result suggests that real exchange rate is positively related to technological progress, and the external terms of trade; while the real exchange rate effects of government spending, the capital stock and endowments of primary factors such as land and minerals were theoretically ambiguous. A measure of urbanization was added to the list of their variables, but it also produced ambiguous effect.

Ghura and Grennes (1993) carried out a study investigating the relationship between real exchange rate misalignment and economic performance using cross sectional data for 33 Sub-Saharan African (SSA) countries. They used three different methods of estimating real exchange rate misalignment. Their empirical results show that real exchange rate misalignment and instability adversely affected real income growth and other macroeconomic variables. Such result confirms earlier works by Edwards (1988a, 1990), Agarwala (1983), Cottani *et al* (1990)

A case study by Obadan (1994) on the determinants of real exchange rate in Nigeria where the independent variables were: terms of trade, balance of trade, net capital inflow, nominal exchange rate, monetary policy variable, trade/commercial policy variable and fiscal policy, come out with the following empirical results: terms of trade and nominal exchange rate variables had the expected negative sign and positive signs, respectively, as suggested by theory and were

highly significant. Net capital inflow had a depreciating effect on the real exchange rate. Trade/commercial policy variable showed an appreciative effect on the real exchange rate. The macroeconomic policy variables exhibited contrary sign and therefore, implying that macroeconomic expansion policies are associated with a depreciation of the real exchange rate.

Using the PPP approach and the fundamental model of real exchange rate determination in Zimbabwe for the period 1990-2000, Ndlela and Sikwila, and Dhliwayo (2000), further confirm the stylized fact about the existence of overvalued and misaligned exchange rate in developing countries. Overall, these studies conclude that a proper alignment of the real exchange rate is a major determinant of the trend of economic performance. On the other hand, severe macroeconomic disequilibria and balance of payment crises in developing countries have often been cited as the direct consequence of real exchange rate misalignment (Edward S, 1989 and Dornbush 1991).

Kiguel (1992) also used the simple version of the familiar dependent economy model to analyze the long run determinants of the real exchange rate and the role of exchange rate policy in determining the real exchange rate. His major findings were: Exchange rate policies only have a limited effect on the real exchange rate. In the long run, the real exchange rate, as any price is being determined by fundamental factors affecting the demand and supply for foreign exchange, and is thus independent of the exchange rate policy. Furthermore, countries can only maintain a stable real exchange rate when they follow stable macroeconomic policies, and when they are not subjected to large external shock.

In a Mundel-Flemming type model, the effects of a devaluation in an economy with a fixed exchange rate regime depends on whether there is full capacity utilization or not. In the short run, devaluation of the currency will lower the real exchange rate and have an expansionary effect with respect to the demand for non-tradable goods and the production of tradable goods.

In summary, the above review helps to identify the determinants of the real exchange rates. It also gives an insight to the likely impact of exchange rate misalignment on the trade balance.

CHAPTER FOUR

4.1 METHODOLOGY AND MODEL SPECIFICATION

The Johansen maximum likelihood procedure was used in this study to estimate the long run parameters, since it is claimed to be superior to the Engle-Granger procedure. Moreover, the Johansen procedure tests for the number of co integrating vectors and provides long run coefficients by considering all variables as endogenous; thus it does not require a priori endogenous-exogenous distinction among variables and it can also identify multiple co integrating vectors.

The Johansen procedure begins by specifying the data generating process of a vector of N variables, X_t as a general Vector auto-regressive (VAR) model in the levels of the variables (see Johansen, 1988; Johansen and Juselius, 1990). This can be formulated as:

$$X_t = A_1 X_{t-1} + \dots + A_k X_{t-k} + U_t + \varepsilon_t \quad (1)$$

Where:

X_t is an $N \times 1$ vector of the macro-variables of interest (non-stationary variables)

A_i is an $N \times N$ matrix of parameters ($i = 1, \dots, k$)

U_t is a vector of constants

ε_t is a vector of error terms.

$t = 1, \dots, T$

Equation (1) can be reparameterized into a reduced form vector error correction model (VECM) as:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + U_t + \varepsilon_t$$

$$= \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + U_t + \varepsilon_t \quad (2)$$

Where:

$$\Gamma_i = -[I - A_1 - \dots - A_i], i = 1, \dots, k-1$$

$$\Pi = -[I - A_1 - \dots - A_k],$$

Δ = first difference operator

I = identity matrix (unit matrix)

The main task is to investigate whether the coefficients contained in the Π matrix contain long run information. Taking the number of variables in the vector to be N , and hence the number of equations in the VAR, and the rank of Π matrix to be P , three cases can be distinguished:

- 1) Rank (Π) = $P = N$; this implies that the matrix has full rank ¹¹ and that the process X_t is stationary (the variables are stationary at levels and no ECM is required)
- 2) Rank (Π) = $P = 0$; this implies that the Π matrix is null and all the elements of X_t are non-stationary, hence the variables are not co integrated.
- 3) Rank (Π) = $P < N$ but not zero; this is the interesting case where the Π matrix is less than full rank. In this case, the rank P is equal to the number of distinct co integration vectors linking variables in X_t , as such P is known as the co integration rank. Using this last case, the Π matrix can be decomposed into two $r \times p$ matrices, α and β^1 such that

$$\alpha \beta^1 = \Pi \quad (3)$$

Where β represents the matrix containing coefficients of the co integration vectors, and

11) The rank of a matrix gives the maximum number of independent rows and columns (Lipschutz, 1987)

has the property that $\beta^1 X_t \sim I(0)$, (where $I(0)$ indicates integrated of order zero), and α represents the matrix of weights with which each co integration vector enters each of the ΔX_t (adjustment parameters). Equation (3) can therefore, be regarded as a hypothesis of reduced rank of the Π matrix, showing that it has P co integrating relationships. We can therefore re-write equation (2) as:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-1} + \alpha \beta^1 X_{t-k} + U_t + \varepsilon_t \dots \dots \dots (4)$$

The co integrating vectors β have the property that $\beta^1 X_t$ is stationary even though X_t is itself a vector of non-stationary variables. The co integration relations are estimated as the eigenvectors corresponding to P non-zero eigenvalues in equation (4). The magnitude of the eigenvalues is a measure of how strong the co integration relation is correlated with a linear combination of the stationary process. The eigenvalues I to P different from zero define the non-stationary part of the process. The null hypothesis is in terms of the co integrating rank P and rejection of $P=0$ is evidence in favor of at least one co integrating vector [see Hendry and Doornik (1997), Harris (1995), Johansen (1988), Enders (1995), etc for more details on these issues]. The solution is given by two likelihood ratio tests for P , which is given by the trace test statistics (λ_{trace}) and the maximum eigenvalue (λ_{max}) given by equation (5) and (6), respectively.

$$Q_p = -T \sum_{i=p+1}^r \ln(I - \lambda_i) \dots \dots \dots (5)$$

$$Q_p = -T \log(I - \lambda_i) \text{-----}(6)$$

Where λ_i is the i^{th} estimated eigenvalue and T is the number of observations. These statistics test the hypothesis that there is at most P co integrating vectors.

4.2 TIME SERIES PROPERTIES OF THE VARIABLES

Time series is a sequence of numerical data in which each item is associated with a particular instant in time. In this study a time series analysis will be made in order to study the dynamics or temporal structure of the data. This analysis involves testing whether the sample data to be use for each variable exhibits stationary or non-stationary attributes along a constant mean or trend. In order to avoid the problem of spurious regression, which normally arises from estimating non-stationary series, unit root tests will be conducted. The aim of this test is to identify the order of integration of a variable with a view of differencing the data if it is necessary to make it stationary.

The Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests, whose null hypothesis is of a unit root I (1), will be carried out to determine the order of integration of the data. A significant test statistics would reject that hypothesis and suggest that the data series

are $I(0)$. We determined lag length to be used in the ADF test by choosing the highest lag length with a significant last lag and no serial correlation.

