Addis Ababa University
School of Graduate Studies

AN ANALYSIS OF THE MACROECONOMIC DETERMINANTS OF

PRIVATE INVESTMENT IN SIERRA LEONE

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An Analysis Of The Macroeconomic Determinants Of Private Investment In
Sierra Leone

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DEDICATION

This work is dedicated to my parents, brothers and sisters, my wife kadiatu munu, and my son Minkailu Jalloh.

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ABSTRACT

This paper endeavors to identify the Macroeconomic determinants of private investment in Sierra Leone using time series data spanning from 1966 to 1998. From a simple trend analysis, it was observed that private investment (as a ratio of GDP) rose steadily from about 6.5% in 1966 to around 8.5% in 1978. After 1978, it fluctuated drastically reaching a minimum of around 3.8% in 1980 and subsequently shooting up to around 11.5% in 1981. Thereafter, private investment (as a ratio of GDP) decline continuously reaching a minimum of around 3.0% in 1998. Several reasons ranging from external shocks, inappropriate fiscal and monetary management, and the ten years of hostilities among others, were responsible for this.

The methodology employed in carrying out the analysis of the study specified a version of the flexible accelerator model of investment for Sierra Leone following the works of Solimano (1990), Chhibber and Shafic (1990), Blejer and Khan (1984), Chhibber and Van Wijnbergen (1988), Musalem (1988), and Scmidt-Hebel and Muller (1991). A dummy variable taking the value of one from 1991 to1998 and zero otherwise, was used to take account of the war in Sierra Leone and enters the regression. This is followed by estimation techniques on the basis of Co-integration analysis using both the Johansen's (1988) procedure and the ECM approach. On the basis of the Johansen's procedure, a single cointegrating vector was identified. Both the long-run and a dynamic private investment models were subsequently estimated. From the estimates of the long-run model, the results indicated that while real GDP and public sector investment positively affect private investment, interest rate, real exchange rate and inflation negatively affect private investment. On the basis of the Short-run estimates, while public sector investment, real GDP and the interest rate have positive effect on private investment, inflation and the real exchange rate negative effects on private investment. Though not significant, the war dummy show a negative sign indicating the adverse effect of the war on private investment in Sierra Leone.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND AND RESEARCH PROBLEM

In the wake of the early 1980s, experience revealed that many Developing countries were confronted with a profound slowdown in economic growth. The growth rate of real per capita GDP fell from 0.4% per year during the 1973-80 period to –1.2% per year during the 1980-89 period (Oshikoya,1994). The reasons for such acute Economic downturn can both be explained by external as well as internal factors. The significant decline in gross investment rates may perhaps reflect many factors that have affected most developing countries during the 1980s. On the average, the proportion of total domestic investment in GDP fell from approximately 20.8% per year during 1973-80 to 1.1% per year during 1980-89. Though this rate has not been uniform across countries, investment has fallen by less than 10% of GDP in some countries.

From one point of view, it is argued that high government spending which is financed by high domestic credit creation is inflationary. This inflation, which is an indication of macroeconomic instability, can crowd out Private investment, thus hampering growth (Fischer 1991). Inflation can also increase capital accumulation as it increases the level of investment. This is because economic agents would like to maintain the real value of their assets. This is often referred to as the Mondel-Tobin effect. Budget deficit when financed by domestic borrowing, increases the real interest rate (in a liberalized economy) there by reducing private investment and hence deteriorating growth. In an economy with fixed interest rate regime, the volume of credit available to the private sector is reduced. Thus private investment is deteriorated and hence

consequently hampering growth. This is more likely for economies where a larger portion of government expenditure is not towards developing infrastructure (which complement private investment). It is also the case that if government expenditure constitutes mainly of investment, this can increase output as it complements private sector investment.

In Africa, many leaders have recently realized the significant role of the private sector in enhancing sustainable economic growth. These leaders now focus their attention on long-term structural adjustment programs and sectoral reforms adopted by these countries in a bid to provide the necessary incentives for the development of the private sector. The growing concern towards the development of the private sector necessitated the formulation of appropriate government policies geared towards the development of the private sector. This phenomenon resulted to what came to be known as privatization. This urge to develop the private sector led the Sierra Leone Government to embark on a large-scale privatization of some public enterprises.

During the post-colonial era, most developing countries realized that political freedom   could only be accomplished and sustained by implementing strong measures of economic independence through the enhancement of increase productivity of essential goods and services in the economy. Since many of these economies lacked indigenously owned modern corporations, the professional and technical infrastructures, or the trained and qualified personnel required to administer them, they resorted to using the state mechanism to ensure an efficient national control of these institutions. However, the experience of the last three decades pointed out the weaknesses and the costs of centralized state control of the economy. The bureaucratization of management, the shifting of initiatives, the lack of proper disciplines and

the self-correcting mechanisms, which the market economy imposes, and coupled with the recent world recession which became widespread in many developing countries (especially those that are highly dependent on export of primary products) saw the need for invigorating the private sector as a way forward to enhance the achievement of the required growth target of these economies. Most of these countries came to realize that an active and dynamic private sector is indispensable in enhancing a sustainable growth of their economies. It therefore became increasingly clear that there is a greater need for incorporating the promotion of private investment and entrepreneurship in the development objectives of these countries.

Sierra Leone's experience with industrialization has been similar to that of other developing countries. After the attainment of independence in 1961, the Government of Sierra Leone followed an import substitution strategy in which policies were designed to encourage the expansion of large-scale, urban-based, foreign-owned firms. The results of this policy proved to be disappointing. The manufacturing sector grew at a real annual rate of 2.8 percent from 1965/66 until 1971/72. During the same period, the number of individuals employed in " large – scale" manufacturing firms declined at an annual rate of 3.5 percent (Chuta and Liedholm, 1975). Moreover, by 1971 unemployment in urban areas had grown to almost 14 percent (Byerlee, Tommy, and Fatoo, 1976) . Consequently, a new industrial strategy has been set forth in the 1974 National Development Plan (Government of Sierra Leone ,1974), in which agro-based ,labor intensive industries are now to receive priority.

Although small scale industries, particularly those located in rural areas are envisaged to play an important role in Sierra Leone's development effort, the policies and programs to foster small-scale rural industries have not been specified. Instead, the National Plan stresses " an immediate

task relating to the (small-scale industry) subsector is to conduct an economic survey to assemble data on its size, composition, structure of inputs and outputs, development problems and potential."

On account of domestic and international factors, the overall performance of the real sector is generally unsatisfactory. According to the revised estimates of the Central Statistics Office(CSO), GDP at factor cost declined by 1.7 percent in 1992-93 as against a registered growth of 3.0 percent in 1993-94. Agriculture continued to be disrupted by the war thereby making it difficult for the country to substantially increase the production of rice (the country's staple food). In the mining sector, whilst diamond and gold mines continued to face acute problems of smuggling, bauxite, rutile and ilmenite suffered from lack of external demand. Depressed world market conditions and the accumulation of stocks led to the closure of the bauxite factory in April 1994. Furthermore, the very high cost of production made local products uncompetitive with imports-legal or illegal; and the international trade environment served to depress the export levels of the mining industry, thus aggravating the situation.

1.2 <u>OBJECTIVES OF THE STUDY</u>

The primary objectives of this study are:

(1) To identify the major Macroeconomic determinants of private investment in Sierra Leone.

(2) To examine whether the ten years war has any serious impact on private investment in Sierra Leone.

(3) To contribute to the existing empirical literature on private investment in developing countries.

1.3 **STATEMENT OF HYPOTHESES**

The following hypotheses of the study will be tested:

(1) Public sector investment "crowds out" private investment in Sierra Leone.

(2) Private investment in Sierra Leone is positively related to real GDP.

(3) The rate of interest negatively affects the level of private investment in Sierra Leone.

1.4 **SIGNIFICANCE OF THE STUDY**

Boosting up the private sector via ways of stimulating private investment remain to be a significant concern of policy makers in Sierra Leone. To achieve this goal, private investment as a ratio of GDP needs to be increased on a sustainable basis. As one of its central objectives, the study will attempt to provide an empirical evaluation on the impact that government investment policies may have on private investment in Sierra Leone. This in effect will make it possible for the study to suggest ways and means through which government policies can stimulate private investment to boost up targeted economic growth. Further more, little or no systematic empirical study has been carried out with regards to the determinants of private investment in Sierra Leone. Thus this study will not only contribute to the existing empirical literature on the determinants of private investment in a typical developing country, but will help to address issues pertinent to the much needed development of a war ravaged country. Hence the findings of this study will be of immense significance to the developmental needs of an ailing economy ravaged by ten years of hostilities.

1.5 **SCOPE OF THE STUDY**.

The study will focus on the impact of certain macroeconomic variables on private investment in Sierra Leone. This is because, private investment is very important in determining the level of both the real output and total employment. More precisely, the study will examine the impact of fiscal expansion, money supply, interest rate, real GDP, inflation and terms of trade on private investment. Tax reduction, which is also a fiscal expansion, will also be considered in this study but it is basically the effect of taxes that affect the openness of the Sierra Leone economy to international trade. The study's period is designed to have coverage on relevant data between the years 1966-1998. This period is chosen due to the availability of relevant data and yet considered reasonably long enough to provide adequate answers to the research questions to be addressed in this study.

1.6 **LIMITATIONS OF THE STUDY**

This study is carried out under major constraints that impose several limitations. First, the macroeconomic data set for Sierra Leone is reported only from 1966 with several other variables important to this study reported only after 1975. Besides, other variables are not completely reported, as there are some years without values. This means only those variables that are reported completely from 1966 to 1998 will be used in the analysis. This is because; it is only this time period that offers a reasonable sample size for the analysis when considering the sample size criteria. Secondly, it was not possible to include survey data in the current analysis since the precarious situation in the country at the time of writing this paper made it impossible to conduct a successful survey in Sierra Leone. This is because, about 60% of the country was under the control of the Rebel forces with no security guaranteed to conduct a survey in their territories. Thus this work is limited to secondary data.

1.7 **ORGANISATION OF THE STUDY**

The remaining parts of this research work will be organized as follows: chapter two examines a historical perspective on investment in Sierra Leone, chapter three provides a review of both the theoretical and empirical literature; chapter four deals with the methodology, which includes model specification and estimation techniques, Chapter five will deal with the estimation and analysis of results and chapter six will deal with the conclusion and policy implication   of the study.

CHAPTER TWO

A HISTORICAL PERSPECTIVE OF INVESTMENT IN SIERRA LEONE

2.1 An Overview Of The Economy.

Sierra Leone is a poor, open and non-oil producing economy with an estimated population of approximately 4.8 million (1998) and a per-capita income of about $140.00 (1998). Population growth rate stood at around 2.2%, while per-capita income decline from $380.00 in 1980 to $140.00 in 1988. Agriculture is the most dominant sector of the economy, contributing approximately 45% to GDP, and providing about 75% of total employment for the country's labor force. It is also a significant source of foreign exchange earnings as it provides major primary exports namely coffee, cocoa, piassava and ginger. This sector alone accounted for about 40% of total export earnings. The country is also rich in mineral deposits. The key minerals are diamond, bauxite, iron ore, rutile and gold. Earnings from mineral exports alone accounted for about 60% of the country's foreign exchange. In comparative terms, the manufacturing sector is rather small, consisting of mainly import substituting industrial products that accounted for about 6% of GDP. The manufacturing sector also accounted for about 2% of the country's labor force employment. Between 1966 and 1970, GDP growth rate averaged at about 4% a year. As a result of the oil shock within 1971 and 1980, GDP growth rate declined at around 2.1% annually. This decline in GDP growth rate can also be attributed to the fall in incomes from the mining sector due to the depletion of alluvial diamond deposits coupled with the closure of the Marampa Iron Ore Mining Company in the early 1970s. The hosting of the Organization of African Unity (O.A.U) in 1980 coupled with the slow down in the country's revenue base accounted for the serious drain of the country's foreign reserves. Between 1981

and 1989 alone, GDP growth rate stood at an annual average of about -0.07 percent .The situation further deteriorated in the 1990s due to the outbreak of the ten years of hostilities which devastated the country's economic base.

Figure 1: Real GDP Growth Rate In Sierra Leone From 1966-1998
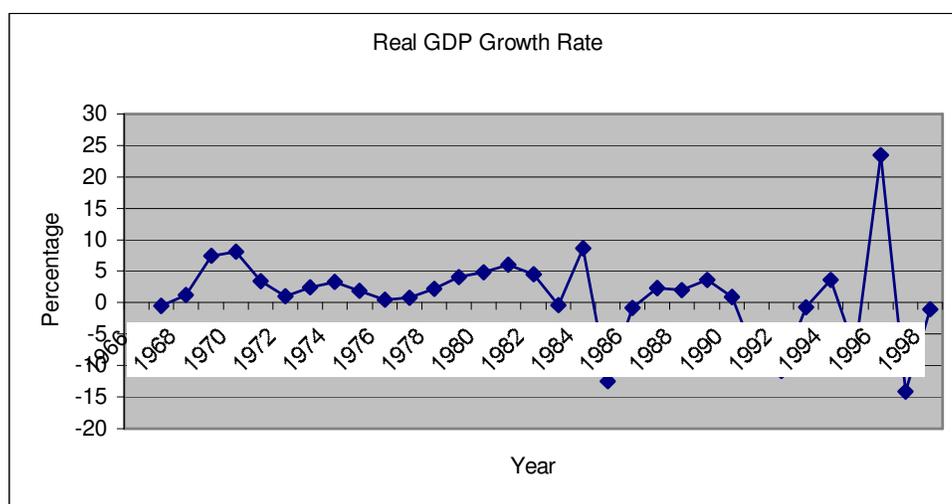
The real sector was depressed as hostilities intensified in the mid 1990s. The rulile and Bauxite mines were temporarily closed down, agricultural exports fell and output from the manufacturing sector was disappointing. Total exports declined by about 55 percent during this period as a result of the negative effects of the war. On the contrary, total imports went up by about 19 percent in an effort to narrow down the gap created by the poor performance of the domestic real sector. This culminated in a widening of the trade deficit from US$ 51 million in 1994/95 to US$125 million[1] in 1995/96. Consequently, the country's reserve position worsened from US$26.2 million in June 1995 to US$17.5 in 1996. This therefore posed a serious destabilizing effect on the exchange rate to an extent that the buying rates depreciated by around 35 percent over the year.

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[1] See Bank of Sierra Leone Annual Report and Statement of Account June 1996.

This drastic slow down in the activities of the real sector provoked a lower than expected revenue for government. The combined effect of the reduction in taxation receipts owing to a narrowing down of the tax base coupled with expenditure pressure caused the fiscal deficit to exceed the budgeted amount. The fiscal deficit for 1995/96 stood at Le51.6 billion (or 6.1 percent of GDP) . As opposed to 1994/95 when only 6 percent of the total fiscal deficit was financed domestically, 49 percent of the 1995/96 deficits were financed domestically. This ugly development in the country's financial position amounted to a huge increase in the stock of Net Domestic Financing from Le 2.4 billion at the end of 1994/95 to Le 2.3 billion in 1995/96(Bank of Sierra Leone Report 1996).

The primary objectives of monetary policy within this period were geared towards a sustained reduction in the stock of money (and consequently the rate of inflation) coupled with an improvement in the interest rate structure in a bid to enhance a viable financial intermediation in the economy. At the same time, there was an overriding need to sterilize excess liquidity (especially high powered money injected via ways and means advances) as monetary trends were expansionary in 1995/96. Reserve money and Narrow money rose by 32 and 48 percent respectively. This increase in money supply coupled with the structural bottlenecks arising from the war kept inflation rates high. Prior to the 1980s and 1990s, money supply growth was somehow relatively stable(see the graph in figure 2 below). However, after the hosting of the OAU in 1980, there was a significant growth in the money supply, averaging about 60 percent annually between 1982 and 1990. As a result of this, inflation became highly noticeable as it started posing serious macroeconomic problems in the country. Following the broke out of hostilities in the wake of the early 1990s, the country was plunged into another era of macroeconomic problems.

Figure 2:The Growth Rate Of Money Supply In Sierra Leone 1966-1998
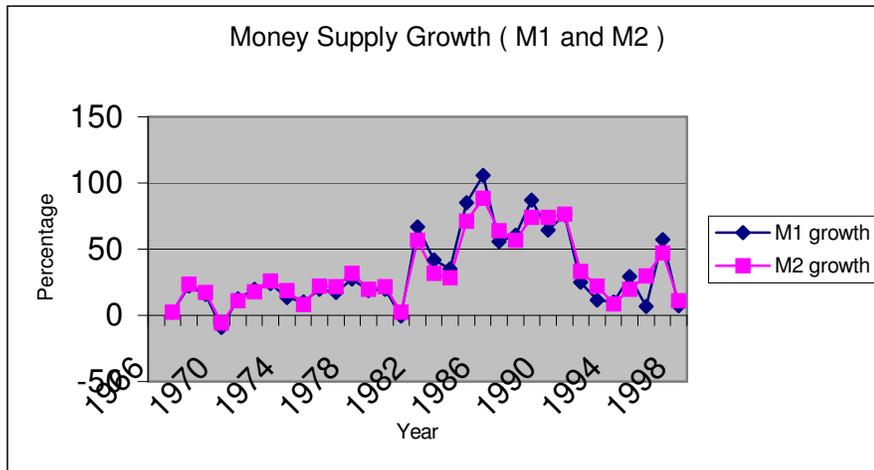
The recorded average inflation rate stood at 23 percent in 1994/1995, and further rose to 34 percent in 1995/96. Inflation rates peaked at 41 percent in January 1996. This is largely due to an intensification of hostilities in November/December of 1995.

In an effort to avert this unfavorable development in the country's major macroeconomic indicators, the Bank of Sierra Leone (the country's central Bank) resorted to adopting a tight monetary stance. The overriding objective was geared towards slowing down the growth in the stock of money in an effort to combat the inflationary impact it may have on the economy. This policy stance yielded the desired outcome as inflation, which was on the rise over the first two quarters of 1995/96, fell by 13.6 percentage points during the fourth quarter. Thereafter, monthly inflation rates experienced a steady decline since January 1996.