In testing for the order of integration, it is assumed that higher order of integration dominates lower order of integration (Dickey and Pantula, 1987). The null hypothesis is that the variable under investigation has a unit root, against the alternative that it does not. Hence, the rejection of the null hypothesis in favor of the alternative implies that the variable is stationary, while acceptance of the null hypothesis implies that the variable is non-stationary.

4.3 MODEL SPECIFICATION

4.3.1 REAL EXCHANGE RATE EQUATION

In studying the determinants of real exchange rates, Edwards (1988,1989b, 1990) started the analysis with a general equilibrium model of the determinants of real exchange rate that is consistent with the simultaneous attainment of internal and external equilibrium. Internal equilibrium presupposes that the market for non-tradable clears in the current period and is envisaged to be so in the future with employment at its natural level. External equilibrium implies that the current account balances both in the current and future periods are compatible with long run capital flows (Elbadawi 1989;Edwards 1988,1989)

The real exchange rate model to be use in this study is adapted from Edwards (1988,1989b, 1990), Elbadawi and Soto (1994,1995), Elbadawi (1993) and Ndulu (1993). The advantage of this model is that it allows for both real and nominal variables to play a role in the short run in the determination of real exchange rate.

We can, therefore specify the equilibrium real exchange rate (e_t^*) model (in log form for the purpose of estimation) as:

$$\text{Log } e_t^* = \alpha_0 + \alpha_1 \log (\text{NCF}) + \alpha_2 \log (\text{TOT}) + \alpha_3 \log (\text{OPEN}) + U_t \text{-----} (7)$$

Where the following notations have been used.

e_t^* = the equilibrium real exchange rate

TOT= external terms of trade

NCF=net capital inflow

OPEN=openness of the economy (trade policy)

U_t =error term.

Equation (7) gives an indication of the main fundamentals that influence the behavior of the equilibrium real exchange rate in Sierra Leone

From theoretical analysis, it can be stated that real exchange rate (e_t) in the short run responds to three forces. First, to fundamental variables which can be represented by (e_t^*) as shown by the equation (1). Second, to the difference between the rate of change in macroeconomic policies (Z_t^*), that is ($Z_t - Z_t^*$), where Z_t and Z_t^* , in a case of monetary policy would represent the rate of increase in money supply (i.e. increase in the rate of domestic credit); and the rate of increase in the demand for money (that is, the increase in the rate of demand for domestic credit), respectively. Thirdly, the change in the nominal exchange rate ($E_t - E_{t-1}$) (Edwards, 1989). Thus, the dynamics of the behavior of the real exchange rate are given by the following equation.

$$\text{Log } e_t = \Phi (\log e_t^* - \text{Log } e_{t-1}) - \lambda (Z_t - Z_t^*) + \eta (\log E_t - \log E_{t-1}) \text{-----} (8)$$

Equation (8) captures the actual dynamics of real exchange rate, where ($\log e_t^* - \text{Log } e_{t-1}$), represents the autonomous tendency of actual real exchange rate to correct existing

misalignment (that is, the deviation of the actual real exchange rate from its equilibrium level), λ , Φ and η are positive parameters that capture the most important dynamic aspects of the adjustment process. Under pegged nominal exchange rates, the parameter Φ measures the speed at which real exchange rate misalignments are corrected, through changes in relative prices. The smaller the value of Φ (that is, the closer it is to zero), the slower will be the speed at which real exchange rate misalignment will be corrected.

In the estimation of the model, the variable excess supply of domestic credit (ESC), which is a measure of $(Z_t - Z_t^*)$, is used to see the effect of monetary policy on the behavior of real exchange rate. It is measured as the rate of growth of domestic credit minus the lagged rate of growth of real GDP, that is; $ESC = (d \log \text{domestic credit}_t - d \log GDP_{t-1})$. Moreover, the ratio of fiscal deficit to lagged high-powered money (DEH) is used as a measure of fiscal deficit, in order to see the effect of fiscal policy on the real exchange rate.

In the short run, the real exchange rate model is obtained by representing the variable e_t^* in Equation (8) by its fundamentals given in Equation (7), replacing the macroeconomic policies vector $(Z_t - Z_t^*)$ with the monetary policy variable-the excess supply of credit (ESC), and the fiscal policy variable; and also by replacing the term $(\log E_t - \log E_{t-1})$ with (NER) denoting the nominal exchange rate movements, so as to obtain the following empirical model.

$$\log e_t = \beta_0 + \beta_1 \log (NCF)_t + \beta_2 \log (TOT)_t + \beta_3 \log (OPEN)_t - \lambda (ESC)_t - \Omega (DEH)_t + \delta (NER)_t + U_t \dots \dots \dots (9)$$

Where the β_i 's ($i=1,2$ and 3), λ , Ω and δ are positive parameters, t denote time, U_t is the error term. Equation (9) is the equation that will be estimated in this study.

4.3.2 DEFINITION OF VARIABLES AND THEIR EXPECTED SIGNS

NET CAPITAL INFLOW (NCF): Under a fixed exchange rate regime, capital inflow leads to an increase in money supply. Consequently, prices rise and the real exchange rate falls (appreciate). In general, when an economy makes a transfer to the rest of the world (capital outflow), current and future domestic real income and expenditure decline, precipitating a slump in the relative prices of non-traded goods. This leads to depreciation of the real exchange rate in the current and future periods (Fosu, 1992). Conversely, when an economy receives transfer from the rest of the world (capital inflow), current and future domestic expenditure tends to rise, stimulating increased demand for non-traded goods which in turn leads to a rise in the prices of non-traded goods. This will cause the real exchange rate to appreciate (called the Dutch disease effect); hence β_1 is negative ($\beta_1 < 0$) [Edwards, 1989]

TERMS OF TRADE (TOT): This refers to the ratio of world price of exportables (P^*x) to the relative world price of importables (P^*m). That is

$$TOT = P^*X/P^*M$$

Terms of trade represent the purchasing power of a country's exports in terms of imports. The TOT effect on the real exchange rate operates through import and export price variations, that is, it focuses on the price effects rather than on the volume effects. In general, improvement in the TOT leads to a real appreciation while a deterioration results in a real depreciation. If the world price of exportable goods, for example, relatively increases (i.e. if TOT improves), the supply of foreign exchange increases. Under a fixed exchange rate system, the increased supply of foreign exchange rate leads to an expansion of the money supply and hence an increase in the general price level. This causes the real exchange rate to appreciate. Alternatively, the improvement in the TOT creates an excess demand in the market for non-

traded goods and therefore exerts an upward pressure on the prices of non-traded goods, so that the real exchange rate appreciates (Khan, M and Montiel P.J, 1987). On the other hand, a worsening of the TOT resulting from an increase in the foreign prices of imports would tend to depreciate the real exchange rate.

An alternative way of examining the TOT effect on the real exchange rate is in terms of the income and substitution effects, which depends on the source of the TOT variation. The income effect arises when the real exchange rate depreciates/appreciates in response to a fall/rise in the relative prices of exports. A decrease/increase in the relative price of exports tends to precipitate a decrease/increase in the real income of the economy. This in turn exerts a downward/upward pressure on the domestic demand for non-tradable goods. The result of this is a fall/rise in the domestic prices of non-traded goods and a depreciation/appreciation of the real exchange rate. Further more, an increase in the prices of imported goods relative to those of exported goods will stimulate a shift in domestic demand towards non-traded goods and hence resulting in an increase in the domestic prices of non-traded goods. This in turn leads to an appreciation of the real exchange rate (Edwards, 1989)

From the foregoing analysis, it can be concluded that the effect of a change in an economy's TOT on the real exchange rate depends upon the magnitude of the income effect in relation to the relative price substitution effect. Thus, the sign of the coefficient of TOT cannot be determined apriori, that is, $\beta_2 </> 0$, since it depends on whether or not the income effect exceeds the substitution effect. For example, if the income effect associated with the TOT deterioration dominates the substitution effect, then $\beta_2 > 0$, that is, a depreciation of the real exchange rate will occur, and vice versa (Edwards 1989)

TRADE POLICIES (OPEN): The effect of trade policies on the real exchange rate is direct nature and the variable openness is used to capture trade policies. Openness is measured as the ratio of the sum of imports and exports to gross domestic product. It shows the extent of trade restrictions and exchange controls. The general view in the literature on trade is that trade liberalization characterized by a reduction of tariffs and/or elimination of quantitative restrictions will normally result in an equilibrium real depreciation. Import demand is expected to increase as the price of imports declines in line with lower tariffs or the removal of quantitative restrictions, generating a deficit. To restore external balance, the trade liberalization will need to be accompanied by an increase in the relative price of tradables or a real depreciation. On the other hand, an imposition of tariff will result in real exchange rate appreciation. This occurs due to an increase in the price of imported goods thus reducing the demand for imported goods and foreign exchange, a result, which materializes if the Marshall-Lerner condition is fulfilled. Moreover, a reduction or elimination of export duties reduces the outlay required for a given quantity of exports. Exports become more attractive so that the supply curve shifts to the right. Consequently, the real exchange rate appreciates.

Thus, the sign of the coefficient of OPEN cannot be determined apriori, since elimination of import duties may lead to real exchange rate depreciation, while elimination of export duties may lead to an appreciation of the real exchange rate, hence $\beta_3 < /> 0$.

MONETARY POLICY (ESC): Under a fixed exchange rate regime, monetary policy is rendered impotent in its use for stabilization purposes. Any attempt by the monetary authorities to reduce inflation in the economy by an open market sale of domestic securities, would leave domestic residents holding less money than they desire at the prevailing foreign

rate of interest. This would result to individuals selling foreign reserves in exchange for domestic currency to maintain their level of domestic currency holding.

Even though monetary policy is said to be impotent under fixed exchange rate regime, it does have influence on the real exchange rate during the process of adjustment. This means that a change in money stock is accountable for the short run fluctuations of the real exchange rate. However, in the long run its effect is completely offset.

Under a fixed exchange rate regime, money supply is not an exogenous variable; rather the policy variable is domestic credit (DC). Money supply is measured as the sum of the domestic credit generated by the banking system plus the value of the country's foreign reserves held by the central bank. That is:

$$MS = FX + DC \text{ -----(10)}$$

Where: MS= stock of money supply, DC= domestic credit, FX= foreign reserve.

Given that the PPP condition holds at the prevailing fixed nominal exchange rate i.e.

$$P_o = E_o P^*_o$$

Where; P_o = domestic price at given values of E_o and P^*_o

E_o = fixed nominal exchange rate and,

P^*_o = foreign price.

Thus, an increase in the stock of money supply through expansion of domestic credit will create excess supply of money over demand for money. With a fixed output level, the excess supply of money will increase aggregate demand for goods over aggregate supply, thus exerting an upward pressure on domestic prices. The higher price level with E_o and P^*_o

unchanged will make the domestic economy uncompetitive, thus leading to an appreciation of the real exchange rate and hence result in balance of payment deficit. However, in the long run, as people switch their expenditure away from domestic goods to imported goods, the foreign exchange reserves declines owing to the fact that people would be converting their excess money supply into foreign reserves with which to purchase the foreign goods. The foreign exchange reserve continues to decline until the stock of money supply is back to its original level. The domestic price (P) also declines to its original level. Hence, the sign of the coefficient ESC is expected to be negative, that is, $\lambda < 0$.

FISACL POLICY (DEH): According to Michael Mussa (1986), macroeconomic policy (fiscal policy) can affect the real exchange rate by altering the difference between domestic spending and domestic income. Specifically, any excess spending over real income, which result from an expansionary policy would induce inflation and hence appreciate the real exchange rate. In other words, higher deficit will result to a real appreciation, other things being equal.

If for example, the government decides to operate an expansionary fiscal policy through temporary tax decrease, this would result in a temporary decrease in government revenue relative to its expenditure. This in turn implies that the domestic market and international market are in disequilibria. The decrease in tax by government would lead to private sector increasing its spending by the same amount of the increase in income resulting from the tax decrease, so that the difference between private domestic spending and private income remains unchanged. The increase in private spending on non-tradables would exert an upward pressure on the prices of those goods, thus maintaining equilibrium in the domestic market. The increase in the prices of non-tradables would then cause a real appreciation.

Hence, the coefficient for DEH is expected to be negative, that is, $\Omega < 0$.

THE NOMINAL EXCHANGE RATE (NER): According to Khan and Lizondo (1987), assuming all other factors remain constant, devaluation increases the domestic price of tradables and, because in the short run the nominal domestic money supply is predetermined, the real value of domestic money decreases and real wealth falls. The reduction in wealth creates an excess supply of non-traded goods and therefore, for equilibrium to be maintained, the real exchange rate must depreciate. Similarly, the reduction in real wealth lowers the demand for non-traded goods and this requires a higher real exchange rate.

Alternatively, devaluation as an effective policy to improve international competitiveness and hence to stimulate the performance of the tradable goods sector depends crucially on the nature and timing of linkages between the nominal exchange rate, prices and inflation. The argument is that, if domestic prices are highly influenced by foreign prices (imported prices) or exchange rate, then a nominal devaluation's effectiveness to improve international competitiveness is reduced. In a case where the "pass through" is complete, that is, when foreign price changes or exchange rate is perfectly correlated with domestic price changes, and immediate, then a nominal devaluation is rendered impotent as a policy variable. On the other hand, if the "pass through" were incomplete, then nominal devaluation would be an effective instrument to be used in achieving improvement in international competitiveness.

Thus the sign of the coefficient NER is positive, that is, $\delta > 0$. This is because an increase in the nominal exchange rate (i.e. devaluation) would result to a depreciation of the real exchange rate.

Note, the real exchange rate misalignment is calculated using the model-based approach, and this variable is then used as an independent variable in the trade

balance equation in order to analyze the effect of real exchange rate misalignment on the trade balance.

4.3.3 TRADE BALANCE EQUATION

This research work will also adopt the trade balance equation as developed by Himarios (1989), Dornbush and Krugman (1976), Krugman and Baldwin (1978) which is generally enough to “nest” the monetarist models but not limited to it.

In general the model can be written as follows:

$$TB=f (GDP, RER_m, M)----- (11)$$

Where:

TB=real trade balance (merchandise export minus merchandise import in real terms)

GDP=real gross domestic product

RER_m=misalignment in the real exchange rate

M=real money supply

The model to be estimated is specified as follows:

$$\text{Log } TB_t = \alpha_0 + \alpha_1 \text{log } GDP_t + \alpha_2 \text{log } (RER_m)_t + \alpha_3 \text{log } M_t + \varepsilon_t----- (12)$$

Where ε_t is the error term.

Since equation 12 is specified in logarithmic form, the estimated coefficients are long run elasticities of trade balance with respect to each corresponding explanatory variable. These long run coefficients will be estimated using the Johansson maximum likelihood approach. The co integrating vector, which is obtained from the co integration analysis, will provide estimates of the long run coefficients.

4.3.4 EXPECTED SIGNS

REAL GROSS DOMESTIC PRODUCT (GDP): Increase in GDP has an ambiguous effect on the trade balance, that is, $\alpha_1 < /> 0$. An increase in GDP will increase the income of the people, which lead to an increase in demand for imported goods, and hence leads to an increase in imports, thereby worsening the trade balance. On the other hand, as income increase, the production of importable increase and if the increase is faster than consumption, this would reduce the volume of imports thus improving the trade balance.

REAL EXCHANGE RATE MISALIGNMENT (RER_m): The sign of the coefficient of RER_m is expected to be negative, that is, $\alpha_2 < 0$. Misalignment of the real exchange rate acts as an implicit tax on exports and thereby reducing the profitability of exports. This result to a decrease in export. Moreover, the misalignment may serve as an implicit subsidy on imports and hence result to an increase in imports. This situation will result to a worsening of the trade balance.

REAL MONEY SUPPLY (M): Money supply variable is expected to have a negative sign, that is, $\alpha_3 < 0$, since an increase in money supply will worsen the trade balance. From the monetarist approach, expansionary monetary policy will increase domestic prices and hence reduce the competitiveness of the domestic country there by causing a reduction in the volume of export, and hence a deterioration in the trade balance.