Despite the destabilizing effects of the rebel war, which started in 1991, significance economic reforms have been undertaken with the implementation of the Economic Recovery Program in

1989 (primarily meant to correct macroeconomic imbalances as well as structural reforms). In 1992, the World Bank extended a Reconstruction Import Credit followed by a structural Adjustment Credit in 1993[2]. Following large stabilization gains, the economy once again experienced a positive rate of growth in 1992. However, with the escalation of hostilities and the wide spread of rebel attacks in the Eastern and Southern parts of the country, there was a larger displacement of the rural population, decline in agricultural output and major disruption of provincial links. This consequently resulted in acute setbacks in macroeconomic stability in 1995. The considerable decline in mining activities coupled with the displacement of persons from farming activities resulted in a decline of real GDP by an estimate of about 10 percent. Transactions in the external sector were drastically downsized in the context of the low level at which the economy was operating. Total Merchandise import comprised of food, Beverages and Tobacco, Crude material, fuel and lubricants, animal and vegetable oil, chemicals, manufactured goods, machinery and transport equipments, and other imports. The main component of total Merchandise export in Sierra Leone comprised of diamond, gold, bauxite, rutile, palm kernel, coffee, cocoa, piassava, fish and shrimps. Between 1993 and 1994, total merchandise export registered a shortfall of about 15.9 percent. This is largely due to the drastic decline in the value of mineral exports. According to a report by the Bank of Sierra Leone, the volume of diamonds exported during 1993-94 was 13.5 percent below the preceding year's quantum of 200 thousand carats. The major cause for this shortfall in mineral exports was largely due to a decline of 22.4 percent in the volume of bauxite exported. Also, the value of rutile exported during the 1993-944 fiscal year declined substantially by 14.2 percent. This was due to uncertainties in the market situation resulting from the disintegration of the USSR (a major purchaser of Sierra Leone's rutile ore) coupled with a generally depressed demand for the commodity in the world

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[2] Bank of Sierra Leone Bulletin April 1997.

market which tended to affect prices adversely. On the other hand, exports of gold registered substantial increase of 21.7 percent and 33.2 percent in volume and value respectively. On the whole, total agricultural exports rose by 31.4 percent between 1992/93 and 1993/94 fiscal years. The volume of cocoa exported alone in 1993-94 shot up by 61.5 percent.

Table 1:Value of Major Domestic Exports (Thousand of dollars)

	1993/94	1992/93	Change	% Change
1	2	3	4	5
Diamonds	21.112	23.933	(1.821)	(7.9)
Bauxite	19.912	34.269	(14,357)	(41.9)
Rutile	57,379	66,849	(9,470)	(14.2)
Gold	1,356	1,018	338	33.2
Ilmenite	4,041	3,804	237	6.2
Total Minerals	**103,800**	**128,873**	**(25,073)**	**19.5**
Palm Kernels	-	13	(13)	(100)
Coffee	2,816	2,946	(130)	(1.1)
Coocoa	3,665	1,931	1,734	89.8
Piassava	97	61	36	59.0
Fish and Shrimps	729	485	244	50.3
Tobacco	1,092	956	136	14.2
Total Agriculture	**8,399**	**6,392**	**2,007**	**31.4**
Others	3,687	3,750	(63)	(1.7)
Domestic Exports	115,886	139,015	(23,132)	(16.6)
Re-exports	1,386	387	999	258.1
Total Exports	**117,272**	**139,402**	**(22,130)**	**(15.9)**

Source: International Finance Department, Bank of Sierra Leone Individual Exporters and GGDO.

Table 2: Volume of Major Domestic Exports.

	1993/94	1992/93	Change	% Change
1	2	3	4	5
Diamonds ('000 Carats)	173	200	(27.0)	(13.5)
Bauxite ('000 Tons)	789	1,043	(254.8)	(24.4)
Rutile ('000 Tons)	155	156	(1.0)	(0.4)
Gold (Ounces)	4,103	4,332	731.9	21.7
Ilmenite ('000 Tons)	59	67	(8.0)	(12.0)
Palm kernel ('000 Tons)	-	-	-	-
Coffee (Tons)	4,400	4,332	67.8	1.6
Cocoa (Tons)	3,525	2,183	1,341.9	61.5
Piassava (Tons)	301	187	114.0	61.0

Source: International Finance Department, Bank of Sierra Leone Individual Exporters and GGDO.

In order to have a broader perspective of the overall economy, some selected major Economics and financial indicators for Sierra Leone are as shown in table 3 below.

Table 3 : Selected Economic and Finance Indicators for Sierra Leone, 1992-1999

	1992	1993	1994	1995	1996	1997	1998	1999
(Annual percentage change, unless otherwise indicated)								
Output, incomes and prices								
Real GDP	-9. 6	0. 1	3. 5	-10. 0	5. 0	10. 1	14. 8	8. 7
(excluding mining sector)	-13. 5	8. 0	6. 0	-1. 5	3. 9	9. 9	8. 0	6. 0
Real GDP per capita	-11. 9	-2. 5	0. 9	-12. 3	2. 3	7. 4	12. 0	6. 0
Real per capita consumption	-13. 1	8. 5	2. 3	2. 1	5. 3	6. 5	1. 5	0. 1
Consumer price index (year-end)	38. 4	15. 1	22. 3	34. 5	6. 4	8. 0	5. 0	5. 0
External sector (in terms of U.S dollars)								
Export (f.o.b) at current prices	3. 3	-21. 1	-0. 1	-64. 3	19. 5	25. 0	129. 6	31. 9
Imports (c.i.f) at current prices	-2. 3	-4. 3	0. 8	-8. 1	52. 5	40. 9	3. 3	-16. 9
Export volume	1. 9	-11. 7	-10. 9	-76. 4	24. 5	...	...	...
Import volume	0. 8	0. 7	-6. 1	-14. 4	49. 6	...	...	...
Terms or trade (decline)	4. 6	-4. 7	3. 6	5. 5	-7. 7	...	...	...
Real effective exchange rate								
(depreciation)	5. 4	15. 3	5. 4	-19. 2	13. 2	...	...	...
Money and Credit								
Net domestic assets	2. 1	57. 4	32. 1	-12. 2	56. 9	4. 5	7. 4	-20. 4
Net domestic credit	-9. 8	-5. 6	8. 3	-0. 2	39. 4	-7. 0	-16. 5	-5. 4
Of which								
Government	-17. 1	-16. 5	4. 7	-1. 3	33. 2	-14. 9	-26. 4	-12. 9
Private	7. 3	10. 9	3. 6	1. 1	6. 2	7. 9	9. 9	7. 5
(annual percentage change)	28. 4	44. 0	11. 8	4. 0	22. 8	30. 2	32. 1	21. 6
Money and quasi-money (M2)	33. 2	17. 1	9. 8	19. 8	28 . 3	11. 0	17. 0	13. 0
(excluding foreign currency deposits)	...	...	...	12. 8	17. 8	11. 0	17. 0	13. 0
Treasury bill rate								
(percent per annum end-period)	43. 8	20. 3	8. 4	27. 9	20. 0	...	...	...
(In percent of GDP, unless otherwise indicated)								
Public Finances								
Central government								
Revenue (excluding grants)	12. 0	13. 8	14. 0	9. 5	9. 8	11. 5	13. 1	14. 4
Of which								
Tax revenue	11. 6	13. 3	13. 6	9. 2	9. 7	11. 3	12. 9	14. 2
Expenditure	20. 9	20. 5	20. 4	19. 4	17. 2	19. 2	19. 1	19. 0
Current expenditure	8. 4	10. 4	11. 7	14. 0	11. 0	10. 3	10. 4	10. 5
Subsidies and transfers	0. 7	0. 7	0. 8	0. 7	0. 7	0. 7	0. 7	0. 7
Total interest payments	6. 8	5. 0	3. 2	2. 0	2. 1	1. 7	1. 3	1. 0
Capital expenditure	5. 0	4. 4	4. 7	2. 6	3. 3	6. 4	6. 7	6. 9
Overall fiscal deficit								
(commitment basis, excluding grants)	-9. 0	-6. 7	-6. 3	-9. 8	-7. 4	-7. 6	-6. 0	-4. 6
(excluding election expenses)	...	...	...	-9. 8	-6. 3	...	...	...
(excluding foreign-financed								
reconstruction spending)	...	...	...	...	...	-4. 9	-3. 6	-2. 5

Table 3 (continued)

	1992	1993	1994	1995	1996	1997	1998	1999
(Annual percentage change, unless otherwise indicated)								
Primary fiscal deficit (excluding grants)	2. 7	2. 0	0. 7	-5. 6	-1. 1	0. 7	2. 2	3. 4
Military expenditure (cash basis,								
including payment of arrears)	2. 7	3. 4	3. 9	4. 5	4. 6	3. 6	2. 5	1. 9
Savings and investment								
Gross domestic saving	6. 3	3. 3	3. 4	4. 5	-9. 7	-7. 4	2. 6	8. 3
Public sector	2. 8	2. 7	1. 5	-4. 5	-1. 2	1. 2	2. 7	2. 9
Private sector	3. 6	0. 6	1. 8	-4. 6	-8. 5	-8. 7	-0. 1	4. 3
Gross domestic fixed capital formation	8. 2	7. 7	8. 5	5. 6	9. 3	16. 4	16. 8	13. 5
Public sector	4. 7	5. 3	4. 4	2. 6	3. 3	6. 4	6. 7	6. 9
Private sector	3. 6	2. 4	4. 1	3. 0	6. 0	10. 0	10. 1	6. 6
External current account balance								
Including official transfers	-13. 4	-12. 4	-14. 8	-17. 3	-13. 3	-15. 7	-12. 2	-7. 4
Excluding official transfers	-17. 4	-16. 1	-17. 5	-21.1	-20. 9	-25. 7	-20. 3	-13. 7
External and public debt and debt service								
Public sector								
external debt, end of year	167. 4	153. 3	128. 6	125. 9	120. 0	109. 8	101. 7	94. 6
Public sector external debt service	12. 8	10. 2	9. 7	10. 2	5. 1	3. 1	2. 7	3. 4
Of which								
Interest due	8. 3	6. 0	6. 3	6. 3	1. 6	1. 3	1. 3	1. 1
Public sector external debt service/exports								
of goods and services (percent)	41. 3	42.1	54. 5	84. 3	43. 0	25. 7	15. 4	17. 9
Public sector domestic debt, end of year	4. 4	2. 7	3. 2	3. 9	5. 4	4. 2	2. 2	1. 2
Gross official reserves								
(In millions of US dollars)	19. 0	29. 6	40. 6	35. 0	26. 8	43. 8	63. 8	83. 8
(In months of imports of goods								
and services)	1. 5	2. 4	3. 3	3. 1	1. 5	1. 8	2. 5	4. 0
Exchange rate (Leone / US dollar,								
period average)	199. 4	567. 5	586. 7	755. 2	920. 7	929. 0	965. 6	989. 3
Nominal GDP (In millions								
of US dollars)	691. 1	771. 1	927. 3	865. 9	940. 6	1067. 8	1,254. 5	1,397. 6

Source: Bank of Sierra Leone Publication April 1997.

The country continued to rank near the bottom on most social indicators especially in the wake

of the 1990s. This is largely due to the extensive devastation of the country's economic resource

base as a result of the ten years of fighting. Average life expectancy stood at around 40 years,

while infant and maternal mortality rates are claimed to be among the highest in the world (see

table 1.2 below on Income and Social Indicators for Sierra Leone).

Table 4: Income and Social Indicators for Sierra Leone

	Latest single year			Programme			.
	1970-75	1980-85	1990-95	1996	1997	1998	1999
Population							
Population (midyear, thousands)	2,931	3,582	4,510	4,630	4,748	4,867	4,989
Population growth rate							
(annual percentage change)	2. 0	2. 1	2. 5	2. 6	2. 5	2. 5	2. 5
Urban population							
(percent of population)	21. 1	28. 3	38. 9	...	...	...	...
Income							
GDP per capita (in US dollars)	250	330	192	203	225	258	280
consumer price index (1990 = 100)	0. 3	4. 4	605. 8	745. 9	766. 4	815. 2	854. 4
Share of income (percent)							
Lowest quintile	6	...	...	...	...	...	...
Highest quintile	53	...	...	...	...	...	...
Social Indicators							
Share of public expenditure (in percent of GDP)							
Health	...	...	1. 0	1. 1	...	...	...
Education	2. 4	1. 5	2. 8	1. 8	...	...	...
Social security and welfare							
Net primary school enrollment rate (in percent of school age population)							
Total	39	47	48	...	...	...	...
Male	47	55	56	...	...	...	...
Female	30	39	39	...	...	...	...
Access to safe water (in percent of population)							
Total	12	24	43	...	...	...	...
Urban	75	58	85	...	...	...	...
Rural	1	8	...	...	...	...	...
Immunization rate (in percent under age)							
Measles	...	58	54	...	...	...	...
DPT	...	23	41	...	...	...	...
Child (under 5) malnutrition rate							
(in percent of age group)	31	...	23	...	...	...	...
Male	34	34	37	38	...	...	...
Female	37	37	43	44	...	...	...

Table 4 Continued

	Latest single year			Programme			
	1970-75	1980-85	1990-95	1996	1997	1998	1999
Life expectancy at birth (years)							
Total	35	35	40	42	...	...	...
Male	34	34	37	38	...	...	...
Female	37	37	43	44	...	...	...
Mortality							
Infant mortality rate							
(per 1000 live birth)	193	189	179	...	...	...	...
Under age mortality rate							
(per 1000 live birth)	...	...	236	...	...	...	...
Adult (15-59)							
Male (per 1,000 population)	...	...	589	...	...	...	...
Female (per 1,000 population)	...	...	470	...	...	...	...
Maternal Mortality rate							
(per 1,000 live births)	...	450	...	...	...	...	...

Source: World Development Indicators (World Bank, February 1977)

Malnutrition is paramount for both children and expectant mothers. Literacy level was low as adult illiteracy rate stood at around 80 percent. This lack of broad-based human capital development thwarted growth in the formal sector employment, leading to a severe limitation of earnings for many Sierra Leoneans. However, the successful implementation of the Structural Adjustment program in Sierra Leone will hopefully lay down a solid foundation for raising economic growth rates to levels that would enhance a noticeable increase in the living standard of the populace.

2.2 Measures To Improve The Investment Climate.

 Since the attainment of independence from colonial rule in 1961, the government of Sierra Leone recognizes private sector investment as the leading stimulus in enhancing economic growth. The legal framework regulating the activities and procedures pertaining to the improvement of the private sector were reformed in such a manner that the granting of benefits, incentives and guarantees became largely automatic and transparent. This subsequently led to the provision of investment incentives under certain investment codes. The first was pioneered through the Development of Tourism Act 1990. This was followed in 1993 by the establishment of the Sierra Leone Export Development and Investment Corporation (SLEDIC) with the aim of expanding the operations of export oriented manufacturing and processing industries. This decree replaces the Sierra Leone Export Promotion Act,1981 and the Development of Industries Act, 1983. Several other investment codes were established ranging from the income (Tax Amendment) Act 1994, the Fisheries (Management and Development) Decree 1994, and the Mines and Mineral Decree 1998. The Mines and Minerals Decree 1994, NPRC Decree No 5 of 1994 which provides for the establishment of the Mineral Advisory Board for the mining of minerals and for other related matters came into operation on 4th March 1994. The Insurance Act of 1971 determines the rules and regulations by which all businesses operating in Sierra Leone are governed. All classes of insurance scheme are in operation in Sierra Leone.

Capital repatriation and remittance of dividends and interest is also guaranteed to foreign investors under the Foreign Investment Protection Act (FIPA). The conduct of Research and Development is highly encouraged. The expenditure incurred on Research, either by an enterprise or by a recognized institution on behalf of an enterprise can be deducted from the taxable income. Patent rights as well as trademarks are issued to enterprises on meeting certain

requirements. The registration of a trademark is valid for a period of 14 years from the application filling date and renewable for similar periods. All these were meant to create a favorable legal environment along side with investment incentive packages to attract foreign direct investment. The Economic and Fiscal Policy framework (1996/98) and other documents which place emphasis on the increased role of the private sector in the economy outlined by the nation's broad economic development strategies[3]. The major economic reforms to be implemented by the Sierra Leone Government include:

- The abolition of import and export licenses;

- The liberalization of the exchange rate mechanism;

- The rationalization and substantial reduction of import tariffs;

- Removal of restrictions on remittance of profits; dividends and expatriate earnings;

- The authorization of residents and non-residents to open foreign currency accounts with the local banks;

- The provision for exporters to retain 100% of their export earnings.

These reforms have enabled an active foreign exchange inter-bank and foreign exchange bureaus to emerge as well as other financial services. The ongoing divestiture programme of the Government under the Public Enterprise Reform and Divestiture Commission (PERDIC) underscores Sierra Leone's commitment to the private sector initiatives and participation in the economic activity of the country. The primary objective is to attain a wider economic participation in an effort to increase the revenue generation of the country. Not withstanding the aforementioned provisions, the Sierra Leone Government also puts in place appropriate legal

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[3] Broadcasted in the presidential speech of the state opening of parliament in 1988.

guidelines and other measures in an effort to enhance transparency in the quest to win public confidence, which is very significant for a wider participation of potential investors.

The institution of an Export Credit Guarantee Scheme by the Bank of Sierra Leone makes it possible for the provision of pre-shipment finance to be granted by credit institutions (commercial banks) to exporters of goods of Sierra Leone origin. The granting of pre-shipment finance to the business sector by credit institutions is normally limited on credits required to purchase machinery, manufacture of products, processing and packaging of goods for export. The guarantee for such credits is normally issued for an amount indicated as the permitted limit, which is the limit up to which the commercial banks may grant pre-shipment finance to the exporter during the period the guarantee is in force. According to this arrangement, if the exporter fails to repay the commercial bank from which the pre-shipment finance is obtained, the bank has the right to make claims from the Bank of Sierra Leone a sum equivalent to two third of the amount owed.