4.3.5 DATA TYPE AND SOURCES

The economic implication of the models require data on the following variables: terms of trade, which requires the price of imports and exports, respectively; net capital inflow; excess supply of credit; trade policy (openness); nominal exchange rate, which requires the current and one lagged nominal exchange rate values, trade balance (export-import), gross domestic product and money supply.

Due to data problem encountered in most developing countries including Sierra Leone, some of these variables would be proxy by other closely related variables. For example, Excess supply of domestic credit is measured, as the rate of growth of domestic credit minus the lagged rate of growth of real GDP. The extent of nominal devaluation is measured by changes in the nominal effective exchange rate. The variable openness would be used as a proxy for trade policy. Further more, the foreign wholesale price would be used as a proxy for foreign price level (P^*), while the domestic consumer price would be used as a proxy for the domestic general price level (P).

4.3.6 DATA SOURCES

The study makes use of secondary data, published by various sources including: Bank of Sierra Leone, Central Statistics Office (CSO), Ministry of Trade and Industry, International Monetary Fund (IMF), World Bank etc.

4.3.6 SCOPE AND LIMITATION

Due to the unavailability of time series data, 1970 is considered as the starting period, while 2000 is the ending period. The study covers the period 1970-2000. It makes an attempt to look

into the effect of the real “fundamentals” variables, macroeconomic policies and the nominal exchange rate on the real exchange rate within the specified time. The study also investigates relationship between trade balance and misalignment in the real exchange rate in the context of Sierra Leone economy.

Relating unreliability of data is a problem that is common in developing countries. It is true for Sierra Leone as well. The study is limited to real “fundamental” variables; macroeconomic variables and exchange rate policy variables.

CHAPTER FIVE

ANALYSIS OF RESULTS

5.1 UNIT ROOT TESTS AND ORDER OF INTEGRATION

Recall that, before testing for co integration, the order of integration of the individual time series must be determined, since most macroeconomic variables are non-stationary. The test for order of integration of the variables is done using the augmented Dickey-Fuller (1981) (ADF) test statistics. The following table presents the result of the unit root test statistics for the variables of interest in our empirical analysis.

TABLE 2: RESULTS OF UNIT ROOT TESTS

Variables	Without drift and	With drift with lags	With drift and trend
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	trend with lags of		of		with lags of	
	1	2	1	2	1	2
LRER	-1.5886	-1.9029	-0.97976	-0.44479	-3.3432	-2.1398
LNCF	0.42975	0.70123	-0.18176	0.088504	-2.2152	-1.9755
LTOT	-0.82436	-0.98993	-1.9554	-2.1149	-3.3872	-2.0934
LOPEN	-0.70204	-0.83683	-2.5199	-1.3463	-2.4768	-1.2864
NER	-1.4896	-1.8366	-1.0158	-0.71583	-3.0682	-2.2863
ESC	-1.7004	-1.9084	-2.0077	-1.6819	-3.4944	-3.4931
DEH	-0.49925	-0.66578	-1.5276	-2.4457	-1.5258	-2.3944
DLRER	-5.6882	-3.1331	-6.2324	-3.6617	-6.1257	-3.5802
DLNCF	-2.1519	-1.0111	-3.0323	-1.6489	-3.0346	-1.4497
DLTOT	-7.8213	-5.3345	-7.6874	-5.2585	-7.9349	-5.6104
DLOPEN	-3.1779	-2.4250	-3.1209	-2.3762	-3.1137	-2.6276
DNER	-5.6599	-3.5522	-6.1694	-4.1728	-6.0367	-4.0794
	1	2	1	2	1	2
DESC	-5.5813	-4.8445	-5.5927	-4.9035	-5.6576	-5.0379
DDEH	-2.7070	-1.9329	-2.6942	-1.9232	-2.5739	-1.8760
LTB	-0.96822	-0.63419	1.1678	1.0568	-2.1409	-2.7049
LGDP	-1.5997	-1.3146	-1.5510	-1.6650	-0.62835	-0.61698
LM	-1.0651	-1.0684	-1.9649	-2.6345	-1.8673	-2.6445
LRERm	-0.92031	-1.1789	-0.82994	-1.0893	-1.3531	-1.4889
DLTB	-2.4176	-1.5324	-4.4421	-4.4037	-2.5521	-1.5475
DLGDP	-2.8902	-1.9738	-3.8968	-4.1774	-4.2745	-11.631
DLM	-2.4499	-2.4095	-2.4414	-2.3843	-2.3654	-2.2693
DLRERm	-3.0281	-1.7658	3.0751	-1.7556	-2.9880	-1.6519

Critical values	1%	-2.645	-2.649	-3.675	-3.685	-4.308	-4.323
	5%	-1.953	-1.954	-2.966	-2.971	-3.573	-3.58

The unit root test reveal that all the variables are non-stationary in levels, that is, they are characterized by I (1) process. However, by taking the first difference, all the variables became stationary.

5.2 MODELING THE REAL EXCHANGE RATE EQUATION

5.2.1 LONG RUN RELATIONSHIP

The Johansen procedure of co integration analysis assumes there is no apriori categorizing of variables as endogenous and exogenous. Thus, if the variables behave as integrated process, tests for co integration is undertaken to establish a long run relationship between the RER and its fundamentals. The appropriate lag length of the VAR was chosen based on the Akaike AIC and the Schwarz SC tests statistics (see appendix 1). It was found that a vector auto regression of order two, VAR (2), prove to be the ideal lag length for the co integration test. A dummy that takes the value of one between 1991 and 2000, and zero otherwise was introduced and this entered the VAR unrestricted. This dummy was introduced to capture the effect of the civil war.

For the Johansen method, there are two test statistics for the number of co integrating vectors: the trace and maximum eigenvalue statistics. In the trace test, the null hypothesis is that the number of co integrating vectors is less than or equal to k , where $k=0,1$ or 2 . In each case the null hypothesis is tested against the general alternative. The maximum eigenvalue test is similar, except that the alternative hypothesis is explicit. The null hypothesis $k=0$ is tested against the alternative that $k=1$, $k=1$ against the alternative that $k=2$, etc. The Johansen

procedure also conducts a weak exogeneity test on the full system using the LR test. This involves testing whether the α coefficient is significantly different from zero. The rationale for such a test is that, estimation and inference on the single equation system will be equivalent to that of the full system only if all the co-integrating variables are weakly exogenous with respect to the dependent variables.

Table 3 below presents the co-integration test and the estimated co-integrating vector for the long run coefficients.

Table 3: CO INTEGRATION ANALYSIS

Ho: rank = P	λ_{Max}	Reimer Adjusted	95%	λ_{Trace}	Reimer Adjusted	95%
P = 0	97.19**	70.38**	30.3	126.2**	91.4**	54.6
P <= 1	20.56	14.89	23.8	29.03	21.02	34.6
P <= 2	5.396	3.908	16.9	8.466	6.131	18.2
P <= 3	3.07	2.223	3.7	3.07	2.223	3.7

Standardized β^1 eigenvectors

LRER	LNCF	LTOT	LOPEN	NER	ESC
1.0000	0.31241	-0.32085	-0.80639	-0.002105	0.10953
0.56627	1.0000	0.30674	6.1040	-0.023107	1.2457
1.3628	0.26977	1.0000	0.56749	0.0026450	-4.6542
0.020218	-0.16910	-0.048434	1.0000	-0.005316	-1.0124

Standardized α coefficients

LRER	-0.91250	-0.18140	-0.095693	-0.17842
LNCF	-0.15042	-0.25122	0.043237	-0.011215
LTOT	0.018331	0.0053588	-0.13871	0.0015862

LOPEN	0.018227	-0.034073	-0.0012937	-0.041841
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DIAGNOSTIC TEST

Vector AR 1-2 F (32, 20) = 1.7498(0.0957)
Vector normality χ^2 (8) = 7.3553 (0.4988)

Number of lags used in the analysis: 2

Variables entered unrestricted: constant, DW (Note: DW= dummy for war)

Variables entered restricted¹²: NER, ESC

12) DEH is not included as restricted into the co integration analysis. The reason is that, besides being insignificant, the inclusion of this variable as restricted affected the diagnostic tests of the vector.

Table 3, shows that both the maximum eigenvalue (λ_{max}) and trace eigenvalue (λ_{trace}) reject the null hypothesis of no co integration ($r = 0$) but not the null hypothesis of at most one co integrating vector ($r \leq 1$). In particular, the λ_{max} and λ_{trace} statistics reject the null hypothesis of no co integration between the variables at the 1% and 5% significance levels, respectively. Therefore, we can conclude that there is one co integrating vector as established by the Johansen statistics. However, there is a possibility of rejecting the null hypothesis when infact it is true, specifically for small samples. “ Thus, according to Reimer (1992), when the sample size is small, the Johansen procedure over-rejects when the null is true, in Harris (1997 p.88). Furthermore, tests for vector serial correlation and normality do not detect serial correlation and normality problem at 5 percent level as reported by the diagnostic tests. Furthermore, the co integration graphics supports the existence of only one co integrating vector, as the first vector is the only stationary one. The stationary vector corresponds to the real exchange rate variable, according to the ordering of the variables (see appendix 2).

Given that a single co integrating vector has been established, there is only one relevant linear combination of the variables, represented by the first row of β^1 matrix (and hence the first

column of α matrix), that is stationary. Thus, by taking the first row of the standardized eigenvectors, β^1 and the corresponding feedback coefficients the estimated long-run equation can be written as follows:

$$\begin{aligned} \text{LRER} = & -0.31241 \text{ LNCF} + 0.32085 \text{ LTOT} + 0.80639 \text{ LOPEN} + 0.0021050 \text{ NER} \\ & (0.0001)** \quad (0.0000)** \quad (0.0286)* \quad (0.1915) \\ & -0.10953 \text{ ESC} \\ & (0.4369) \end{aligned}$$

(Values in parentheses represent P- values). * and ** implies rejection at 5% and 1% significance level, respectively.

Furthermore, the first column of the adjusted coefficients, α , measure the feedback effects of lagged disequilibria in the co integration relationship on the variables in the vector auto regression. In particular the first element of this column of the coefficients, shows the weight at which the co integrating vector enters the equation.

Having established the long run equation, we now test for the long run weak exogeneity and identify the unique co integrating vector. Imposing zero restriction on the α coefficients along with identifying β vector is necessary to conduct a test for weak exogeneity. According to Johansen (1992), if the speed of adjustment coefficients (α_i 's) in the co integration analysis approach zero, then the corresponding variables can be considered weakly exogenous. The importance of this test is that, if all the explanatory variables are not weakly exogenous, then it is not valid to move to a single equation approach when estimating the short run model. The test is based on the likelihood ratio test (LR-test) with asymptotic χ^2 distribution, and involves a test of whether α is significantly different from zero. The significance of the hypothesis of weak exogeneity in empirical analysis is that, if the variables are weakly exogenous, then it is

legitimate to abandon the multivariate model and perform the analysis using the single equation approach by conditioning on these variables (Harris, 1995).

The results are summarized in tables 4 and 5, respectively.

Table 4: Test for zero restriction on α -coefficients

Variable	LRER	LNCF	LTOT	LOPEN
α -Coefficients	-0.91250	-0.15042	0.018331	0.018227
LR-test: χ^2 (≈ 1)	30.634	2.9551	1.7279	1.6568
P-value	(0.0000)**	0.0856	0.1887	0.1980

From table 4, the result shows that all the variables except LRER are weakly exogenous.

Table 5: Test for zero restrictions on the long run parameters

Variables	LRER	LNCF	LTOT	LOPEN	NER	ESC
β^1	1.0000	0.31241	-0.32085	-0.80639	-0.00210	0.10953
LR-test: χ^2 (≈ 1)	68.211	15.017	50.65	4.9872	1.0928	0.58708
P-value	0.0000**	0.0001**	0.0000*	0.0255*	0.2958	0.4435

* And** implies rejection at 5% and 1% level of significance, respectively

As the above result (table 5) shows, NER and ESC are found to be statistically insignificant. The other variables; LNCF, LTOT and LOPEN are statistically significant. All variables have their expected signs.

The coefficient of net capital inflow is negative as suggested by theory and is statistically significant. The negative sign of the coefficient indicate that an increase in foreign exchange supply tends to appreciate the real exchange rate. An inflow of capital leads to an increase in foreign exchange, hence leading to an increase in foreign reserves. This increase in foreign reserves may require a decrease in domestic credit in order to maintain the money supply, and this occurs through an appreciation of the exchange rate. This finding is consistent with other empirical findings by some economists. For example, a study by Favaro and Spiller (1989) showed that an increase in capital inflow in Uruguay resulted in real exchange rate appreciation. Another study by Edwards (1986) in which he investigated the role of capital inflows in the process of real exchange rate determination in Chile, showed that an increase in net capital inflow is associated with a real appreciation. Ghura and Greene (1993) also obtained comparable results for Sub-Saharan African countries.

The coefficient for openness (OPEN) is positive and significant. This implies that trade liberalization that is aimed at reducing tariffs and eliminating trade restrictions result in RER depreciation. Liberalization allows more goods and services into the country, hence leading to competition with domestic goods. Such competition will cause a downward pressure on the prices of non-tradable due to low demand, hence leading to RER depreciation. The long run estimation gives a coefficient of 0.81, which implies that a 1% increase in openness of the economy would lead to a 0.81% rise in the RER. This finding conforms to studies by Janine and Ayogu (1995).

The term of trade variable (TOT) is significant with a positive sign, implying that an increase (improvement) in the TOT would cause a depreciation of the RER. The elasticity coefficient is 0.32 implying that a 1% increase in the TOT will give rise to a 0.32% depreciation of the RER. The positive and significant effect of the TOT on the RER implies that the substitution

effect dominates the income effect. This result is consistent with the empirical results of Connolly and Devereux (1992), who found a positive relationship between RER and external TOT for 17 Latin American countries. Aron (1999) also observed the same positive effect of the TOT on the RER.

However, the positive coefficient of TOT contradicts findings by other economists such as Edwards (1989), Carlos Diaz- Alejandro (1982), who found the TOT coefficient to be negative and significant.

Finally, the coefficients for NER and ESC are found to be statistically insignificant with positive and negative signs, respectively. The insignificant nature of these variables shows that they do not have a long run effect on the equilibrium RER. Furthermore, according to literature, these variables are policy variables with short run effects

5.1.4 THE ERROR CORRECTION MODEL (ECM)

Since there is only one co integrating vector and there is no problem of endogeneity based on the weak exogeneity test, there is no need to use a simultaneous equation technique. The ECM is estimated by ordinary least square (OLS). The Hendry's general-to-specific modeling approach was applied in order to arrive at a more parsimonious model. The result is summarized in table 6

Table 6: ECM RESULT

Variables	Coefficient	Standard error	t-value	t-prob
Constant	-0.16617	0.082755	-2.008	0.0756
DLNCF_1	-0.27988	0.071795	-3.898	0.0114
DLOPEN	0.24687	0.10259	2.406	0.0611
DLTOT_1	-0.31215	0.058829	-5.306	0.0061

DNER	2.1524	0.91104	2.363	0.0458
DESC_1	-1.1562	0.31940	-3.620	0.0362
DW	2.5615	0.69353	3.693	0.0141
VECM_1	-0.29231	0.069100	-4.230	0.0134

$R^2 = 0.350064$ $F(7, 21) = 1.6158 [0.1856]$ $DW = 1.77$

AR $1 - 2 F(2, 19) = 0.23453 [0.7932]$

ARCH $1 F(1, 19) = 0.047283 [0.8302]$

Normality $\chi^2(2) = 1.2634 [0.5317]$

RESET $F(1, 20) = 4.2172 [0.0533]$

Note: figures in square brackets are probability values for various tests.