Furthermore, Sierra Leone is a member of the Multilateral Investment Guarantee Agency (MIGA) of the World Bank, which provides non-commercial risks coverage for foreign investors in developing countries. The country also entered into bilateral Investment Promotion and Protection Agreements with a number of countries in an effort to provide further protection to their nationals wishing to invest in Sierra Leone, and it is also anticipated that other similar agreement will be negotiated in the future with other countries. Sierra Leone also operates an open door economic policy for foreign investors and foreign capital is welcome. The guidelines provided by the Bank of Sierra Leone are geared towards the enhancement and promotion of foreign investment in all sectors of the economy. The principles of transparency and non-

discrimination were aimed at addressing problems of trade policies deleterious to export led growth and attraction of foreign investment. Published tariff schedules are simplified and not subject to administrative change or discretionary exceptions. The old practices of levying import duties on administered list prices has been replaced by the international norm of using invoice prices as the basis for valuation. The need to streamline broader formalities to reduce unnecessary cost of compliance and delay are being looked into. Access to the GATT/WTO membership also mean that trade policies would be more in line with its objectives, and these practices would be harmonized with countries of the wider world. All these provisions facilitated by the Government of Sierra Leone accounted for the currently active role played by the private sector in fostering the growth objectives of the country.

2.3 **Private Sector Investment Opportunities.**

Small-scale manufacturing, mining, fishing, transport, and agricultural investment projects characterizes the private sector activities in Sierra Leone. At present, it is estimated that the Manufacturing sector contributes only about 6% of GDP. Most enterprises undertake light manufacturing and produce consumer goods such as plastic footwear, small items of furniture, clothing, beer, soft drinks, candles, matches, travel bags, sugar etc. A great deal of opportunities exists in this sector, as profit margins are relatively very high. This is due to the fact that low taxes were levied on this sector to encourage domestic manufacture of goods that were previously imported. Most Manufacturing industries in Sierra Leone are more or less limited to converting imported semi finished materials to consumer goods with the exception of agro-based industries that depend on home grown produce such as tobacco leaf for the manufacture of cigarettes, palm oil for margarine and soaps, timber for plywood and furniture, cocoa beans for cocoa butter, etc. The major manufacturing companies operating in Sierra Leone include the

Aureol Tobacco Company Limited, the Sierra Leone Brewery Limited, the Sierra Leone Match Factory, Magbass Sugar Manufacturing Complex, Freetown Cold Storage, Chanrai Chemicals, Sierra Leone Paint Factory, Sierra Leone Knitting Mills, and the Sierra Leone Oxygen Factory to mention a few. Other investment opportunities mainly classified as small-scale enterprises include activities like Gara dyeing, black smithing, cassava processing, soap making, tailoring, carpentry and baking. These Small-scale enterprises are the most dominant in Sierra Leone by virtue of their small initial capital requirement. Their significance lies in the fact that they provide self-employment opportunities for a greater portion or the rural population.

The mining sector in Sierra Leone proved to be the chief earner of foreign exchange, a major source of government income and an important provider of employment. Diamond, Gold, Bauxite, Rutile and Iron are the key minerals that dominate the mining sector. Several incentives were put in place to encourage the export of alluvial diamonds through official channels by maintaining taxes and fees at only 2.5 percent of total export value. Mining regulations in support of Mineral Act were drafted and enacted in December 1997. Promotional programs were also initiated by the end of 1998 in a bid to attract targeted investors in various mining activities. A national mineral survey was also initiated in 1997 to provide a detailed account of mineral resources in the country.

 Unlike Diamond and Gold whose mining activities can be easily undertaken by private individuals, Iron, Rutile and Bauxite mining is exclusively undertaken by joint ventures between the government and reputable foreign companies. This is largely due to the heavy initial capital requirement to undertake their mining activities. In Sierra Leone, approximately 70% of the total mining population is engaged in diamond mining. Out of this, about 80% of the diamond

mining activities is of the alluvial type, which is largely characterized by illicit mining. Since few private indigenes in the mining sector can afford to procure mining equipments like washing plants, airlifts, bailing machines etc, alluvial diamond mining is easy for most indigenous miners as it requires less capital investment. Those engaged in alluvial mining activity used crude implements like shovels, pickaxes, locally made gravel-washing instruments called "shakers". Lebanese constitute of the most dominant foreign group actively engaged in diamond mining activities in Sierra Leone. Unlike the Sierra Leonean indigenes engaged in the mining sector, their Lebanese foreign counterpart are better off as they can afford to access better mining machinery implements. Thus many Sierra Leoneans either establish mining partnership with the Lebanese or they work for them in their mines. So there is a kind of dominance by the Lebanese people in terms of the overall private mining activities. Besides, they are the main merchants involved in diamond buying activities in Sierra Leone with a higher prospect of smuggling incidences. The high involvement of the Lebanese people in the diamond mining and buying activities in Sierra Leone is seen by many as a major source of the country's potential loss of its wealth through smuggling and repatriation of mines income. Though the policy objective for mining development in Sierra Leone is to encourage the intensification of exploration for mineral resources, encourage both foreign and local investment in mines development, and ensure security of tenure for those who participate in this sector, yet measures need be put in place to minimize the high incidence of smuggling of the country's major resource.

Agriculture, besides being the mainstay of the Sierra Leone economy is perhaps the largest in terms of the proportion of those it offers employment. It provides export items such as coffee, cocoa, palm oil, palm kernel, piassava and ginger. These products provide opportunities for new

investors in both the growing and processing of raw materials. Sugar cane is use for sugar production, fruits such as pineapple and oranges for juices, jams and canning oil seeds such as groundnuts, sunflowers and Soya beans for oil extraction, and cotton for spinning and weaving. Opportunities also exist in the production and exportation of products such as cut flowers, fresh beans, mushrooms, asparagus, mangoes, avocados, passion fruits, melons and chillies to mention a few. There are large tracts of land yet to be exploited and which may be available on a long-term lease basis, or as part of a joint venture arrangement. It is estimated that only a third of the available arable land is currently under intensive cultivation. Most farmers grow Rice (the country's staple food), although the quantity produced in recent times is rather insufficient for domestic consumption. This resulted to large quantities of rice being imported each year since the late 1970s.

Fisheries also constitute a major sector of the Sierra Leone economy open to private investment. Sierra Leone has approximately 485km of coastline rich in lobsters, shrimps, and shark fins. This provides a vast scope for marine fishing and related industries. Part of the production is for export and part is released for local consumption. There is great industrial potential in this sector with a need for well-organized deep-sea fishing. A well-organized fishery fleet for deep-sea resources will be a good source of foreign exchange earnings for investors. The potential yield of the fisheries resources is estimated at around 200,000mt[4] annually. The current production is about 70,000mt. Current statistics reported by SLEDIC indicated that there are presently about 14 registered fishing companies with about 4 cold room facilities. There are about 6,000 canoes in the artisanal fishing sector with only 16% motorized. There is a greater potential for fish farming and deep-sea fishing in the near future.

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[4] These figures were reported by the Sierra Leone Export Development and Investment Corporation (SLEDIC)

Major construction programs for Sierra Leone are to be implemented under the internationally funded Post War Rehabilitation, Reconstruction and Resettlement programme. Investment opportunities exist in the construction of pre-fabricated low-cost houses including the construction of schools, institutions and rehabilitation of infrastructures out side major urban centers. This includes the repairs of roads, construction of bridges and their repairs etc. Sierra Leone has a total road network of about 10,500 km including 1970 km of feeder roads. There is a road link between all major towns with connect roads to numerous rural settings. A proper rehabilitation of the available roads will give the country in the next few years an arterial road network connecting Freetown (the capital) with all major inland centers and possibly providing the basis of developing a modern, efficient and economic transport system.

The coast of Sierra Leone has a considerable tourist attraction. Investment opportunities exist in hotels, restaurants, beach resorts along the coast and other related tourist services. There is an established Hotel Training School, which is meant to meet the needs of potential investors in the tourist industry. Although tourism is making a growing contribution to the Sierra Leone economy, it is still in its infancy since the country's resources in this field are yet to be exploited. According to studies carried out by consultants financed by EEC, the tourist market in Sierra Leone can grow to make Sierra Leone a prime destination for tourist from Europe. In 1990 alone, it was reported that Sierra Leone was receiving about 100,000 tourists a year of whom 95 percent were French. Tourism has traditionally been an important source of foreign exchange and employment generation. According to a report by the Bank of Sierra Leone(April 1995), Hotel revenue grew at an average rate of 17 percent a year between 1980 and 1991. However, since the inception of the rebel war in 1991, Hotel revenue fell down considerably.

The liberalized financial system in Sierra Leone offers opportunities for profitable investment in the provision of new financial products and services in banking and insurance. The country has a financial system consisting of the Bank of Sierra Leone and five other commercial banks; Barclays Bank, Standard Chartered Bank, Sierra Leone Commercial Bank and Union Trust Bank. Due to the recent closure of the Barclays Bank (which is foreign owned), an indigenous bank call the Rokel Commercial Bank was established in replacement of the Barclays Bank. Some of these banks have branches in the provinces. Foreign currency denominated accounts can be maintained locally at commercial banks. Furthermore, Sierra Leone intends to establish capital markets and the Government's privatization programme, now underway, is expected to further strengthen the capital markets. The Bank of Sierra Leone supervises the country's financial system, controls and regulates the nation's money supply and foreign reserve. Under its development finance program, the Bank of Sierra Leone operates a premium Savings Bond Scheme whose profits ensure the provision of Agricultural Credits and an Export Credit Guarantee Scheme and Government Securities Market. The latter includes securities of a short and long-term nature and treasury bills with discounting facilities. The commercial banks charge fees for their services, the amount of which varies from bank to bank. Competition among the banks affects the scale of charges as well as the fixing of the exchange rate for buying and selling foreign currency. The Sierra Leone Postal Services (SALPOST) and the Sierra Leone Housing Corporation (SALHOC) operate savings banks. There are also rural banks supervised by the bank of Sierra Leone.

2.4 Trends in Private Investment.

A proper analysis of investment activities in Sierra Leone could be attempted by first looking at the pattern of investment over the years using trend analysis. This would be of much help in an attempt to portray a better picture of investment behavior in Sierra Leone.

Table 5: Private investment in Sierra Leone (expressed as a ratio of GDP).

Year	GDP (million Leones)	Private Investment PIV (million Leones)	Private Inv as a ratio of GDP (PIV/GDP)	Annual Change in PIV/GDP	Annual % Change in PIV/GDP	Annual Private Investment as a % of GDP
1		3	4	5	6	7
1966	262	17.816	0.068			6.8
1967	262	18.602	0.071	0.003	4.411	7.1
1968	275	20.075	0.073	0.002	2.816	7.3
1969	325	22.365	0.071	-0.002	-2.739	7.1
1970	355	26.27	0.074	0.003	4.225	7.4
1971	349	24.43	0.07	-0.004	-5.405	7
1972	356	25.988	0.073	0.003	4.285	7.3
1973	393	29.475	0.075	0.002	2.739	7.5
1974	479	37.762	0.079	0.004	5.333	7.9
1975	573	43.548	0.076	-0.003	-3.797	7.6
1976	614	47.248	0.077	0.001	1.314	7.7
1977	744	62.496	0.084	0.007	9.09	8.4
1978	850	59.5	0.07	-0.014	-16.66	7
1979	1029	74.088	0.072	0.002	2.857	7.2
1980	1156	40.46	0.035	-0.037	-51.38	3.5
1981	1292	147.28	0.114	0.079	225.71	11.4
1982	1605	125.19	0.078	-0.036	-31.57	7.8
1983	1876	165.09	0.088	0.01	12.82	8.8
1984	2730	294.84	0.108	0.02	22.72	10.8
1985	4746	294.25	0.062	-0.046	-42.59	6.2
1986	7331	505.83	0.069	0.007	11.29	6.9
1987	22472	1011.24	0.045	-0.024	-34.78	4.5
1988	43305	1350	0.031	-0.014	-30.72	3.1
1989	55804	3738.9	0.067	0.036	114.9	6.7
1990	96133	5671.8	0.059	-0.008	-11.9	5.9
1991	192428	11738	0.061	0.002	3.39	6.1
1992	327259	11781	0.036	-0.025	-40.9	3.6
1993	467188	11212	0.024	-0.012	-33.33	2.4
1994	543711	22292	0.041	0.017	70.83	4.1
1995	710389	21311	0.03	-0.011	-26.82	3
1996	856246	26543	0.031	0.001	3.33	3.1
1997	959488	8976	0.009	-0.022	-69.82	0.9
1998	998798	23000	0.023	0.014	145.85	2.3

In this analysis, private investment is expressed as a percentage of GDP. Due to data unavailability for certain time periods, the current trend analysis is made for the period 1966-1998 for which data was collected. The trend of Private investment in Sierra Leone from 1966 to 1998 is shown in figure 3 below (which is plotted from the values of column 7 of table 5). From this figure, it could be observed that for the period 1966 to 1977, private investment (as a percentage of GDP) increased from about 6.8% in 1966 to around 8.4% in 1977. This period characterizes the most prosperous and stable era in the economic history of the country. GDP growth rate stood at around 4.1% during this period(see figure 1). From 1977 to 1980, private investment (as a percentage of GDP) declined steadily from 8.4% in 1977 to around 3.5% in 1980. This decline in private investment may be explained in the context of the perceived "crowding-out" effect on the private sector following the high expenditure for hosting the O.A.U summit in Sierra Leone in 1980. The fact of the matter is that, there was an observed decline in public spending on infrastructure in order to make provision for financing the anticipated high cost of hosting the O.A.U in the country. This huge increase in government spending for hosting the O.A.U was in part financed by borrowing from domestic sources, thereby leaving less funds available to the private sector. As can be observed from the trends portrayed in the figure below, private investment (as a percentage of GDP) experienced a big leap from around 3.5% in 1980 to a peak of about 11.4% in 1981.The National Development Bank was very instrumental during this period in creating a conducive atmosphere for private investment activities through the provision of long-term loans to the private sector. Thereafter, private investment (as a percentage of GDP) fluctuated between 7.8% in 1982 to around 10.8% in 1984. After 1984, private investment (as a percentage of GDP) experienced a persistently fluctuating downward trend, hitting minimum points of about 2.4% and 2.3% in 1993 and 1998 respectively, with a characteristic negative growth rate of GDP. One possible explanation for

this down turn in private investment in the mid 1980s may be due to the implementation of the so called "Economic Emergency Act"[5] in 1987 by the then APC government under the leadership of President Joseph Saidu Momoh .

Figure 3: Trend in private investment in Sierra Leone (annual % share of GDP).
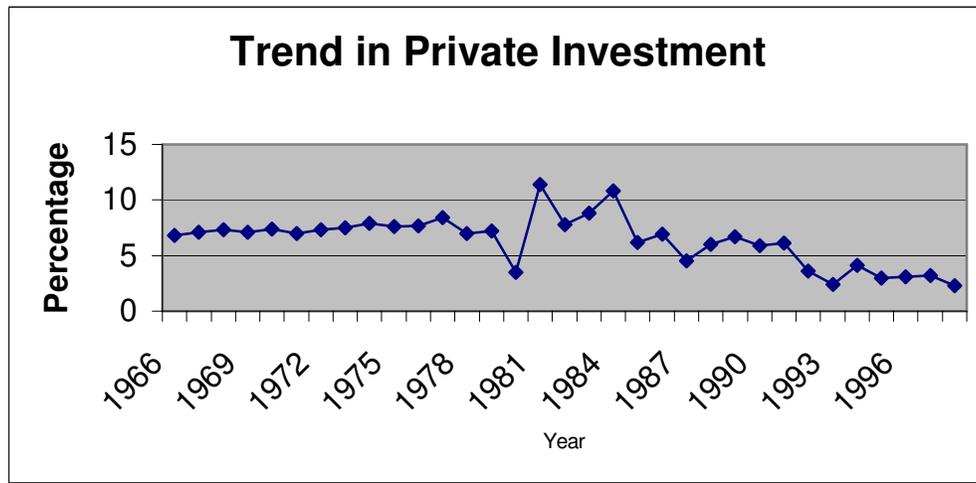
Sierra Leoneans, however, viewed this Act as posing an unfavorable atmosphere for the conduct of viable business activities. The stringent monetary policies following the introduction of this Act added salt to injury in the business sector as credit facilities to the private sector dwindled significantly afterwards. The outbreak of the rebel war in 1991 aggravated the problem through out the 1990s. The intensification of hostilities in the mid 1990s saw many private firms, both indigenous and foreign owned closed down completely. Foreign owned private banks were as well closed down both in the urban centers and provincial headquarters of Sierra Leone. This development further aggravated the already financially constrained private sector.

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[5] This Act warranted people not to hold more than a certain amount of money at hand. The Act made it a criminal offence for people holding more that the stipulated amount of money in their premises. It means
an amount of money above a certain stipulated quantity should be taken to the Banks.

CHAPTER THREE

<u>LITERATURE REVIEW</u>

3.1 Theoretical Literature

Different Economists propounded several theories of investment over different time periods. This section will endeavor to unearth some of the very prominent theoretical literature on investment. More specifically, the Keynesian theory of investment, the accelerator principle, the neoclassical flexible-accelerator theory of investment, the Tobin's Q-theory, the Disequilibrium models of investment and theories based on irreversibility and uncertainty will all be reviewed in the paragraphs that follows.

The Keynesian theory of investment was propounded in the 1930s by one of the most celebrated British Economist, John Maynard Keynes. Keynes (1936), was the first to draw attention to the concept of an independent investment decision function in the economy. According to him, investment is considered as a function of the marginal efficiency of capital in relation to a given level of interest rate that reflects the opportunity cost of the invested capital. Investment, he said, can be worth undertaken if the present value of the future income stream from a given level of capital investment is equal to or greater than the initial cost of capital. He further argued that investment spending could be highly volatile partly due to the underlying uncertainty associated with the expected returns on investment. This argument presented a strong case in explaining the concept of the Business Cycle. Keynes further postulated that the decisions to undertake capital investment are based on what he referred to as the "animal spirit" of the

investors. By the term "animal Spirit", he considered investment decisions as being very much affected by the level of optimism or pessimism that the investors construed about the general atmosphere within which the investment project will be undertaken. This implies that the decision to invest or divest largely depends on the individual investor's expectations about the possible outcome of the investment venture. He therefore considered the volume of investment at any point in time as being largely determined by the investors' rational expectations formation about the economic environment within which they operate.

Between the 1950s and the early 1960s, the accelerator principle emerged as a dominant theory of investment following the motivation arising from the celebrated works of Keynes in the 1930s. This theory postulated a linear relationship between investment and output. One of the popular views of the accelerator theory of investment is that, given an incremental capital /output ratio, it will be possible to calculate the level of investment required enhance a given targeted level of output growth. A basic assumption of this theory of investment is that, there is a fixed ratio of desired capital stock to output. The limitations of the accelerator principle however emerged from the very simplistic assumptions that (1) there is a fixed ratio of desired capital stock to output, (2) there is enough investment to keep the desired capital stock to the actual capital stock.