The result shows that LNCF, LOPEN AND LTOT are all statistically significant. However, the term of trade variable tends to have a negative sign as opposed to the positive sign in the long run model. This implies that, in the short run, the income effect dominate the substitution effect, thereby causing a real exchange rate appreciation. The diagnostic tests accept the null hypothesis of no serial correlation, no functional mis-specification and no autoregressive conditional heteroscedasticity. Also, the JARQUE-BERA test for normality, which is distributed as a chi-square with two degrees of freedom showed that the residuals of μ_t are normally distributed. The F-test for overall significance of the model shows that all the variables are jointly significant. Finally, the goodness of fit (R^2) of the above model shows that 35% of the total variation in the dependent variable is explained by the independent variables. This is plausible as this is a dynamic model, where all the variables are stationary and hence there is no problem of spurious regression.

The coefficient of the speed of adjustment to disequilibrium is significant with expected sign and reasonable magnitude (-0.29). This indicates that the short run dynamics converges on the long run co integrating relationship.

In the short-run dynamic analysis, excess credit (ESC) is found to be statistically significant with the expected negative sign. This suggests that monetary variables have a short-run effect on the RER, and that an expansionary monetary policy will result to RER appreciation. An increase in money supply will increase the demand for non-tradables and hence causes an upward pressure on domestic prices. The increase in prices will cause the real exchange rate to appreciate. The result is however consistent with empirical findings by Edwards, S (1988), Elbadawi, I (1992) and, Ghura and Greene in which macroeconomic policy variable (monetary policy) was found to be negative.

Furthermore, the coefficient of nominal devaluation (NER) is found to be statistically significant in the short-run with a positive sign. This also suggests that a nominal devaluation will depreciate the RER as suggested by theory.

Finally, the coefficient for the dummy for war was found out to be statistically significant with a positive sign. This implies that the effect of the civil war resulted to a depreciation of the real exchange rate. Intuitively, during the war the demand for foreign currency increases, as people were eager to move out of the country to a safer place. This increase in the demand for foreign currency resulted to a depreciation of the domestic currency, and this in turn resulted to a depreciation of the real exchange rate. The real exchange rate depreciate because there was a fall in the demand for non-tradable goods, and this causes the price of such goods to fall, thereby causing a depreciation of the real exchange rate.

5.1.5 TRENDS IN THE EQUILIBRIUM REAL EXCHANGE RATE

The long run equilibrium real exchange rate can be estimated from the real exchange rate equation, by assigning zero values to both the macroeconomic policy variable (ESC) and the nominal devaluation variable (NER). Thus, only the ‘fundamentals’ influence the ERER.

However, there is a problem of determining what values of the fundamentals to use in computing the ERER. The literature suggested three methods to overcome this problem: (i) to use the actual values of the fundamentals, (ii) to choose values for these series of fundamentals arbitrarily, perhaps based on some historical pattern, and (iii) to use some kind of averaging procedure to smooth the series of the RER fundamentals (Edwards, 1989). This study however used the third option, because it tends to smooth the data series of the real exchange fundamentals. Moreover, it decomposes the data into permanent and transitory components. This method involves decomposing the time series data into permanent and transitory components before using them in the construction of series for ERER. There are two possible ways to “smooth” the series; the Beveridge-Nelson (B-N) decomposition and the moving average approach. The study uses the moving average method by computing a 5 years moving average to construct the respective sustainable values. The moving average method smoothes the data more substantially than the B-N decomposition method (Baffes et al, 1999), and therefore yields more economically appealing results. Moreover, the B-N method needs large sample size and may give economically implausible results in the case of small samples.

In order to generate the ERER, a necessary and sufficient condition is the existence of strong exogeneity of the fundamentals. This involves conducting a Granger causality test. Thus, the existence of weak exogeneity of the fundamentals together with the lack of Granger causality from the RER to the fundamentals is a sufficient condition to generate the ERER using time series based on estimates of the “permanent” fundamentals. The result of the Granger causality, using the Hausman’s test, is given below. According to the test result provided in table 7, the null hypothesis that LRER does not Granger Cause a specific variable is not

rejected in all cases. This shows that, there is one-way causation with no positive feedback.

Thus, the ERES can be generated using these time series data (see figure 7).

Table 7: Granger Causality test

Null hypothesis	F- statistics	Prob
LRER does not granger cause LTOT	0.04640	0.95475
LRER does not granger cause LNCF	0.05759	0.94416
LRER does not Granger cause LOPEN	0.90476	0.41800

Figure 7 depicts that the RER is misaligned. The misaligned RER is plotted in figure 8 below.

FIG 7: TRENDS IN EQUILIBRIUM REAL EXCHANGE RATE

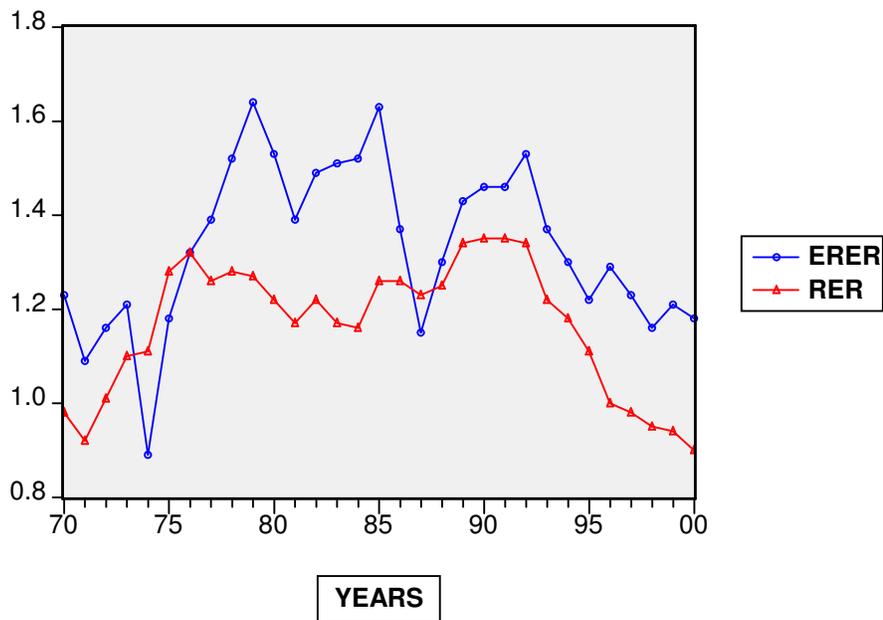
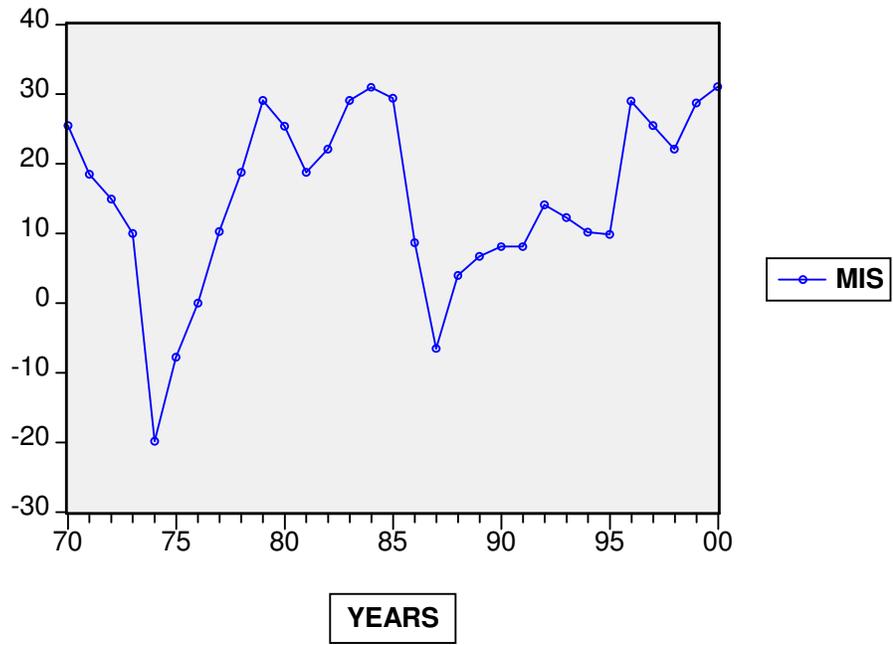


FIG 8:MISALIGNMENT OF THE REAL EXCHANGE RATE



5.3 MODELLING THE TRADE BALANCE EQUATION

5.3.1 LONG RUN RELATIONSHIP

Note, the result of the unit root tests suggest that all the variables in the trade balance equation are non-stationary, that is they are I (1) series, but became stationary when differenced once. Thus the Johansen method is used to establish the long run relationship.

TABLE 8 gives a summary of the co integration result. A lag length of two was chosen as the appropriate lag length for the VAR, based on the Akaike AIC and the Schwarz SC tests statistics (see appendix 3)

Table 8: CO INTEGRATION ANALYSIS

Ho: rank=P	λ_{max}	95%	λ_{trace}	95%

P= = 0	48.5**	30.3	79.56**	54.6
P< = 1	16.78	23.8	31.06	34.6
P< = 2	13.94	16.9	14.28	18.2
P< = 3	0.3386	3.7	0.3386	3.7

Standardized β^1 eigenvectors

LTB	LGDP	LM	LRERm
1.0000	-0.34825	0.30985	0.39943
-0.61295	1.0000	0.28268	0.56348
41.951	2.7807	1.0000	-0.91083
0.78246	-0.85049	0.44175	1.0000

Standardized α coefficients

LTB	-0.42669	0.10461	-0.0031485	0.0036942
LGDP	0.63958	-0.53001	-0.038765	-0.0095470
LM	-0.057641	-1.7334	-0.054215	0.012307
LRERm	-0.27877	0.018431	0.32226	-0.12981

DIAGNOSTIC TEST

Vector AR 1-1 F (16, 3) = 1.7016 (0.3682)
Vector normality χ^2 (8) = 3.7822 (0.8762)

** implies rejection at the 1% significance level.

Number of lags used in the analysis: 2

Variables entered unrestricted: constant, DW (dummy for war)

The co integration results show that, the null hypothesis of zero co integration is rejected. Both the λ_{max} and λ_{trace} statistics for the significance of the eigenvectors support one co integrating vector. Moreover, there is no report of serial correlation and normality problem at 5 percent as reported by the diagnostic tests.

The co integration graphics reaffirm the existence of one co integrating vector since it is the first vector that is stationary. This vector corresponds to the real trade balance variable, based on the way the variables are ordered (see appendix 4). As we have found one co integrating vector, it follows then that the first row of β^1 matrix and the first column of α matrix are relevant, since they are the only row and column that are stationary. Thus, by taking the first row of the standardized eigenvector, β^1 , the estimated equation can be written as follows:

$$LTB = 0.34825 LGDP - 0.30985 LM - 0.39943LRER$$

$$(0.0059)** \quad (0.0000)** \quad (0.0036)**$$

Figures in parentheses represent P-values. * and ** implies rejection at 5% and 1% significance level, respectively.

Furthermore, by disaggregating the trade balance into merchandise import and merchandise export, it shows clearly the channel through which each of the variables affect the trade balance. Thus, the merchandise export and merchandise import regression estimates are shown below.

Export equation

$$LEX = 0.14230LPx - 0.78205LRERm - 1.9645LGDPf + 0.073LPm$$

$$(0.034)* \quad (0.000)** \quad (0.014)* \quad (0.2873)$$

Import equation

$$LIM = 0.79896 LGDP + 0.40102 LM + 0.17130 LRERm$$

(0.0000)** (0.0003)** (0.0555)

Where, LPx = export price index, LGDPf = foreign GDP, LPm = import price index

Weak exogeneity test is also conducted by imposing a zero restriction on the α -coefficients of the first column using the LR-test. This helps us to write the endogenous variables conditional on other variables in the VAR. This test is referred to as weak exogeneity test. The result is summarized in table 9 below:

Table 9: Test for zero restriction on α -coefficients

Variables	LTB	LGDP	LM	LRERm
α - Coefficients	-0.42669	0.63958	-0.057641	-0.27877
LR-test: χ^2 (≈ 1)	18.503	1.0595	0.010274	0.95094
P-values	0.0000**	0.3033	0.9193	0.3295

** Implies rejection at 1% significance level.

Furthermore, the long run coefficients of the respective variables are tested for their level of significance to identify the variables that uniquely constitutes the co integrating vector. Thus, a zero restriction is imposed on each coefficient and the vectors for the LR-test are conducted. The result is summarized in table 10.

Table 10: Test for zero restrictions on the long run parameters

Variables	LTB	LGDP	LM	LRERm
β - Coefficients	1.0000	-0.34825	0.30985	0.39943
LR-test: χ^2 (≈ 1)	22.09	7.5724	23.108	8.454

P-values	0.0000**	0.0059**	0.0000**	0.0036**
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** Implies rejection at 1% significance level.

The result shows that all variables are statistically significance with their expected signs.

The LGDP variable is positive and statistically significant. The coefficient of 0.35 shows that a 1% increase in LGDP leads to a 0.35% improvement in the trade balance. An increase in real income leads to an increase in both merchandise imports and merchandise exports. The model suggests that, with an increase in income, production increases. Also, the increase in production is faster than consumption such that there are some products left for export, hence denoting the positive relationship between export and real income.

Moreover, as income increases, consumption increase as well, and this result to an increase in demand for imports; which depicts the positive relationship between income and imports. Thus, the overall increase in real income leads to an improvement in the trade balance because the increase in export is higher than the increase in import. Furthermore, from the export equation, an increase in foreign GDP resulted to a fall in export as shown by the negative sign. The result shows that a 1% increase in foreign income tends to generate a 0.14% fall in the volume of export.

The coefficient for LM is negative and statistically significant. The negative sign depicts that an expansionary monetary policy will lead to a deterioration of the trade balance as predicted by theory. The result shows that a 1% increase in money supply, will lead to a 0.31% worsening of the trade balance. The worsening of the trade balance is through both import and export. Economic agents perceived an increase in money supply as an increase in wealth, and hence expenditure on import increases (hence the positive relationship between LM and import) and thereby worsening the trade balance.

LRERm variable is found to be negative as predicted and statistically significant. The coefficient shows that 1% misalignment in the real exchange rate will worsen the trade balance by almost 0.40% all things remain constant. According to the literature, overvaluation is supposed to reduce the price of export in local currency and thereby resulting to a fall in export. As the real exchange rate gets overvalued, the profitability of producing exportable goods fall and hence less is produced for export.

Furthermore, overvaluation will reduce the price of import in local currency and thereby resulting to an increase in import. The final analysis will lead to a worsening of the trade balance. This scenario is true for a developing country like Sierra Leone, whose exports are mostly primary commodities, while her imports include intermediate and finished manufactured goods.

5.2.3 THE ERROR CORRECTION MODEL (ECM)

In the long run analysis, the presence of one co integrating vector was supported, and the variables were found to be weakly exogenous except LTB. Thus OLS is appropriate in estimating the short run model. A general-to-specific modeling approach of Hendry is used and the result is summarized in table 11 below.

Table 11: ECM RESULT

Variable	Coefficient	Standard error	t-value	t-prob
Constant	-0.64344	0.18257	-3.524	0.0097
DLRERm_1	-0.29231	0.079789	-3.664	0.0352

DW	-0.42013	0.16488	-2.548	0.0382
VECM_1	-0.58184	0.20694	-2.812	0.0203

R2 = 0.332777 F (3, 15) = 2.4937 [0.0996] DW = 1.78

AR 1 -2 F (2, 13) = 1.3577 [0.2914]

ARCH 1 F (1, 13) = 0.20763 [0.9053]

Normality χ^2 (2) = 1.0958 [0.5782]

RESET F (1, 14) = 0.22446 [0.6430]

Note: figures in square brackets are probability values for various tests.

The result shows that both real exchange rate misalignment (DLRERm) and dummy variable for war are statistically significant with negative signs. The negative sign for DLRERm depicts that overvaluation will result to a worsening of the trade balance in the short run.

Furthermore, the civil war tends to worsen the trade balance in the short run. The justification is that, during the war, there was a fall in merchandise export as rebels occupied most of the diamond and agricultural areas, such that government has little control over these exports.