As a result of the above-mentioned limitations of the accelerator principle of investment, it was later modified to what became the flexible accelerator principle of investment, which is based

on the optimal accumulation of capital[6]. The basic assumption of the flexible-accelerator principle is that, investment is a function of the level of output and the user cost of capital. The user cost of capital is however dependent on the price of capital goods, the real interest rate, and the rate of depreciation of capital assets.

Joshua Greene and Delano Villanueva (1991) claimed that, the neoclassical flexible-accelerator model has been the most widely accepted general theory of investment behavior and that; empirical tests of the model using data from several industrial countries have been quite successful. They cited for instance the works of Bischoff (1969), Hines and Catephoros (1970), Jorgenson (1967, 1971), and Clark (1979)[7]. However, they also cited the main limitations of the flexible-accelerator principle as being hard to test in developing countries because of two key assumptions of the model such as the existence of perfect capital markets, and little or no government investment. They considered these two assumptions of the model as being unrealistic, and further pointed that certain variables such as capital stock, real wages, and real financing for debt and equity are normally either unavailable or inadequate.

Due to the inherent problems associated in applying the neoclassical flexible-accelerator model in developing countries, one line of research pioneered by Mckinnon (1973) and Shaw (1973), has abandoned this model, advancing instead the hypothesis that private investment in developing countries is positively related to the accumulation of domestic real money balances.

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[6] The modification of the accelerator principle to the flexible –accelerator theory is associated with the works of Jorgenson (1967) and Hall and Jorgenson (1971).

[7] A good treatment of this can be found in the works of Joshua Greene and Delano Villanueva (1991) on "Private Investment In Developing Countries" An Empirical Analysis.

The key assumption under the Mckinnon (1973) and Shaw (1973) version of private investment is that, private investors in developing countries must accumulate adequate money balances before undertaking investment projects due to the limited access to credit and equity markets. This line of reasoning is based on the fact that, since money balances are directly influenced by real deposit interest rate, there should therefore be a positive relationship between private investment and real interest rate in these countries. The only short-coming of this approach is that it disregards the negative effect of higher real interest rates on private investment through resultant increments in the user cost of capital that normally follow higher interest rates.

The "naïve" accelerator model assumes that investment is determined by the changes in the level of output. If we denote the stock of capital by K and output by Q, the naïve accelerator model is given by the equation shown below:

$$K_t - K_{t-1} = \beta(Q_t - Q_{t-1})...1$$

The above equation can be written as:

$$\Delta K_t = I_t = \beta\Delta Q_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.2$$

Where β is the acceleration coefficient, which represents the increase in the capital stock, resulting from the change in the level of effective demand. This model of investment is referred to as being naïve since it assumes that the level of present day investment is only influenced by changes in output in the current period.

In the case of the flexible accelerator model, it is assumed that investment is determined not only by the current change in output, but also by earlier changes in the level of output. In modeling the flexible accelerator, we therefore need to introduce one or more lags of changes in

the level of output, ΔQ. In some cases, use is made of the partial adjustment model. The basic assumption in the application of the partial adjustment model is that, the desired level of capital stock depends on

the current level of output. This is represented as follows:

$$K_t^* = \beta Q_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3$$

The above equation can be written alternatively as:

$$I_t^* = \Delta K_t^* = \beta \Delta Q_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4$$

From the above equations, we can now formulate the partial adjustment model as:

$$K_t = \lambda \beta Q_t + (1 - \lambda) K_{t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

By taking the first difference of the above equation, we have:

$$I_t = \lambda \beta \Delta Q_t + (1 - \lambda) I_{t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

This final equation can be used for both estimation and hypothesis testing using the linear regression model.

In another development, James Tobin (1969), pioneered one of the most challenging theories of investment referred to as the Tobin's Q-theory of investment. The central idea behind this theory of investment is focused on how to measure the gap between the desired and actual level of capital stock. According to Sachs and Larrain (1993), they advanced an appropriate definition of the q as "the ratio of the cost of the acquisition of a firm through the financial market to the cost of acquiring the firm's capital in the output market". With regards to this definition, if the

value of q > 1, it indicates that the desired capital stock is greater than the actual level of the capital , meaning that the market value of the firm exceeds its cost. This implies therefore that investment is bound to rise. The reverse holds in the case where q < 1.

As the search for optimal solutions for models of investment continued, another variant of investment models branded as "Disequilibrium Models of Investment" emerged. The origin of these models can be traced following the works of Malinvaud (1980, 1982) and Sneessens(1987). These models were based on the idea that investment depends on profitability and output demand conditions. Malinvaud's point of view is that, investment decisions can be disintegrated into two major stages. The first and foremost stage involves decision relating to the expansion of the level of productive capacity, which in turn depends on the level of capacity utilization in a given economy. The other stage involves decision relating to the capital intensity of the extra capacity, which is dependent on the cost of capital and labor input. According to Serven and Solimano (1992), it is of relevance to have a distinction between the two decisions due to the assumption of Putty-Clay Technology; so that factor proportions are flexible ex-ante and rigid ex-post. In a sense, it thus implies that the proportion in which inputs are combined before investment vary but fixed there after. Sneessens (1987), postulated that net investment is positively related to the gap between actual and long run equilibrium capacity. This gap is seen as reflecting the discrepancy between actual and equilibrium rates of capacity utilization (sales constraints), and actual and equilibrium mark up rates (profitability). It is thus believed that these situations of disequilibria is what influence investment behavior. The simplistic assumption upon which disequilibrium models are based has to do with rational expectation and market disequilibrium to exist side by side. It is further argued that both the input and out put market may not clear when rational economic agents anticipate future sales constraints, and

price and wage rigidities. Thus the market disequilibrium model and rational expectations can combine to explain the determination of investment.

Rama (1987), pioneered a work by developing a model which improves on the Disequilibrium models of investment by augmenting the sales constraint and profitability with credit constraints. This model is considered appropriate for developing countries where credit availability posed a very serious constraint on private investment activities. It is argued that the low level of savings ratio in developing countries is as a result of the low foreign savings resulting from high stock of foreign debt coupled with the low domestic savings due to large budget deficits. In most LDCs, the existence of financial repression means firms at the micro level face credit rationing. With credit rationing, firms' retain earnings or internal finance and external finance, such as bank credit and bonds are not perfect substitutes. This is due to the fact that rationing raises the cost of new debt and equity over and above the opportunity cost of retain earnings[8]. With the existence of credit rationing, firms might not be able to undertake their desired level of investment.

A lot of criticisms came up in recent times on the issue of the applicability of some of the above-mentioned theories of investment in developing countries. In a paper titled "Government Policy and Private investment in Developing Countries", Blejer and Khan (1984) highlighted the main objections with regards to the applicability of the neoclassical models of investment in developing countries. According to him, institutional and structural factors such as lack of well-functioning financial markets, distortions arising from foreign exchange constraints, the relative large role of the government in capital formation, and other market rigidities constituted the

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[8] See Servan and Solimano(1992) pp 99

main problems that limit the successful application of these models in developing countries. Furthermore, they argued that severe data constraints on such variables like the stock of capital, the labor force, and wages posed very serious problems in these countries. However, recent studies (especially those by Sundararajan and Thakur(1980) and Tun Wai Wong (1982)) attempted to incorporate certain versions of the neoclassical models of investment in developing countries. On the contrary, McKinnon and Shaw (1973) abandoned the use of the neoclassical models of investment for developing countries partly due to the above-mentioned constraints. They advanced the hypothesis that private investment in developing countries is a positive function of the accumulation of domestic real money balances. The main assumption of this hypothesis was based on the fact that private investors in developing countries are constrained by limited access to credit and equity markets.

According to yet another recent approach referred to in the literature as the "neoliberal" school (Galbis ,1979), much significance is accorded to financial deepening and high interest rate as viable instruments in enhancing growth. The main advocates of this approach are Mckinnon (1973) and Shaw (1973). They strongly believed that the main problem in developing countries is related to financial repression,[9] and that if these countries avoid such practices, it will induce savings through which investment could be enhanced to promote growth. They argued that liberalization of the interest rate would not only stimulate savings and hence loanable funds, but it will also enhance a more efficient mechanism for the allocation of the available funds with the ultimate aim of achieving a higher growth rate of the economy. In the "neoliberal" approach, therefore, investment is considered to be positively related to the real rate of interest. This view provides a direct contrast to the neoclassical school, which hypothesized a negative relationship between investment and real interest rate. The core argument in the neoliberal approach is based

on the fact that a rise in the rate of interest will stimulate the level of savings through financial intermediaries, and thereby increases the volume of investible funds. This phenomenon by which the volume of investment could be raised via the resultant increase in the level of investible funds made possible by a rise in the interest rate is what McKinnon (1973) referred to as the "conduit effect". In real world situation, while it is true that the demand for investment is negatively affected by the real interest rate, in the case of developing economies where financial repression is in wide practice, realized investment actually increases as a result of the greater availability of funds made possible through increases in the real rate of interest.

Owing to the irreversible nature of investment projects, the recent literature has introduced an element of uncertainty in the analysis of investment behavior (Pyndick ,1991). The main assumption in this argument is that, most capital goods are considered firm specific, and sometimes with low resale value. With such a case, disinvestments will be very costly as alternative uses for such firm-specific capital goods may not be possible. It is further argued that, the net present value (NPV) rule[10] needed modification due to the irreversible nature of certain investment project. This is because, it may be costly for the firm to disinvest should market conditions change adversely. So under conditions of uncertainty, coupled with the irreversibility nature of capital goods, investment decisions can be delayed to give firms the opportunity to access information about the future. This is so because, once investment is made, shifting capital usage to other sectors will be difficult or liquidation can be made at the risk of capital loss. According to Pyndick (1991), this loss option value is an opportunity cost that must be included as part of the cost. He further argued that, "the value of the unit must exceed the

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[9] This has to do with stringent control on interest rates especially in the downwards direction.
[10] which says, one should undertake investment if the value of a unit of capital is at least as large as its cost.

purchase and installation cost, by an amount equal to the value of keeping the investment option active".

Rodrik(1991) came up with yet another element of uncertainty referred to as policy uncertainty. He strongly believed that Policy uncertainty has a serious effect on investment behavior. According to him, when a policy reform is introduced, it is very unlikely that the private sector will see it as one hundred percent sustainable. The expectations that the political-economic configuration that supported the earlier policies may resurface, and the fear that unexpected consequences may lead to a reversal of the new policy are the two basic reasons for such behavior by the private sector. For the policy reform to be successful, he argued that investor must duly respond to the signals generated by the policy reforms. Rational behavior from the part of the investors may lead to the withholding of investment activities until much of the uncertainty regarding the eventual success of the reform is eliminated.

In another development, Dixit and Pindyck (1994) posed the argument that three main features characterize investment decisions: Firstly, investment decisions are quite irreversible in the sense that the initial cost of investment comprises of a sunk component that cannot be retrieved once the investment decision is made. Such costs include expenses incurred on major infrastructures like buildings, roads construction, bridges and the purchase of certain types of machines. Secondly, they argued that the decision to invest has a risk component arising from the uncertainty over the future outcomes from the investment project. This implies that the decision to undertake an investment project depends on the investor's assessment of the probabilities of the outcomes associated with profits or loss. Thirdly, the timing of investment decision is fundamental on the side of the potential investor. This means that the investor has the option to postpone the investment decision in an effort to accumulate enough information

about the future. These three features characterizing the decision to undertake investment projects are tantamount in the process of determining the optimal investment decision-making. If these arguments do hold, it implies therefore that, the predictions of the earlier versions of the neoclassical models of investment which lay emphasis on such factors like changes in the interest rate, changes in tax policy etc, will be of less significance in determining private investment as when compared to the volatility and uncertainty of the economic environment. Dixit and Pindyck (1994) attempted to measure the degree of uncertainty of the economic environment by the level of fluctuations in prices, profits, input cost, exchange rates, and tax regulatory policies.

Many writers also deliberated on the issue of profits and sales as major determinants of private investment activities. Realized profits are said to act as guides to business people in making judgment about the prospect of future profits. The major drive towards undertaking investment expenditure is centered on the expectation that the investment project will be profitable. In cases where there is uneasy access to investible funds through financial institutions (as is the case in developing countries) firms largely depend on financing their investment out of retained profit. The greater the levels of profits are, the better are the possibilities of self-financing business. Major works on the relationship between investment and profits/sales were done by Kuh (1963), Grunfeld (1960), Eisner (1967) to mention a few[11].

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[11] For a detail treatment of these works, see Jorgensen, D.W. (1967) PP. 129-55.

3.2 Empirical Literature

Greene and Villanueva (1991), carried out a study on the determinants of private investment using a sample of 23 developing countries. Their main objective was to analyze the impact of various macroeconomic factors on private investment activities during the post 1974 period in a wider range of developing countries. According to the empirical evidence of their study, private investment has a positive relationship with real GDP growth, but rather negatively related to domestic inflation, real interest rate, debt service ratio, and the ratio of debt to GDP. One main thing noted in this study is that the results were rather more robust before the 1982 debt crisis.

Fielding (1994) carried out a similar study to investigate the determinant of private investment using a model similar to that of Greene and Villanueva. The result of this study confirmed a positive relationship between private investment and the level of GDP per-capita. In contrast, Ozler and Rodrick(1992) pioneered a similar study using a sample of developing countries over the 1975-1985 period. Their study revealed that the coefficient of GDP per-capita was not significant in their investment model.

Blejer and Khan (1984) in their study to investigate the impact of government policy on private investment, collected data on a sample of 24 developing countries. The outcome of this study indicated that private investment has a positive relationship with changes in expected real GDP, the level of public sector investment, credit fund availability[12]. The result of the study however pointed out that private investment is negatively related to excess productive capacity. In essence, this study confirmed that there is a long-run complementarity between private

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[12] This is measured by the change in bank credit for the private sector and in the level of private capital inflows.

investment and public sector investment. In the short-run, however, public sector investment and private investment are seen to be substitutes for one another. This is due to the fact that public sector investment usually crowds out private investment in most developing countries.

Dailamin (1990), carried out a study on "Fiscal Policy and Private Investment in Developing Countries" and found that private investment is positively related with the real deposit rate of interest. This positive relationship between real deposit interest and private investment is consistent with the famous Mckinnon-Shaw(1993)hypothesis.

Pfefferman and Mandarassy (1993), studied the determinants of private investment in developing countries. They identified two major categories of these determinants, which they referred to as positive and discouraging factors respectively. According to their empirical evidence, availability of accessible credit funds to the private sector has a positive impact on private investment. On the other hand, high fiscal deficits, high debt to GDP ratio, and volatility of the inflation and exchange rate all has negative impact on private investment (this is what they referred to as the discouraging factors). They considered variables such as public investment and real interest rate as uncertain factors due to the fact that their impact on private investment are ambiguous and hence cannot be pre-determined.

Oshikoya (1994) carried out a study on the macroeconomic determinants of private investment using a sample of seven African countries for the period 1970-1988. The seven African countries used in this study were the middle-income countries, which comprised of Cameroon, Morocco, Mauritius and Tunisia. The low-income countries were Kenya, Malawi and Tanzania. The estimation procedure was done using the ordinary least square (OLS) approach. The

estimated results indicated that private investment is positively related to public sector investment, the real interest rate for the middle-income countries. For the low-income countries, the results showed a significantly negative relationship between private investment and inflation rate, however, the relationship between real exchange rate and private investment was also negative but rather insignificant. With regards to the issue of the anticipated adverse effect of changes in the terms of trade on private investment, empirical evidence from this study indicated that for both the middle income and low-income countries, the relationship is rather weak. Furthermore, the study confirmed that the availability of accessible domestic credits to the private sector has a positive and significant impact on the level of private investment activities in both the low income as well as the high-income countries covered in the study.

Tun Wai and Chong Hue Wong (1982) studied the determinants of private investment in developing countries. They adopted their model from a version of the modified flexible-acceleration theory of investment, which they applied on data collected from developing countries. They ran separate ordinary least squares regression models on data collected from Malaysia, Greece, Thailand, Mexico and Korea. The results indicated that private investment is positively related to public sector investment, changes in bank credit to the private sector, net capital inflows and private sector out put. The results were all significant for all those countries that data was collected.

Chhibber and Wijnbergen (1988), undertook a study on Public Policy and Private Investment in Turkey. This study revealed that, shifts in the composition of public expenditure towards the provision of major infrastructure facilities had a positive and significant impact on private investment. This result seems plausible especially in the case of developing countries where

certain infrastructures like good roads, transportation, electricity supply, communication facilities, schools etc, are in low supply. Hence, the improvement of such facilities by the public sector is very important for accelerating the needed growth in developing countries.

Khan and Reinhart (1990) carried out a study on private investment and economic growth in developing countries. The conclusion from their study was that both private investment and public investment have different effects on the long-run economic growth rate. Private investment was seen to play a much more -significant role in the growth process than does public investment. The only shortcoming in this study is that it failed to consider the complementary effects of public investment on private investment. Such public expenditures like construction of roads, building of schools, electricity and telecommunication do have a strong effect on private investment.

Asante, Y. (2000) studied the Determinants of Private Investment Behavior in Ghana using data for the period 1970 to 1992. This study revealed that public investment as a ratio of GDP, growth rate of real credit to the private sector, the real exchange rate, the real interest rate, lagged private investment as a ratio of GDP, all have positive and significant impact on private investment. Public investment, growth rate of real credit to the private sector, the real exchange rate, are all significant at the 1% level. On the contrary, measure of macroeconomic instability, political instability represented by coup dummy, and inflation all have a negative impact on private investment in Ghana. The main strength of this study is that, it incorporated many macroeconomic variables that are expected to affect private investment in the context of a developing country. The only weakness of the study is that it used a short time period coupled with the many explanatory variables. Given the short period of the study and the many

explanatory in the model, the degree of freedom will be very low and that may impose constraints in the model estimation process.

Jasperson, Frederist, et al (1995), pointed out that high private investment is common in countries that demonstrate high growth rates, high accessibility to financial resources. According them, high inflation rates as well as government deficits were rather insignificant. Their study further revealed that high private sector investment is also common in countries with relatively open economies, measured by the share of trade flows in GDP.

Zerfu, D. (2001)[13] carried out a study on the Macroeconomic determinants of private investment in Ethiopia using time series data for the period 1965-1999. The result from this study indicated that GDP, public investment on infrastructure and foreign exchange availability all have positive effects on private investment. On the contrary, inflation rate and external debt to GDP ratio showed a negative effect on private investment.

Getnet (1992) carried out a study on the determinants of private investment in Ethiopia using annual data for the period 1970-1989. His findings indicated a negative relationship between public investment and private investment. This result demonstrated a crowding out of public investment on private sector activities. However, on estimating a reduced form of the investment equation, public investment turned out to be insignificant. Further more, real GNP growth was seen to have a negative effect on private investment. This result may not seem plausible, as it is inconsistence with the theoretical economic a priori.

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[13] In a paper presented at Oxford University, Center for the Study of African Economies

In another attempt to investigate the determinants and constraints of private investment in Ethiopia, Mitiku, W. (1996) carried out a study using both time series data for the period 1975-1994, and survey results of investors/ enterprises which have acquired investment certificates from 19992-1995. The results based on the time series data indicated that private investment in Ethiopia is determined by the availability of finance, the real exchange rate, investment policy (private investment policy), debt-service payment and debt-overhang. On the contrary, real interest rate, growth of GDP per capita, public investment and changes in terms of trade did not affect private investment during the period of study. Results based on the survey data pointed out that bureaucratic procedure, lack of infrastructure and access to finance are the main constraints for entry, operation and expansion.

Wisdom, A. (1997) carried out a study on the determinants of private investment in Ghana using data spanning from 1970 to 1994. His study identified real GDP, real lending rate, public investment and credit availability to the private sector as the main determinants of private investment in Ghana. The regression result based on OLS revealed that real GDP, and credit availability have a positive impact on private investment. On the contrary, public investment was seen to have a negative effect on private investment. This negative effect of public investment on the private sector suggests the "crowding out" of public investment on the private sector in Ghana.

In his study on the determinants of private investment in Namibia for the period covering 1970 to 1996, Harupara (1998) found out that public investment, credit to the private sector, real GDP growth, real interest rate, inflation and real exchange rate are the main determinants of private investment in Namibia. The results pointed out that credit to the private sector, real GDP growth

and real invest rate have a positive effect on private investment. However, inflation has a negative effect on private investment in Namibia.

Mbugua, T.K.(2000) carried out a study on "The Micro and Macroeconomic Determinants of Private Investment in the Manufacturing Sector in Kenya". His study identified current and past public expenditure on infrastructure, public expenditure on education, public debt, real interest rates, and real GDP lagged once as the main determinants of private investment I the manufacturing sector of Kenya. He modeled the private investment equation by OLS using data covering the period 1964 to 1998. The result indicated that real interest rate, public expenditure on infrastructure, lagged credit to the private sector, real gross domestic product lagged once and public expenditure on education lagged twice all have positive and significant effect on private investment in the manufacturing sector of Kenya. Public debt, on the contrary, had a negative impact on private investment in the manufacturing sector in Kenya.

In his master's thesis, Mekonnen, G. (1997) undertook a study on the determinants of private and industrial investment in Ethiopia using time series data for the period 1975-1993. The result from this study indicates that lagged gross investment has a negative and significant effect on private investment in Ethiopia. The other explanatory variables in his private investment model are all insignificant. This includes government capital expenditure, lagged GDP and the lagged change of total credit.

In summary, the reviewed empirical literature revealed that growth in real GDP, real interest rate, debt service to GDP ratio, GDP per-capita, availability of credit funds to the private sector, public sector investment, net capital inflows, the real exchange rate and the rate of inflation

among others, explain private investment behavior in most developing countries. There was however some discrepancies on the signs of some of the determinants of private investment. This is particularly the case for public sector investment. In addition to that, most of the reviewed studies were based on cross-country data.

So far, no systematic empirical study on the determinants of private investment in Sierra Leone has been carried out .In addition to that, the theoretical as well as the empirical literature on the reviewed works pointed out several controversies as no clear-cut consensus is arrived at on the impact of certain macroeconomic variables on private investment. That is, while some studies show a positive relationship others show a negative relationship between the same macroeconomic variable and private investment. It is thus necessary to carry a study that will not only identify the major determinants of private investment behavior in Sierra Leone, but that which will also determine both the sign and significance of those determinants. Thirdly, use will also be made of the Johansen's maximum likelihood procedure as well as the Error Correction Modeling technique (ECM) in this study in an effort to analyze both the long-run and the short-run impact for each of the identified determinants of private investment behavior. A combination of these two estimation procedures has the advantage of providing reliable estimates. This is because these estimation techniques make use of cointegration analysis, thereby minimizes the chances of spurious relationships. Thus, this study is an attempt to provide empirical evidences upon which rigorous future research on the determinants of private investment in Sierra Leone will be encouraged.

CHAPTER FOUR

METHODOLOGY OF THE STUDY.

4.1 Model Specification

This section specifies an appropriate model of private Investment behavior in Sierra Leone on the basis of the recent literature. Private manufacturing investment model specifications for developing economies are currently based on the empirical evidences by Solimano (1990), Chhibber and Shafic (1990), Blejer and Khan (1984), Chhibber and Van Wijnbergen (1988), Musalem (1988), and Scmidt-Hebel and Muller (1991). These studies were based on a more flexible version of the accelerator principle in an effort to take account of factors that can best capture the behavior of private investment decision making in developing countries. Thus this study will adopt a model specification procedure following a variant of the flexible accelerator principle in line with the objective of capturing the main determinants of private investment in Sierra Leone.

According to the accelerator principle, the desired capital stock at any time period is proportional to the expected level of output. Mathematically, this proposition is expressed thus:

$$K_t^* = \alpha Y_t^e \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1$$

Where K_t^* is define as the desired capital stock by the private sector in period t, Y_t^e is the expected level of output in period t, and α is a constant denoting the capital output ratio. At any time period t, the desired level of gross fixed investment can be decomposed into two parts. The first consists of an addition to the existing stock of capital while the second part consists of the replacement of warn out capital known as depreciation. This can therefore be represented thus:

$$I_t^* = K_t^* - K_{t-1} + \delta K_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.2$$

By simplifying equation 2 above , we have:

$$I_t^* = K_t^* - (K_{t-1} - \delta K_{t-1})$$

$$I_t^* = K_t^* - (1 - \delta)K_{t-1}$$

On introducing a lag operator (L) in the above equation (i.e $L K_t^* = K_{t-1}$),

we have:

$$I_t^* = [1 - (1 - \delta)L]K_t^* \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.3$$

From equation 1, the accelerator principle was expressed as $K_t^* = \alpha Y_t^e$. Now, by substituting

for K_t^* in equation 3 above, we have:

$$I_t^* = [1 - (1 - \delta)L] \, \alpha Y_t^e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.4$$

Where I_t^* = the desired level of investment in period t,

δ = the rate of depreciation of capital stock,

L = the lag operator,

Y_t^e = the expected level of output in period t.

In order to incorporate the effect of time lags between the planning and implementation period of an investment project, partial adjustment models were introduced in later versions of the flexible accelerator models of investment. In these models, actual gross investment is assumed to adjust in response to the difference between desired investment in period t and the actual investment in period t-1. The adjustment process of such investment models can be represented thus:

$$(I_t - I_{t-1}) = \phi(I_t^* - I_{t-1}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.5$$

Where

I_t, I_{t-1} = the level of actual investment in period t an t-1 respectively.

ϕ = the speed of adjustment whose value is assumed to lie between zero and one (i.e $0 \leq \phi \leq 1$).[14]

Several attempts have been made in the quest to determine the speed of adjustment with which private industrial investment responds to the difference between desired and actual investment. Recent empirical works by Blejer and Khan (1984) and Chhibber and Van Wijnbergen (1988) identified such factors like expectation of profitability, credit availability, government expenditure policies, and real interest rate as having significant impact via way of influencing the ability and initiatives of private investors to implement their investment projects. These factors were therefore thought of affecting the speed of adjustment. Thus they attempted to model the speed of adjustment by incorporating the above factors in a mathematical formulation presented as:

$$\phi = \phi_0 + \frac{1}{(I_t^* - I_{t-1})}[\phi_1\Pi + \phi_2 RI + \phi_3 C + \phi_4 G]..6$$

Where Π represents profits, RI is the real interest rate, C is real credit availability, G is government real capital expenditure . Now by substituting the value of ϕ in equation (6) into equation (5), we have:

$$I_t - I_{t-1} = [\phi_0 + \frac{1}{(I_t^* - I_{t-1})}(\phi_1\Pi + \phi_2 RI + \phi_3 C + \phi_4 G)] (I_t^* - I_{t-1})$$

_____

[14] With this representation, there will be complete adjustment if $\phi = 1$. If $\phi = 0$, it implies no adjustment at all. The closer the value of ϕ is to unity, the higher the speed of adjustment. The reverse is the case when the value of ϕ tends towards zero.

On further simplifying the L.H.S of the above equation we have:

$$(I_t - I_{t-1}) = \phi_0(I_t^* - I_{t-1}) + \phi_1\Pi + \phi_2 RI + \phi_3 C + \phi_4 G$$

$$I_t = \phi_0 I_t^* + \phi_1\Pi + \phi_2 RI + \phi_3 C + \phi_4 G + (1- \phi_0) I_{t-1} \ldots\ldots\ldots\ldots 7$$

From equation 4, we have $I_t^* = [1 - (1 - \delta)L] \, \alpha Y_t^e$. Now by substituting equation 4 in equation

7 we have:

$$I_t = \phi_0[(1 - (1 - \delta)]LY_t^e + \phi_1\Pi + \phi_2 RI + \phi_3 C + \phi_4 G + (1- \phi_0) I_{t-1} \ldots\ldots\ldots 8$$

Equation (8) above is the type of investment model that have been used in several empirical

studies. This model tries to incorporate variables that best capture the behavior of private

investment decision-making. On the basis of the above derivations, the current study will

therefore specify a private investment model as:

$$PIV = \phi_0 + \phi_1(RGDP) + \phi_2(PUBINV) + \phi_3(R) + \phi_4(RER) + \phi_5(INF) + \phi_6(DUM) + \varepsilon_t$$

where:

PIV	=	total private investment.
RGDP	=	real GDP
PUBINV	=	total public sector investment.
RER	=	real exchange rate
R	=	real interest rate.
INF	=	the rate of inflation
DUM	=	a war dummy taking the value of one from 1991 to 1998 and zero

otherwise

ε_t = the error term

The expected signs of the coefficients for the private investment model are as shown in table 3

below .

Table 6: Expected signs of the coefficients for the private investment model.

Variable	Expected sign
RGDP	+
PUBINV	±
RER	-
R	±
INF	±
DUM	-

The coefficient of the term representing real GDP is expected to be positive. This is because as real GDP increases, aggregate demand will increase thereby stimulating an increased production of goods and services through investment undertakings.

The sign of the variable representing public sector investment (PUBINV) is expected to be positive or negative. It is positive if such public investment is geared towards the development of essential infrastructures like roads, electricity, transport and communication etc. However, if the method of financing such public sector investment is through borrowing from domestic financial institutions, this will pose a constraint to private investment with regards to accessing loans from these institutions. In that case, public sector investment is expected to have a negative sign.

The coefficient of the variable representing the real rate of interest (R) is expected to be negative or positive. It can be negative because, a lower rate of interest will induce private economic agents to undertake investment activities due to the low cost of borrowing investment funds associated with lower levels of real interest rate. However, considering the nature of developing countries, which are characterized by heavy financial repression, investment funds may not be readily available to potential private investors. In such a case, the only way to induce

people to mobilize investment funds through savings is by offering high interest rate. This in essence implies that the higher the interest rate offered by financial intermediaries, the more the availability of investment funds through savings and hence the higher the level of private investment. This is the premise of the argument posed by the Mckinnon-Shaw hypothesis, which postulated a positive relationship between the real interest rate and private investment.

The coefficient of the real exchange rate (RER) is expected to be negative. This is because a deprecation (devaluation) of the domestic currency will lead to an increase in the cost of imports in terms of the domestic currency. Since the bulk of the investment capital in developing countries constitute of imported machineries, this will increase the cost of investment and hence a reduction in investment activities.

The coefficient of the term representing the rate of inflation (INF) is either negative or positive. According to existing theory, it is asserted that high domestic inflation can adversely affect the level of private investment due to the level of risk associated with long-term investment activities as a result of the consequent distortionary effect of information signals on prices in the economy. It is believed that high inflation rates act as appropriate signals that indicate the level of macroeconomic instability generated by both external and internal shocks in the economy. Another popular opinion in the literature is that, unfavorable terms of trade resulting from high inflation periods will trigger an increase in the cost of imports relative to income earned from export thereby depressing the purchasing power of income generated from exports. In the words of Temitope .W. Oshikoya (1994), "severe terms of trade, therefore, may worsen the ratio of current deficit to GDP- an indicator of external balance and macroeconomic stability, with adverse consequences on private investment". He further argued that "fluctuating world prices

will not only induce macroeconomic uncertainty, but may also exert an impact on inflation, real exchanger rates, resource allocation and overall investment outlook". According to the Mundell-Tobin effect, however, it is asserted that a higher anticipated inflation rate leads to a lower real interest rate, which will result to portfolio adjustment away from real money balances towards real capital. This therefore implies that higher anticipated inflation would induce an increase in real investment activities by private economic agents[15]. Hence, anticipated inflation is seen to have a positive impact on private investment.

4.2 Method Of Analysis.

The time series properties of the data set used in this study will first be examined by employing vigorous tests for stationarity. There are Several methods of testing for stationarity (eg tests of stationarity based on Correlogram, the Box-Pierce Q statistic and the Ljung-Box (LB) statistic). This paper will however employ the unit root test for stationarity using the Dickey-Fuller as well as the Philips-Perron class of tests. The Dickey-Fuller (DF) as well as the Augmented Dickey-Fuller (ADF) tests will be carried out using PcGive. The Philips-Perron unit root testing exercise will be carried out using E-Views.

After performing the unit root tests for stationarity, cointegration analysis will also be employed to determine the long run relationship of the variables entering the private investment model. By definition, two or more series are said to be cointegrated if they exhibit a well-established long-term relationship. This normally implies that the variables must have a long-term co-movement. For times series variables that exhibit Cointegration, even though they may be non-stationary in levels, but the regression relationship of these variables do have a valid long-run relationship. In

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[15] What we can deduce from this conclusion is the fact that the Fischer effect does not hold in this case. See for

this vain therefore, testing for Cointegration becomes very important when dealing with time series data. This paper will however look at two basic procedures of testing for Cointegration in economic time series variables. These are:

(1) The Engle-Granger Approach (The two-steps Alogrithm)

The test for Cointegration using the Engle-Granger procedure involves two steps. In the first step, unit root tests are carried out in order to determine the order of integration of the series. If all the variables are of the same order of integration, it is possible to run the regression in levels. Given a regression model:

$$Y_t = \alpha + \beta X_{1t} + \theta X_{2t} + U_t.$$

It is required that the order of integration of the dependent variable be lower than or equal to the order of integration[16] of the explanatory variables. A variable that is stationary in levels is said to be integrated of order zero, which is represented as I(0). A variable is said to be integrated of the first order (represented as I(1)) if it must be differenced once before it becomes stationary. In general, a time series variable is said to be integrated of order d

(i.e I(d)) if it should be differenced d times to make it stationary.

The second step in the Engle-Granger procedure involves estimating the integrating vector. This requires the estimation of the regression model using variables in their levels. Given the

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instance Nowak et al (1996). P. 7

[16] The order of integration of a variable is simply the number of times the variable must be differenced to make it stationary.

dependent variable C_t and the explanatory variable Y_t, the integrating vector can be formulated as:

$$C_t = \beta Y_t + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..1$$

From the above equation, we estimate the residual U_t (i.e $U_t = C_t - \beta Y_t$)

Which is a linear combination of the variables. Finally, we test the residual for unit root using the conventional unit root testing procedures. If the null hypothesis of unit root is rejected, it therefore implies that the residuals are stationary. This therefore means that the variables are cointegrated. Otherwise, the variables are not cointegrated.

(2) **The Johansen's Maximum Likelihood Approach**

Even though the Engle-Granger Cointegration testing procedure is simple to implement, it however has some major weaknesses. First, the conclusion about the Cointegration of variables may be sensitive to what variables that are selected to be on the right hand side of the cointegrating equation. This problem is perhaps more serious in the case of three or more variables. Secondly, the Engle-Granger approach does not have a systematic procedure for separate estimation of the multiple Cointegration when there are three or more variables. Thirdly, there is a risk of carrying the error introduced by the Researcher in the first step to the second step above.

The Johansen's Procedure tries to overcome the weaknesses inherent in the Engle-Granger procedure. It estimates and tests for the presence of multiple cointegration vectors. It also allows the researcher to test restricted versions of cointegrating vectors and speed of adjustment. The Johansen's procedure relies very much on the relationship between the rank

of the matrix and its characteristic roots. Suppose we define a variable X_t as an (n x 1)

vector of variables $(X_{1t}, X_{2t}, \ldots\ldots\ldots X_{nt})$.

$$X_t = \beta X_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where X_t = vectors

$$
\begin{aligned}
X_t - X_{t-1} &= \Delta X_t = \beta X_{t-1} - X_{t-1} + \varepsilon_t \\
&= (\beta - 1) X_t + \varepsilon_t \\
&= \prod X_{t-1} + \varepsilon_t \\
\Delta X_t &= \prod X_{t-1} + \varepsilon_t
\end{aligned}
$$

From the above equations, we can find the number of cointegrating vectors by evaluating the

rank of $\prod$ from the above formulation. In essence, the Johansen's procedure is simply a

multivariate generalization of the Dickey-Fuller test for unit root. The Johansen's Maximum

Likelihood procedure will be estimated using PcFIML. The appropriate rank will be determined

by examining the significance of the eigenvalues using both the maximum eigenvalue (λ_{max}) as

well as the trace (λ_{trace})[17] statistics. Both the Johansen's (1988) and the Reimers'(1992) critical

values will be used to identify the most appropriate rank. The advantage of the Reimers'

statistics is that it corrects[18] for small sample. So in the event of any discrepancy between the

Johansen's and the Reimers' statistics, I shall use the Reimers' critical values because of the

small sample size used in this analysis.

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[17] Where λ_{max} = -Tlog $(1-\lambda_i)$ and λ_{trace} = -TΣlog$(1-\lambda_i)$.