Further more, the agricultural commodities have long gestation period and are being determined by weather conditions, such that in the short run output cannot increase.

Furthermore, the diagnostic tests suggest that there is no serial correlation, no mis-specification, and no autoregressive conditional heteroscedasticity. In addition, the Jarque-Bera test for normality shows that the residuals are normally distributed. Finally, the speed of adjustment to equilibrium carries the expected sign and lies within the relevant range (less than unity).

5.2.4 GRANGER CAUSALITY TEST

An important issue in verifying the validity of the trade balance equation is the direction of causality between the trade balance and real exchange rate misalignment. This involves the application of pair wise Granger Causality test. The test result is presented in table 12 below

Table 12: Result of Granger Causality

<i>Null hypothesis</i>	F-test	Probability
RER does not Granger Cause TB	5.46280	0.01109
TB does not Granger Cause RERm	1.27161	0.29860

From the above result, the null hypothesis that, “RERm does not Granger Cause TB” is rejected at 5% significance level, and hence the direction of causality is from RERm to TB with no positive feedback (Unidirectional). This result therefore confirms the validity of the trade balance equation.

CHAPTER SIX

6.1 CONCLUSION AND POLICY IMPLICATIONS

The purpose of this paper was to estimate time-series models of real exchange rate and trade balance in Sierra Leone, in order to address the underlying objectives. The study had four specific objectives: First, to establish the equilibrium real exchange rate for the economy of Sierra Leone. Second, to identify the determinants of the real exchange rate and show the direction of their influences. Third, to estimate the degree of misalignment in the real exchange rate. The fourth objective is to analyze the likely impact of real exchange rate misalignment on the trade balance.

This paper has arrived at the following conclusions:

First, in terms of long-run effects of the fundamentals, net capital inflows are found to be negative. It shows that capital resource inflow leads to an appreciation of the real exchange rate. This is because; an increase in capital inflow results in an increase in foreign reserves. Thus in order to keep the supply of money constant, there must be a decrease in domestic credit. The decrease in domestic credit may require an appreciation of the exchange rate.

Second, the term of trade was found to be positive which implies that, an increase (improvement) in the term of trade results in depreciation of the real exchange rate. This shows that the substitution effect dominates the income effect. Thus as people's income increases, they shift their demands in favor of imported goods, there by causing a fall in the demand for non-tradables. This scenario then causes the price of non-tradables to fall, there by causing a real depreciation.

Finally, openness, which is a proxy for trade policy, carries a positive sign. This implies that trade liberalization aimed at reducing tariffs and eliminating trade restrictions results in real exchange rate depreciation.

Moreover, in the short run dynamic error-correction model; the coefficient of excess credit was found to be negative. This suggests that an expansionary monetary policy will result in an appreciation of the real exchange rate. Furthermore, the coefficient of nominal devaluation is found to be positive, which suggest that a nominal devaluation will depreciate the real exchange rate. Finally, the dummy for war was found to be positive. This suggests that the existence of the civil war resulted in a depreciation of the real exchange rate.

From the empirical results, it is also clear that Sierra Leone's real exchange rate has been misaligned from its equilibrium real exchange rate over the study period as depicted in figure

7. For most part of the study period, the real exchange rate is below its equilibrium value, denoting an overvaluation (appreciation) of the exchange rate. Moreover, the real exchange rate misalignment adjusts very slowly towards its equilibrium level and therefore; the country has to sustain real exchange rate misalignment for a long period of time.

Also notable from the results of our study is the fact that in the trade balance equation, real GDP is found to be positive. This implies that, increase in real GDP will tend to improve the trade balance. However, this variable was found to be insignificant in the short run.

The coefficient for real money supply is also found to be negative, which implies that an expansionary monetary policy will result in a worsening of the trade balance. This variable was also found to be insignificant in the short run analysis.

Furthermore, the real exchange rate misalignment variable is found to be negative. This implies that an overvaluation of the real exchange rate result to a worsening of the trade balance.

In the short run error correction model, the study found that the real exchange rate misalignment have negative signs. This implies that this variable tend to worsen the trade balance in the short run. Finally, the dummy for war was found to have a negative effect on the trade balance. This result was true for a war ravage country like Sierra Leone, where the intensity of the rebel war causes a decline in both agricultural production and export of diamonds

6.2: POLICY IMPLICATIONS

The conclusion drawn from our study suggests that policy intervention has an important role to play in improving the performance of the Sierra Leone economy. The presence of exchange

rate misalignment in the country, suggests that both fundamental variables and short run factors have led to the misalignment in the real exchange rate of Sierra Leone. Policy makers in Sierra Leone have to aim at evolving an optimal macroeconomic policy mix, which will maintain the real exchange rate at levels that do not deviate widely from the equilibrium level. Our study provides useful information that could lead to the attainment of such goal.

In a bid to bring about a real depreciation in the exchange rate, the growth of money supply should be closely monitored. Thus, the government should pursue a tight monetary policy to limit the capacity of banks to extend credit. The implication is that, a contractionary monetary policy through a reduction in domestic credit will lead to a downward pressure on domestic prices of non-tradables and hence result to depreciation of the real exchange rate.

Furthermore, the reduction in domestic prices due to a contractionary monetary policy will make Sierra Leonean goods to be more competitive internationally. This might result to an increase in export and hence an improvement in the balance of trade.

This study also supports the use of trade liberalization through the elimination of import tariffs and other trade restrictions. The implication is that, trade liberalization allows more goods into the country, hence leading to competition with domestic goods. Such competition will cause a downward pressure on the prices of non-tradables, thereby resulting to a real depreciation. However, it is important to note that trade liberalization may reduce government revenue. The cost of trade liberalization is that, the revenue which the government is, suppose to collect in the form of import and export duties will never be realized, hence leading to a loss/reduction in government revenue; which may impact negatively on government budget.

Furthermore, trade liberalization may influence negatively on employment. This is justified by the fact that, domestic industries that cannot withstand such competition will end up “folding up”, and hence creating unemployment for the populace.

Another consideration for policy is that, government should encourage foreign direct investment through an increase in real interest rate, which may cause short run capital inflow. The implication is that foreign direct investment has a long run effect on the real exchange rate. In other words, foreign direct investment will cause an increase in the production of non-tradable goods in the long run. The increase in production will result to a reduction in the price of non-tradables and hence causing real exchange rate depreciation.

Furthermore, since the study reveals that the real exchange rate is below its equilibrium value (that is overvaluation), then the study recommends the use of nominal devaluation in order to bring about realignment of the exchange rate. It is evident that an active exchange rate management is necessary to avoid real exchange rate overvaluation. Nominal devaluation helps to maintain an economy’s international competitiveness on the external front.

According to Edwards (1989), nominal devaluation is a powerful tool in inducing real exchange rate depreciation. Thus, if a country’s real exchange rate is overvalued, nominal devaluation may serve as a powerful tool to bring about realignment in the exchange rate.

The implication is that, devaluation reduces the domestic price of export thereby resulting to an increase in export. Moreover, devaluation increases the domestic price of imports and hence causing a reduction in imports. This situation is expected to improve the trade balance.

However, an overvaluation (appreciation) of the real exchange rate has a deteriorating effect on the economy and also leads to a loss of international competitiveness. It is argued that an overvalued real exchange rate imposes an implicit tax on export and hence leads to a

reduction in export. It also imposes an implicit subsidy on imports and hence leads to an increase in imports. This will worsen the trade balance of the country. In essence, this study recommends the use of nominal devaluation in order to bring about realignment in the exchange rate.

It is important to note that; devaluation may not improve the trade balance in the short run due to the J-curve effect. It is argued that in the short run devaluation may worsen the trade balance. But the in the long run devaluation is expected to improve the trade balance.

Finally, it is suggested that the government should embark on export promotion strategy. Such policy can be achieved through price incentives to exporters, and also through the promotion of non-traditional exports. Also, export diversification and the provision of basic infrastructure in the rural areas as well as supply of inputs at affordable prices may provide additional boost to export performance. The government should also pursue an outward-oriented strategy.

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