[18] The Reimer's statistics corrects for sample size as it replaces T by T-mn for both the max and trace statistics.

The test summary menu of the PcGive version 9.10 software will also be used to carry out several other tests including Vector Normality, Heteroscedastcity, Autocorelation, Model specification to name a few(see appendix A).

4.3 Source Of Data.

Secondary data will be used in carrying out this study. The relevant data will be collected from the World Bank Publications, International Financial Statistics Year Books, Bank of Sierra Leone Bulletins and the Sierra Leone Central Statistics Office annual Publications. The Internet will also be utilized in collecting relevant information pertaining this study through the use of appropriate web sites.

CHAPTER FIVE

ESTIMATIOM AND INTERPRETATION OF REGRESSION RESULTS.

The empirical findings of this study will be analyzed in this chapter. Prior to estimating the investment model specified in the previous chapter, this chapter will first look at the time series properties of the data set by performing unit root tests using both the ADF and the Philips-Perron procedures. Several other diagnostic tests were employed to assess the robustness of the estimated model on the basis of econometric criteria. The Error Correction Model (ECM) is used to analyze the short run dynamics of the model while the Johansen's Maximum likelihood procedure is also used to estimate the long run coefficients of the investment model.

5.1 Data Description ,Transformation and Trend.

The data set used in the analysis of this paper coverered a 33 years period spanning from 1966 to 1998. Time series data were collected on the following variables: Private investment, Public sector investment, real GDP, Real Exchange rate, Interest rate and Inflation. A brief discussion on each of these variables is given in the ensuing paragraphs.

The Private Investment variable as used in this analysis is taken as the sum of all non-governmental investment. This includes all private investment activities in agriculture, manufacturing industries, mining, whole Sale and retail trade, transport and communication, education, financial services etc. In Sierra Leone, published data on private investment is not available, data on this variable is therefore obtained as a residual by taking the difference between gross fixed investment and public sector investment. This residual, which represents

the private sector investment, is transformed by simply taking its natural log. LPIV then denotes the log of the private sector investment. The trend of LPIV is plotted and shown in figure 4 below.
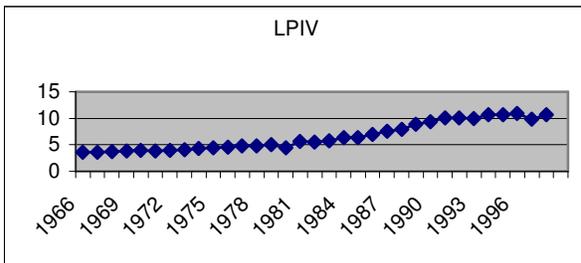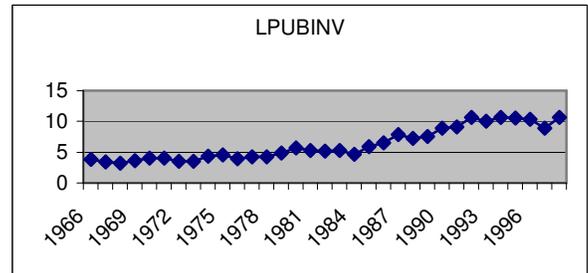
Figure 4: Trends in LPIV   **Figure 5: Trends in LPUBINV**

LPIV

LPUBINV

 The Public Investment variable as used in this study is simply the sum total of all public sector investment in Sierra Leone. This includes public sector investment on infrastructure, education, transport and communication etc. Fortunately, this variable is reported for Sierra Leone and was obtained from the Central Statistics Office (CSO) Publications. Simple log transformation is also done for this variable . Hence, LPUBINV denotes the log of public sector investment, which enters the specified model as an explanatory variable. The trend of LPUBINV is shown in figure 5 above.

The Real GDP variable as used in this paper is obtained by simply converting nominal GDP (which is collected from IFS) into real GDP. Dividing nominal GDP by the Consumer Price Index (CPI) for Sierra Leone does the conversion from nominal to real GDP. The converted real GDP values are subsequently transformed by simply taking their natural logs to obtain LRGDP,

which also enters the specified model as an explanatory variable. The trend of this variable is shown in figure 6 below.
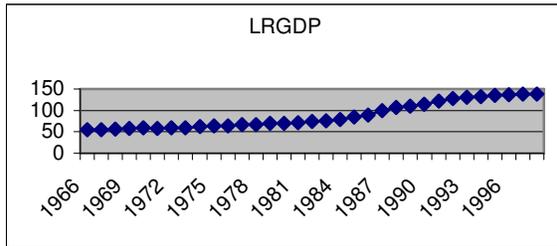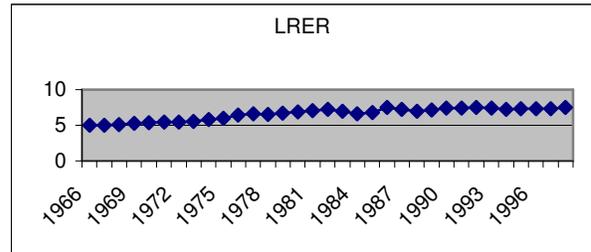
Figure 6: Trends in LRGDP **Figure 7: Trends in LRER**

The Real Exchange Rate variable as used in this analysis is obtained by converting the nominal exchange rate (which is obtained from IFS). The conversion from nominal exchange rate to real exchange rate is done following the Purchasing Power Parity (PPP) formulation. That is the real exchange rate is calculated by multiplying the nominal exchange rate by the ratio of the foreign to domestic prices using appropriate index of prices. Thus the real exchange rate is given as:

$$RER = E.\left(\frac{P^f}{P^d}\right)$$

Where

RER = real exchange rate.

E = nominal exchange rate.

P^f = an index of foreign prices

P^d = an index of domestic prices

Since Britain is the major trading partner for Sierra Leone, the producer' price index for Britain was used to represent the index of foreign prices. The consumer price index (CPI) for Sierra Leone was also used to represent the domestic price index as used in the calculation above. The calculated real exchange rate values are then transformed by taking their natural logs to obtain

the variable LRER, which denotes the log of the real exchange rate variable. This variable also entered the specified model as an explanatory variable. The trend of LRER is plotted and shown in figure 7 above.

The Inflation rate variable as used in this paper is simply generated as the growth rate of prices. The Consumer Price Index (CPI) for Sierra Leone, which is obtained from IFS, is used as a proxy for prices from which the inflation variable is generated. No log transformation is taken for this variable since there is a possibility of having negative values in generating the inflation variable from the consumer price index (CPI). This variable is denoted as INF and it also entered the specified model as an explanatory variable. The trend of INF is shown in figure 8 belo w.
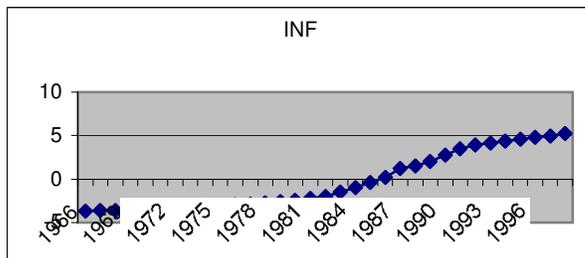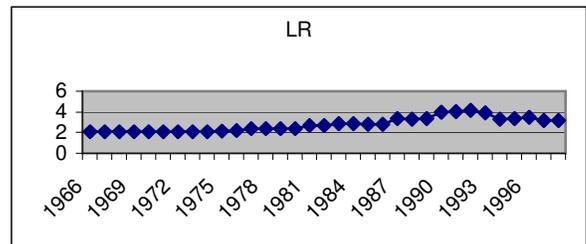
Figure 8: Trends in INF   **Figure 9: Trends in LR**

The Real Interest rate variable as used in this analysis is obtained by subtracting the rate of inflation from the nominal interest rate for each period. The lending interest rate is used in generating the real interest rate and it is obtained from IFS. Simple log transformation is also done from the generated real interest rate. Hence LR denotes the log of the real rate of interest, which also entered the specified model as an explanatory variable. The trend of LR is shown in figure 9.

5.2 Time Series Properties Of The Data.

In order to avoid problems of spurious correlation normally associated with the inclusion of non-stationary series in regression models, appropriate tests of stationarity were employed. The result for both the Augmented Dickey-Fuller (ADF) and Philips-Perron tests are as shown in Table 7 below.

Table 7: **Unit Root Tests For The Variables**.

SERIES	ADF test with trend and constant, two lags. ADF critical Values: 5% = -3.567, 1% = -4.295		Philips –Perron test with trend and Constant. PP critical values: 5% = -3.5562, 1% = -4.2717	
	Level	First Difference	Level	First Difference
LPIV	-2.1941	-7.2317**	-2.0763	-7.2708**
LPUBINV	-2.4813	-6.3393**	-2.5963	-6.6928**
LRER	-1.4829	-4.5359**	-1.3064	-4.9628**
LR	-1.2370	-4.7562**	-1.7220	-4.8881**
LRGDP	-2.3224	-6.4150**	-2.37584	-7.5607**
INF	-3.4312	-5.1944**	-3.1546	-6.2354**

*(**) implies reject the null hypothesis of non-stationarity at 5% and 1% respectively.

From the results shown in table 7, both the Dicky-Fuller and the Philips-Perron class of tests show that LPIV is non-stationary in levels when both a constant and trend are included. This is because the null hypothesis of unit roots is not rejected at the 5% level of significance. However, when the first difference of LPIV is taken, both the ADF and Philips-Perron class of tests indicate stationarity of LPIV at the 1% level. The tests also revealed that LPUBINV, LRER, LR, LRGDP and INF are all non-stationary in levels. These series however became stationary when differenced once. This is because the null hypothesis of unit root is rejected at

the 1% level of significance for both the ADF and Philips-Perron class of test when the series are differenced once. With these results, the order of integration of the variables is therefore summarized as shown table 8 below.

Table 8 : The order of integration of the variable.

LPIV	LPUBINV	LR	LRGD	LRER	INF
I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

From Table 8, it can be seen that the variables are all integrated of the same order (i.e they are all integrated of order one), hence cointegration analysis is feasible in carrying out the specified private investment model estimation exercise in the subsequent section.

5.3 Modelling The Long-Run Private Investment Equation

Having established the order of integration of the variables that enter the private investment model in the previous section, this section will go a step further in trying to determine the maximum number of cointegrating vectors that appropriately span the variables entering the VAR for the current analysis. However, before proceeding to the Johansen's estimation procedure, a test for the appropriate lag length of the VAR was carried out. The criteria used to select the appropriate lag length are based on the F-test, Schwarz Information Criterion (SIC), Akaike Information Criterion (AIC), and Hannan Quinn (HQ) criterion. On the basis of these criteria, a Vector Autoregressive model of order two, VAR(2) , was found to be the most appropriate in carrying out the cointegration test (see Table 9 below).

Table 9: Testing for the appropriate lag length of the VAR .

Model's Lag Length	Log-likelihood	SIC	HQ	AIC
One	153.8987	-4.1152	-5.4247	-6.7677
Two	211.5889	-5.0105	-7.4425	-8.6509

A dummy variable that takes the value of one from 1991 to 1998 and zero otherwise was introduced entering the VAR. This dummy was introduced in order to capture the impact of the rebel war in Sierra Leone, which started since 1991.

On the basis of the 1-Step Recursive Residuals graphics shown in figure 2B of Appendix B, it could be observed that the null hypothesis of overall parameter constancy from the estimated VAR cannot be rejected. This is a further indication that the VAR(2) is appropriate. Furthermore, the test summary results from the VAR as shown in the lower block of table 6 indicated that the residuals are white noise and that the null hypothesis of vector normality cannot be rejected.

The Johansen's (1988) as well as the Reimers'(1992)[19] critical values were used in determining the appropriate rank (which is equal to the number of contegrating vectors) for the VAR(2) . The results of the cointegration test for the private investment model are shown in table 6. On the basis of the Johansen's critical values, both the maximum eigenvalue (λ_{max}) and trace (λ_{trace}) statistics rejected the null hypothesis of a rank less than or equal to one in favor of the alternative hypothesis of a rank of two at the 1% level of significance. The result according to the Johansen's critical values therefore suggest a rank of 2, implying the presence of two cointegrating vectors spanning the variables that enters the VAR(2). On the contrary, when adjustment for sample size is done based on the Reimers'(1992) critical values, it could be observed that both the maximum eigenvalue (λ_{max}) and trace (λ_{trace}) statistics rejected the null

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[19] The advantage of the Reimers' statistic is that it corrects for degrees of freedom. With small sample, the Johansen procedure over rejects the null hypothesis even when it is true. Reimers (1992) made an adjustment for the degree of freedom by replacing T by T-nm. In this formulation, T is the sample size, n is the number of variables used in the estimation and m is the lag length in the VAR.

hypothesis of a zero rank in favor of the alternative hypothesis of a rank of one at the 5% and

1% level of significance respectively(see the results as shown in Table 10 below). The

Reimers' statistics therefore support the presence of only one cointegrating vector as against

two. The fact that the sample size used in this analysis is small therefore led to the conclusion

that only a single cointegrating vector spans the variables as attested by the Reimers' statistics.

In an effort to substantiate the arrival to this conclusion, a visual inspection on the behavior of

the cointegrating vectors was done by examining the cointegration relation graphics, which are

plotted from the VAR and shown in figure 1B of Appendix B.

Table 10: Results of the cointegration test for the Private investment equation.

$H_{O:}$	Maximum Eigenvalue Statistics (λ_{max})			Trace Statistics (λ_{trace})		
	Test Statistics		**Critical Value**	Test Statistics		**Critical Value**
	Johansen's	**Reimers'**	**5%**	**Johansen's**	**Reimers'**	**5%**
r = 0	73.12**	44.81*	39.4	171.8**	105.3**	94.2
r ≤ 1	50.24**	30.79	33.5	98.66**	60.47	68.5
r ≤ 2	24.47	15.25	27.1	46.41	29.67	47.2
r ≤ 3	17.7	10.85	21.0	23.54	14.43	29.7
r ≤ 4	4.547	2.787	14.1	5.834	3.576	15.4
r ≤ 5	1.287	0.7887	3.8	1.287	1.4632	3.8
r ≤ 6	1.034	0.6745	2.7	1.034	0.6745	2.7

System Diagnostic Tests
```
Vector portmanteau  4 lags =   156.08
Vector AR 1-2 F(72, 11)    =   7.1105 [0.1356]
Vector normality Chi^2(12) =   18.165 [0.1108]
```

Where ** and * means rejection of the null hypothesis at the 1% and 5% respectively.
r denotes the rank of the long-run matrix. It identifies the number of cointegating vectors.

From the cointegration relation graphics shown in figure 1B of Appendix B, it could be

observed that among the six cointegration relations shown, only the first one seems to be

stationary when compared to the second and third. To further confirm the sationarity of the first cointegrating vector as observed from the visual inspection of the cointegration relation graphics shown in figure B of Appendix B, unit root tests for stationarity were carried out for each of the six cointegrating vectors. The result of the unit root test for stationarity on the cointegrating vectors using the Dickey-Fuller and the Augmented Dickey-Fuller class of tests are as shown in Table 11 below.

Table 11 : Unit root test of stationarity for the cointegrating vectors

VECTOR	Dickey-Fuller Class		
	Dickey-Fuller (DF)	Augmented Dickey-Fuller (ADF)	
		Lag length of 1	Lag length of 2
CIvec1	-4.0022**	-4.6221**	-4.4898**
CIvec2	-1.8352	-1.8352	-0.63630
CIvec3	-0.17974	-0.13663	-0.11540
CIvec4	-0.41946	-0.43183	-0.43828
CIvec5	-0.71109	-0.51459	-0.44910
CIvec6	-0.17171	-0.031839	-0.10662

Note: ** and * implies significance at the 1% and 5% respectively.

Where CIvec1, CIvec2, CIvec3, CIvec4, CIvec5 and CIvec6 are the six cointegrating vectors saved from the cointegration test.

The results of the unit root test of stationarity as shown in table 11 above indicate that, among the six cointgrating vectors, only the first cointegrating vector (CIvec1) is stationary. Based on the way the variables are ordered, the first vector corresponds to the private investment variable. This therefore provides sufficient evidence to support the decision for accepting a single cointegrating vector for our analysis. Thus, the only cointegrating vector is the first vector from the standardized β' eigenvectors obtained from the cointegration test.

The relevant β' eigenvectors and the corresponding standardized α coefficients are thus:

Standardized β' eigenvectors

LPIV	LRGDP	LPUBINV	LRER	LR	INF	DUM
1.0000	-0.44916	-1.2458	0.11604	3.3164	0.045293	0.1986

Standardized α coefficients

LPIV	LRGDP1	LPUBINV	LRER	LR	INF	DUM
-0.13591	1.2996	0.23731	0.04981	0.0154	-2.0483	0.11922

Normalization is done with respect to the private investment variable (LPIV).

A test of weak exogeneity on each of the explanatory variables entering the long run private investment equation was carried out by imposing zero restriction on the α coefficients. This test is based on the LR-Statistic with an asymptotic Chi-Square (χ^2) distribution. The result of the test as shown in table 11 below indicates that LRGDP, LPUBINV, LRER , LR and INF are all weakly exogenous in the system.

Table 12: The results of the LR test for Weak exogeneity (LR-test, rank = 1)

Variable	LRGDP	LPUBINV	LRER	LR	INF
LR-Statistic	1.6893	1.1774	0.81268	0.45319	0.5355
P-Value	[0.1347]	[0.2779]	[0.3673]	[0.5008]	[0.4543]

In order to determine the variables that uniquely span the cointegrating vectors, tests of significance were subsequently carried out. This is also based on the LR-test[20] by imposing zero restriction on the coefficients of the long run cointegrating vectors. The result from the significance tests are shown in Table 12 below.

Table 13 : Significance Tests Results for the long run Private Investment parameters.

VARIABLE	COEFFICIENT	LR-STATISTICS	P-VALUE
LRGDP	0.44916	6.8866	[0.0087]***
LPUBINV	1.2458	5.1453	[0.0498]**
LRER	– 0.11604	4.5689	[0.0749]*
LR	-3.3164	4.8764	[0.0697]*
INF	– 0.045293	4.9768	[0.0614]*
DUM	-0.1986	0.3564	[0.5607]

The result from the test of significance as shown in Table 12 above indicates that all but one variable, the war dummy, has significant effect on the private investment equation. Hence, by dropping this insignificant variable (the war dummy), the final long run private investment equation is as shown table 13 below:

Table 14:Results of the final long run private investment equation.

Variable	LRGDP	LPUBINV	LRER	LR	INF
Coefficient	0.43312	1.3006	-0.1771	-3.2835	-0.042453
p-value	[0.0087]	[0.0498]	[0.0749]	[0.0697]	[0.0614]

From table 13 above, the long run private investment equation is presented thus:

LPIV =   0.43312(LRGDP) + 1. 3006(LPUBINV) – 0.17716(LRER) – 3. 283(LR) – 0. 042453(INF)
                   (0. 0087) *   (0. 0498) **   (0. 0749)*   (0. 0697)*   (0. 0614)***

Where figures in parenthesis represent P-values
***(**)* means significant at the 1%, 5% and 10% respectively

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[20] The LR test tests against the unrestricted value of the coefficients from the cointegrating vectors. It is calculated as $T\sum_{i=1}^{r}\log[(1-\lambda_i^*)/(1-\lambda_{i)})]$. It is a test based on an asymptotic $\chi^2[r(n-s)]$ distribution.

5.4 Modeling A Dynamic Private Investment Equation.

This section employs the Error Correction Model (ECM) in estimating a dynamic private

investment equation using the data set for Sierra Leone. In this method, we first estimate the

static long-run regression from which we obtain the residuals. The residuals were then subjected

to unit roots tests of stationarity using the Dicky-Fuller (DF) as well as the Augmented Dickey-

Fuller (ADF) class of tests. If the unit root tests for stationarity reveal that the residuals are

stationary, then an Error Correction (ECM) will be estimated by regressing the first difference

of the private investment variable on those of the other variable plus the lagged term of the

residuals using OLS. The results of the unit root test of stationarity for the residuals as shown in

table 15 below indicate that the residuals from the static long run equation are white noise.

Table 15: Result of the Unit Root Test for the Residuals.

Variable	DF	ADF(1)	ADF(2)
Residual	−4.2070**	−3.1249**	−3.0702**

Hence, the short run model was estimated using the ECM formulation. The results are as shown

in table 16 below.

Table16: The Dynamic Private Investment Estimation Results.(Modelling ΔLPIV by OLS)

Variable	coefficient	Std.Error	t-value	t-prob	part R^2
Constant	0.13491	0.08360	1.614	0.1197	0.0979
ΔLPUBINV	0.31359	0.12956	2.420	0.0234	0.1962
ΔLRER	−0.14360	0.39753	−0.361	0.7211	0.0054
ΔLGDP	0.03572	0.06045	0.591	0.5601	0.0143
ΔLR	1.9425	0.9094	2.136	0.0445	0.1266
ΔINF	−0.00227	0.00793	−0.287	0.7766	0.0034
CV1	−0.44697	0.18769	−2.381	0.0255	0.1911

R^2 = 0.358748 F(6,24) = 2.2378 [0.0742 DW = 2.42

```
AR 1-2F(2, 22)   =   2.6333[0.0943]
ARCH 1 F(1, 22)  =   0.0231[0.8805]
```
Normality χ^2(2) =   5.7274[0.0571]

χ^2 F(12, 11)   =   0.8185[0.6333]
RESET F(1, 23) =   0.7975[0.3811]

From the short run estimates shown in table 16 above, the results indicate that short run changes in public sector investment (ΔLPUBINV) has a positive and significance effect on private investment. Short run changes in the real interest rate (ΔLR) is also positive and significance. However, short run changes in real GDP (ΔLGDP), real exchange rate (ΔLRER) and the rate of inflation (ΔINF) all carry the expected signs but rather insignificance. Furthermore, about 44.7 percent of the discrepancy between the actual and long run values of private investment is corrected within each year. This is shown by the coefficient of the error correction term (CV1) which is also significant at the 5% level. The coefficient of multiple determination (R^2) is 35.9 %. This low value of R^2 reflects the fact that we are dealing with a dynamic model with all variables being stationary, hence there is no room for spurious correlation.

Diagnostic tests were also carried out in order to check the model for data consistency. The test summary result as shown in the lower block of Table 14 above indicated that there is no problem of residual non-normality. This is because the test for normality based on the Jarque Bera statistic does not reject the null hypothesis of normality of the residuals. The test based on the Langrangean Multiplier (LM) also indicated the absence of Serial Correlation in the residuals. This result is also supported by the Durbin-Watson's (DW) statistics of 2.42 as shown above. The LM test for Autoregressive Conditional Heterosecedastcity (ARCH) indicated that there is no ARCH effect. Finally, the RESET test also confirmed that there is no functional mis-specification problem.

5.5 Economic Interpretation of the Estimation Results.

The previous sections presented estimation results of the private investment model for Sierra Leone using both the Johansen's Maximum likelihood procedure (for the long-run) and the Error Correction Model (for the short-run). This section provides an interpretation of the estimates.

The results from the long-run estimate revealed that real GDP has a positive and significant impact on private investment in Sierra Leone. The Error Correction Model (ECM) also indicated that short run changes in the real GDP have a positive but insignificant impact on private investment. This evidence therefore provides a support for the second hypothesis of the study which says-"Private investment in Sierra Leone is positively related to real GDP". This is not surprising since an increase in real GDP, all things being equal, is expected to induce an increase in aggregate demand, thereby providing the market for investors' products. Thus, the positive relationship between private investment and real GDP as obtain in this study is in agreement with the findings of Greene and Villanueva (1991), Fielding (1994), Blejer and Khan (1984), Jasperson, Frederist, et al (1995), Zerfu, D. (2001) , Akpalu (1997), Harupara (1998), and Mbugua, T (2000). However, the empirical evidence by Ozler and Rodrick(1992), Workie(1996) and Getachew (1997) pointed out no significant relationship between private investment and real GDP growth.

On the issue of the relationship between private and public sector investment, the results indicated a positive and significant relationship for both the long run and the Error Correction Model (ECM). This means that an increase in public sector investment in Sierra Leone will help to promote private sector investment more especially so when such public investment activities

are directed in the provision of basic infrastructure and education. The result therefore provides evidence against the first hypothesis that 'Public sector investment "crowds out" private investment in Sierra Leone'. It was upon the consideration that high public sector borrowing from the limited domestic financial resources to finance public investment normally constrain access of the private sector agents to such financial resources that prompted the statement of the above hypothesis. However, the empirical evidence obtained from this study show that public sector investment in Sierra Leone "crowds in" private sector investment since such investments proved to complement private sector activities. This positive relationship between private and public sector investment as evidenced in this study lends support to the empirical evidences provided by Blejer and Khan (1984), Oshikoya(1994),   Tun Wai and Chong Hue Wong (1982) , Chhibber and Wijnbergen (1988), Yaw Asante (2000), and Mbugua, T.K.(2000). In contrast, studies by Balasa(1988), Laumas(1990), Getnet (1992) and Akpalu (1997) revealed a negative relationship between private investment and public sector investment. These contradicting empirical evidences may not also be surprising as they may be reflective of both the method of financing public sector investment and the policy environment in different countries in which these studies were carried out.

The real exchange rate has a negative impact on private investment for both the long-run and short-run estimates. This negative impact of the real exchange rate on private investment is however only significant in the long-run since the short-run model shows no significant relationship between private investment and the real exchange rate. This is not surprising as the bulk of the capital assets as well as the intermediate inputs are imported. The implication therefore is that, a depreciation (devaluation) of the exchange rate that increases the cost of imported capital assets and intermediate inputs will hence affect the level of private investment

through the resultant decline in the demand for both imported capital and intermediate inputs. This result therefore indicates that a depreciation (devaluation) of the Leone (the local currency in Sierra Leone) will depress the private sector through the resultant decline in investment activities following an increase in the real exchange rate. The empirical evidence by Oshikoya (1994) provided a support for this result. However, studies by Yaw Asante (2000) and Workie (1996) showed a positive relationship between private investment and real exchange rate.

The relationship between private investment and the real rate of interest as obtained in this study presents opposing effects between the long and the short-run estimates. While the short run model revealed a positive relationship between private investment and the real rate of interest, the long run model pointed out a negative relationship. The real rate of interest is however significant both in the short and long run equations from the private investment model. The negative relationship between private investment and the real rate of interest as presented by the long run estimates therefore provided support for the third hypothesis of the study which says- "The rate of interest negatively affects the level of private investment in Sierra Leone". This is so because, an increase in the real rate of interest will raise the user cost of capital, thereby making investment less profitable. Thus, the level of private investment is expected to decline as the real rate of interest continue to rise. On the empirical front, while the studies by Dailamin (1990), Oshikoya (1994), Asante, Y. (2000) , Akpalu (1997), Harupara (1998), Mbugua, T.k.(2000) provided support for the short run positive relationship established in this study, the study by Greene and Villanueva (1991) supported a negative relationship as established by the long run estimates of this study.

In essence, while the short run estimates from this study lend support to the McKinnon-Shaw hypothesis, which established a positive relationship between private investment and the real rate of interest, the long run estimates on the contrary supported the neoclassical view.

The rate of inflation has a negative impact on private investment for both the short and long run equations. However, this negative impact of inflation on private investment is only significant in the long run as opposed to the short run. This means that an increase in domestic prices all other things being equal, adversely affect private sector investment in Sierra Leone. This is not surprising as a high domestic inflation will raise the cost of local production for goods and services through the rising cost of resource inputs. This also means that local products will be relatively expensive as compared to their foreign counterparts, thereby affecting the demand for locally produced goods and services, and hence a decline in investment towards their production. The empirical evidences by Greene and Villanueva (1991), Pfefferman and Mandarassy (1993), Zerfu, D. (2001) and Harupara (1998) all provided support for this negative relationship between private investment and inflation as obtained in this study.

The war dummy (DUM) has the appropriate sign but rather insignificant. This is not surprising as it really portrays the manner in which the war in Sierra Leone was pursued. To start with, when the war broke out in 1991, the government of Sierra Leone was able to solicit immediate support from some West African states (ECOWAS member states), especially Nigeria , Guinea and Mali. These countries provided military assistance to the government of Sierra Leone in combating the then invading rebel forces of corporal Foday Sankoh , who declared himself as the rebel leader. The presence of the foreign military contingent fighting along side with the national army prevented the rapid invasion of the rebel forces in Sierra Leone for a very long

period. This, coupled with the constant security campaign by the government was able to convince investors to continue operations especially in the urban centers of the country. Not until a bloody military coup led by Major Johnny Paul Koroma in May 1997, that a volcano of turbulence and unrest erupted in the whole country. This is because, after successfully overthrowing the then SLPP Government of President Ahmed Tejan Kabbah, the military junta merged with the rebel forces in an effort to fight back possible attacks by intervening forces(especially that from the West African Military contingent, ECOMOG). The large presence of the rebel forces in the midst of the military junta saw a lot of atrocities committed through out the length and breadth of the country. This therefore led to a total collapse of all economic activities in the country including private investment. Hence the brunt of the war effect on private investment in Sierra Leone became clearly manifested only after the military take over in 1997.

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATION OF THE STUDY

The study specified a private investment model for Sierra Leone following a version of the flexible accelerator model using time series data from 1966 to 1998. Prior to the estimation of the specified model, tests for stationarity were carried out using the Augmented Dickey-Fuller as well as the Philips-Perron class of tests. The results from the unit root testing exercise revealed that all the variables used in the estimation are all integrated of order one (i.e they are all I(1) series). Cointegration analysis was subsequently carried out using the Johansen's (1988) formulation in order to determine the number of cointegrating vectors that span the variables entering the analysis. From the results of the cointegration tests, though Johansen's critical values suggested two cointegrating vectors, the Reimers'(1992) critical values as well as the cointegration relation graphics suggested the existence of only a single cointegrating vector. Since the Reimers' statistic adjusts for sample size coupled with the fact that the sample used in the analysis is small, the conclusion on the number of cointegrating vectors was therefore based on the Reimers' statistics, which suggested a single cointegating vector. The existence of a single cointegrating vector therefore   suggested estimation using an Error Correction Model (ECM). The estimation results for both the long run and the Error Correction Model (ECM) are summarized as follows:

Firstly, public sector investment has a positive impact on private investment in both the short and long run equations. This appears quite plausible as the significant role of public sector investment on infrastructures as well as education is confirmed by this outcome. Availability of

an efficient transport and communication networks, electricity supply, skilled labor force and the good political will are all tantamount in enhancing an efficient private sector in Sierra Leone.

Secondly, growth in real GDP has positive effect in boosting up private investment in Sierra Leone. This positive relationship between private investment and real GDP is however only significant in the longrun equation as opposed to the shortrun. This provides a strong support for the flexible accelerator theory of investment which postulated a positive relationship between the growth in the stock of capital assets and the changes in real output.

Thirdly, the real exchange rate adversely affect private investment activities in Sierra Leone. This adverse effect is only significant in the longrun since the shortrun estimate show non-significance. This is not surprising as rapid real exchange rate fluctuations provide a signal for macroeconomic instability. Since macroeconomic instability triggers business uncertainty, fluctuations in the real exchange rate will therefore adversely affect private investment behavior through the uncertainty element it creates in the economy.

Fourthly, the real rate of interest exhibited opposing signs between the short and the long run analysis. In the short run, changes in the real rate of interest have a positive effect on private investment in Sierra Leone. This relationship is rather significant from both the shortrun and longrun estimates. This result is in line with the Mckinnon-Shaw hypothesis, which postulated a positive relationship between the real rate of interest and the level of private investment. The long run impact of the real rate of interest on private investment was however negative, in line with the classical proposition.

Fifthly, inflation rate has an adverse effect on private investment in Sierra Leone for both the short and long run analysis. However, the adverse effect of inflation on private investment is only significant in the long run as the short run model indicates non-significance of the inflation variable. This therefore implies that it requires sufficient time for the macroeconomic uncertainty element signaled by inflation to have it full impact in distorting the information content upon which private investors form their expectations. Hence the adverse effect of inflation is only manifestible in the long run as indicated by the empirical evidence.

Thus, the empirical evidence from this study has important policy implications. To start with, the study pointed out a complementary relationship between public and private sector investment in Sierra Leone. Therefore, in line with the Government's overall growth framework (as manifested in the Economic Recovery Program launched in 1989), stimulating the private sector by restructuring government expenditure towards the development of basic infrastructures will certainly yield the desired objective of promoting growth. Further more, in the pursuit of structural adjustment programs, the central government need not cut down their expenditure on public investment especially on infrastructure and education since such expenditures do have a positive impact in boosting up the private sector. Since excessive borrowing by the central government from the limited domestic financial institutions to finance public investment normally "crowds out" the private sector, it is therefore recommended that such acts should be avoided in the interest of promoting growth through increased private sector investment. That is, the financing of pubic sector investment should be done in such a manner that no constraints be imposed on the private sector in accessing credit facilities domestically. This required the institution of appropriate measures that will cut down the high incidence of

corruption related cases in the use of public finances. This is because, a greater proportion of government revenue from taxes as well as foreign debts are misappropriated through corruption and mismanagement. Such measure will enable an efficient use of the proceeds from taxation or foreign loans to finance public sector investment. This in effect will help reduce the "crowding out" effect of high public borrowing from domestic resources on the private sector. Government should also avoid such practices that may result in any form of financial repression. This means the existing major financial institutions should be allowed to operate freely in order to enhance high efficiency standards. This does not mean the complete absence of certain government regulations governing the conduct of financial services, but such regulations should be in the interest of promoting overall efficiency.

Since growth in real GDP has a positive and significant impact on private investment, policies geared towards increasing real GDP growth should be put in place. In this vain, the Sierra Leone Government need to strengthen agricultural support policies to boost up productivity in the agricultural sector as this sector alone accounts for about 75% of total employment in Sierra Leone. Boosting the agricultural sector will not only improve the living standard of a greater proportion of Sierra Leoneans through the increased personal earnings from agriculture, the resulting increase in foreign exchange earnings from agricultural exports alone will help alleviate the acute foreign exchange constraints that the country faced over the years. Increased earnings in the agricultural sector will also induce an increase in aggregate demand for manufacturing products, thereby creating a market for investors' products. Secondly, mining policies should also be in the interest of the greater majority rather than a selected few. This is because; a favorable mining policy that benefits many Sierra Leonean indigenes will reduce the outflow of mining incomes through repatriation. The old practice of giving preference to

foreigners in the issuance of mining licenses should be avoided in an effort to abate the high incidence of income outflow through repatriation. This is because, if the bulk of the mining income is in the hands of foreigners, increase in incomes from the mining sector may have less impact in creating the much needed domestic market for investors as a greater portion of this income will be repatriated. Thus, the overall incomes policy framework should be in the interest of improving the incomes status of the indigenes since this may have favorable effects in creating the market for effective private investment undertakings.

The real rate of interest is seen to have opposing effects between the short and long run. The empirical evidence from the study revealed that the real rate of interest positively affect private investment in the short run. The long run impact of the real rate of interest on private investment is however negative. What this result indicate is that, in the short run, increases in the real rate of interest will help to mobilize funds through increase savings. As pointed out by blejer and Khan(1984)- one of the principal constraints on investment in developing countries is the quantity, rather than the cost of financial resources. This is because, according to them, the rates of return in these countries tend to be very high. This therefore means that increases in the rate of interest will not be heavily felt initially as the resultant increase in savings will help to make loanable funds available to investors through financial intermediation. This therefore offers an explanation for the positive short run relationship between real interest rate and private investment. In the long run however, further increases in the interest rate will increase the user cost of capital to an extent that net profits become negative. In this case, the relationship between interest rate and private capital formation is negative. The policy advise therefore is that, while the central Government must avoid fixing the interest rate at very low levels, it must at the same time prevent it from rising to levels that will adversely affect private investment.

Specifying a range within which fluctuations in the rate of interest will not have an adverse effect on private investment can do this. In a sense, this calls for a kind of interest rate regulatory policy by the Central Bank of Sierra Leone on all Commercial banks in the interest of promoting private sector investment. In addition to this, the government needs to strengthen its support to the National Development Bank (NDB), which provides long-term loans to the private sector.

A fluctuation in the real exchange rate is seen to have an adverse effect on private investment both in the short and long run. This is not surprising as a depreciation (devaluation) of the exchange rate raises the cost of capital importation in local currency terms. As a developing country, Sierra Leone heavily depends on imported capital assets for investment purposes. Apart from the physical capital assets, a greater percentage of the intermediate inputs used by certain industries are imported. This is mainly the case for manufacturing industries as well as oil refineries. Exchange rate Stabilization policy should therefore be put in place as a mechanism to remedy the adverse effect of exchange rate depreciation on private investment. One possible way of stabilizing the exchange rate could be through the introduction of some kind of dirty-float mechanism where by the government indirectly intervenes by selling or buying foreign currency whenever there is disequilibrium in the foreign exchange market. This calls for the foreign exchange branch of the Central Bank of Sierra Leone to kind of intervene by way of selling foreign exchange to the general public whenever there is a foreign exchange crisis. This can be done by introducing the auction system to facilitate the buying of foreign currency by the general public from the bank at stable prices. This will also help to curb the activities of the parallel markets by way of reducing the exchange rate premium in these markets. The introduction of such an exchange rate stabilization policy also will help in maintaining the

prices of imported capital as well as intermediate inputs in local currency terms . This is because the domestic prices of imported goods largely reflect the current state of the exchange rate since these goods are purchased in foreign currency.

Inflation both in the short and long run has an adverse effect on private investment. To promote private investment therefore, policies geared towards reducing the rate of inflation should be put in place. Since the main causes of inflation in developing countries emanate from expansionary fiscal and monetary policies, it is therefore the suggestion of this paper that such expansionary policies be reviewed in the interest of avoiding the inflationary effects accompanying them. High fiscal deficits as well as excess money supply should therefore be avoided as such practices are inflationary.

This paper has several limitations. In the first place, the data set for Sierra Leone is incomplete for most variables. While some variables are reported only after 1975, others are not fully reported as some years are without values. This therefore limited the studies on those variables that are reported at least from 1966 to 1998. This is because, this period provides a reasonable sample size to carry out certain econometrics analysis. Secondly, no survey data was used in the analysis of this paper. This is because, at the time of writing this paper, it was not feasible to conduct a survey in Sierra Leone successfully as rebel forces occupied around 60% of the country with no security guarantee in carrying out survey activities in their territories. Thus more future studies need to be done in this area in an effort to complement the empirical evidence presented by this study.

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APPENDIX A

DIAGNOSTIC TESTS

Testing for the appropriate lag length for the VAR.

The following criteria were used in selecting the appropriate lag length for the VAR. These

criteria are; the Akaike Information criterion (AIC) , the Schwarz criterion (SC) and the

Hannan-Quinn(FQ) criterion. The above cretiria are calculated as follows:

$$AIC = \log|\Omega| + 2kT^{-2}$$

$$SC = \log|\Omega| + k \log(T)T^{-1}$$

$$HQ = \log|\Omega| + 2k \log(\log(T))T^{-1}$$

Where T is the sample s   ize and k is the number of coefficients. The lag length of the model

with the smallest value of the above criteria is the most appropriate lag length of the VAR. For a

detailed treatment of these criteria, see Judge et al.(1985) or Lutkepohl (1991).

LR-test

Most tests take the form of likelihood ratio (LR) tests. These are tests that try to establish the

validity of certain parameter restrictions. If ℓ is the unrestricted, and ℓ_0 is the restricted, log-

likelihood, then the null hypothesis that the restrictions are valid, $-2(\ell_0 - \ell)$ has a $\chi^2(s)$

distribution , with s the number of restrictions imposed (so model ℓ_0 is nested in ℓ)

Portmanteau Statistic

This test is a degree-of–freedom corrected version of the Box and Pierce (1970) statistic. It is sometimes referred to as the Ljung-Box or Q-statistic. This test is basically designed as a goodness-of-fit test in stationary autoregressive moving –average variables. It is calculated thus:

$$LB(s) = T^2 \sum_{J=1}^{S} \frac{r_j^2}{T-j},$$

Where s is the length of the correlogram and r_j is the jth coefficient of the residual autocorrelation given as:

$$r_j = \frac{\sum_{t=j+1}^{T} (v_t - v_0)(v_{t-j} - v_j)}{\sqrt{\sum_{t=j+1}^{T} (v_t - v_0)^2 \sum_{t=j+1}^{T} (v_{t-j} - v_0)^2}}$$

Where $v_0 = \frac{1}{T-j} \sum_{t=j+1}^{T} v_t$ (i.e the sample mean of v_t, t = j+1,…,T

The vector portmanteau statistic is simply the multivariate equivalent of the single equation portmanteau statistic, and it is valid asymptotic test only in a VAR. For detail explanation the vector portmanteau statistic, see Hosking(1980) or Lutkepohl(1991).

Test For Normality

If we denote the mean and variance of v by μ and σ^2, and that $\mu_i = E[v - \mu]^i$, then $\sigma^2 = \mu_2$.

Then the skewness and kurtosis are defined as ;

$$\sqrt{\beta_1} = \frac{\mu_3}{\mu_2^{3/2}} \quad \text{and} \quad \beta_2 = \frac{\mu_4}{\mu_2^2}$$

The sample counterparts are defined as:

$$\bar{v} = \frac{1}{T} \sum_{i=1}^{T} v_i, m_{i1} = \frac{1}{T} \sum_{i=1}^{T} (v_i - \bar{v})^i, \sqrt{b_1} = \frac{m_3}{m_2^{3/2}}$$

For a variate to be normal, then $\sqrt{\beta_1} = 0$ and $\beta_2 = 3$

A detailed treatment of this test is given in Bowman and Shenton (1975).

LM Test For Autocorrelated Squared Residuals

In the linear Autocorrelated Conditional Heteroscedasticity (ARCH) model, the variance is specified as:

$$\sigma^2 = E[v_t^2 / v_{t-1}, ..., v_{t-s}] = c + \sum_{i=1}^{s} \gamma_i v_{t-i}^2$$

An LM-test for the hypothesis $\gamma = (\gamma_1, ..., \gamma_s)' = 0$, called the ARCH test, may be obtained as

TR^2 from the regression of $\hat{v}_t^2$ on a constant and $\hat{v}_{t-1}^2$ to $\hat{v}_{t-s}^2$. This is asymptotically distributed

as

$\chi^2(s)$. For a detailed treatment, see Engle, Hendry and Trumbull(1985).

Test for Heteroscedasticity.

This test is based on White(1980), and involves an auxiliary regression of $\{\hat{v}_t^2\}$ on a constant, the original regressors $\{w_{it}\}$, and all their squares $\{w_{it}^2\}$. The null is unconditional homosecedasicity, and the alternative is that the variance of the $\{v_t\}$ depends on the w_t and on the $\{w_{it}^2\}$. Assuming that the auxiliary regression has 1+s regressors, the two statistics are distributed as $\chi^2(s)$ and

F(s, T-s-1-k). If one of the $\{w_{it}\}$ is the constant term, and on the variables are redundant when squared, $s = (k-1)^2$. Redundant variables are automatically omitted from the regression, and s is adjusted accordingly.

APPENDIX B

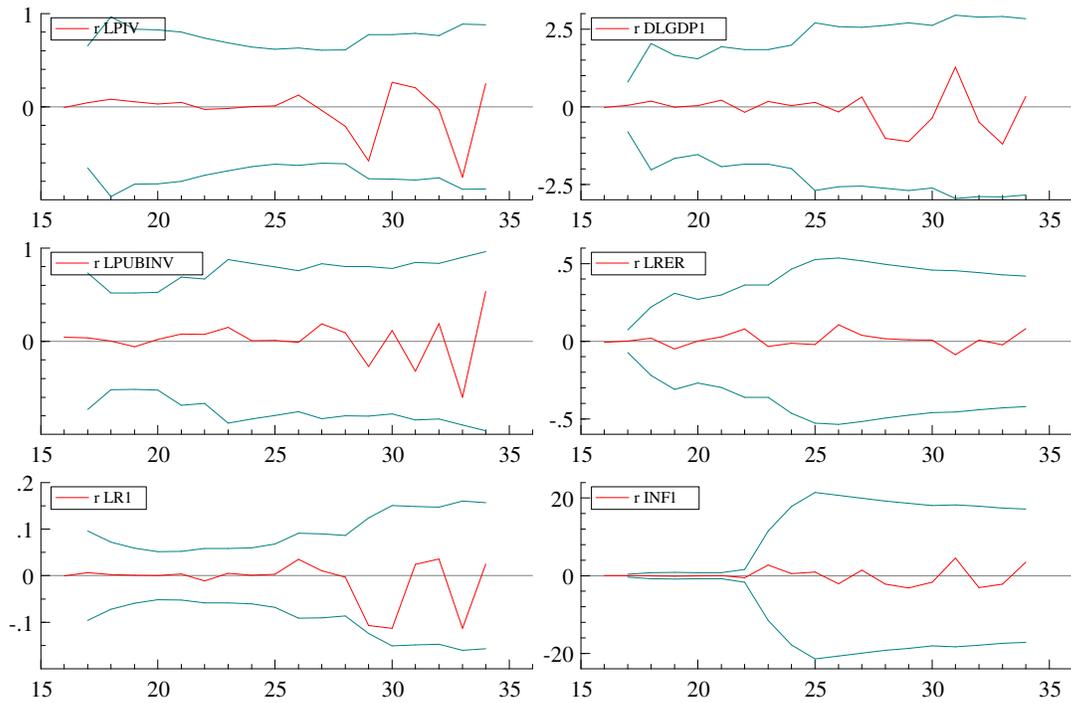**Figure 1 B : The cointegrating relations from the VAR for private investment .**
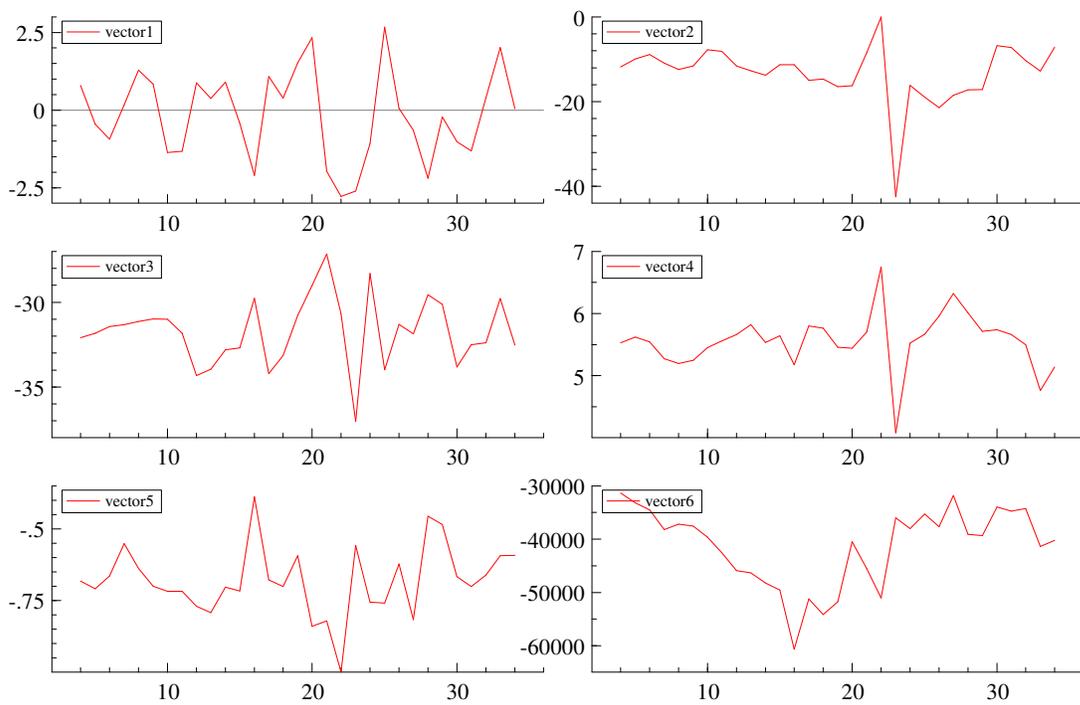
Figure 2 B: 1-Step Residuals ±2*S.E. Recursive Graphics of the VAR for private investment equation.

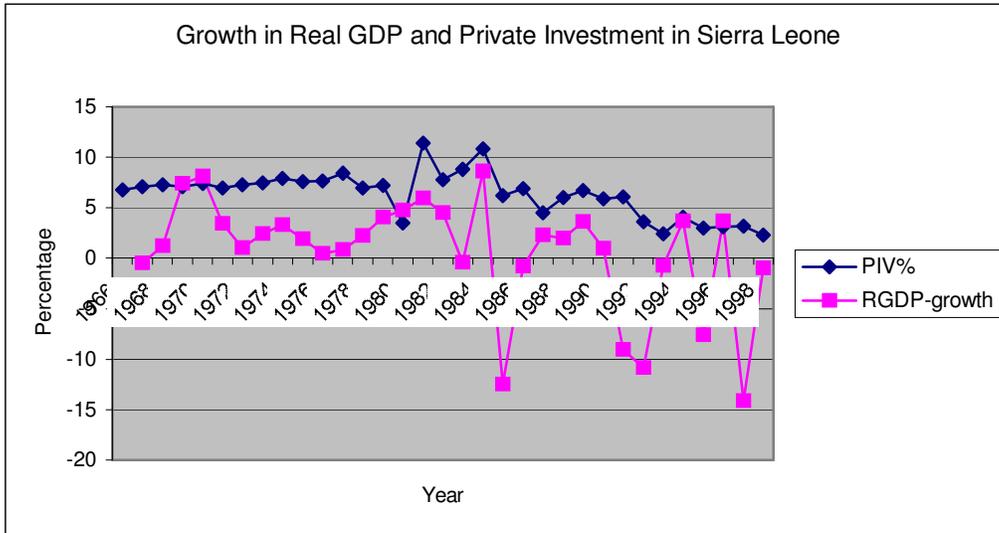**Figure 1 C: Real GDP Growth and Private Investment in Sierra Leone**

Growth in Real GDP and Private Investment in Sierra Leone

Figure 2 C: Inflation and Private Investment in Sierra Leone

Inflation and Private Investment in Sierra Leone
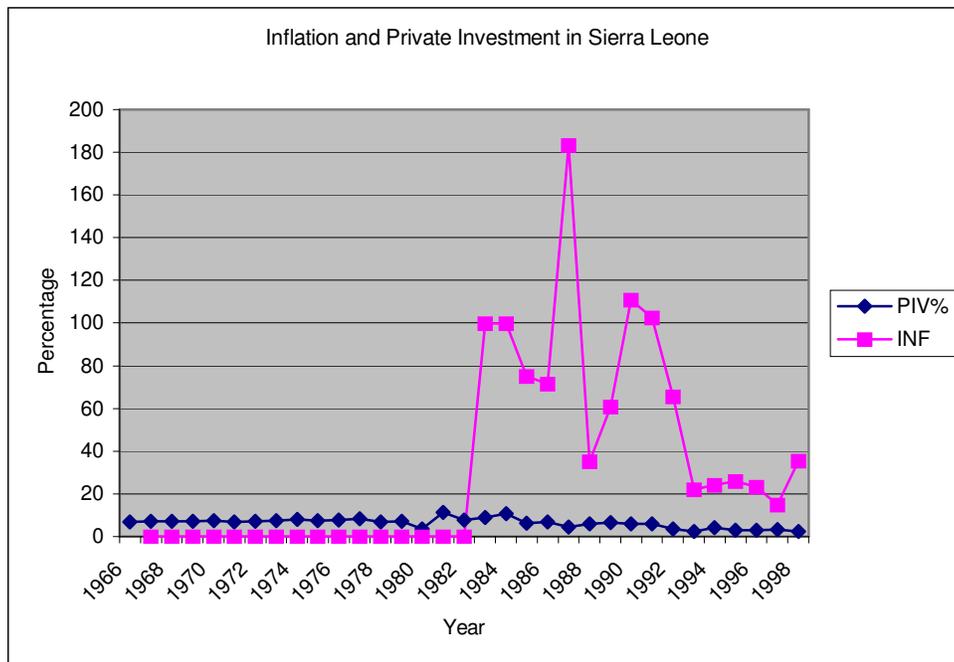
Figure 3C: Public and Private Investment in Sierra

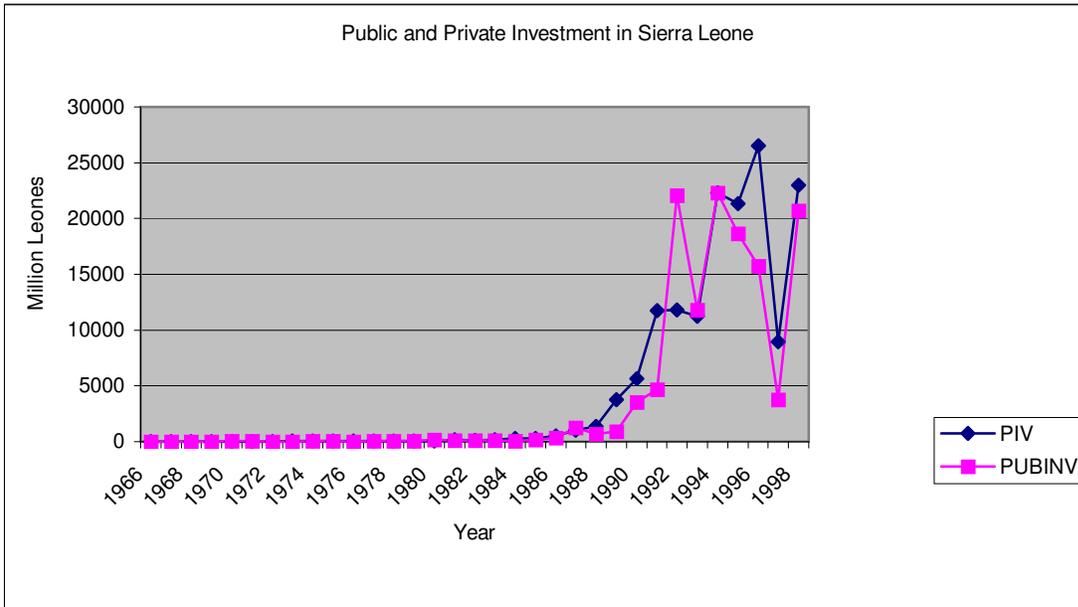Public and Private Investment in Sierra Leone

Figure 4C: Exchange Rate Fluctuations and Private Investment in sierra Leone

Exchange Rate Fluctuations and Private Investment in Sierra Leone
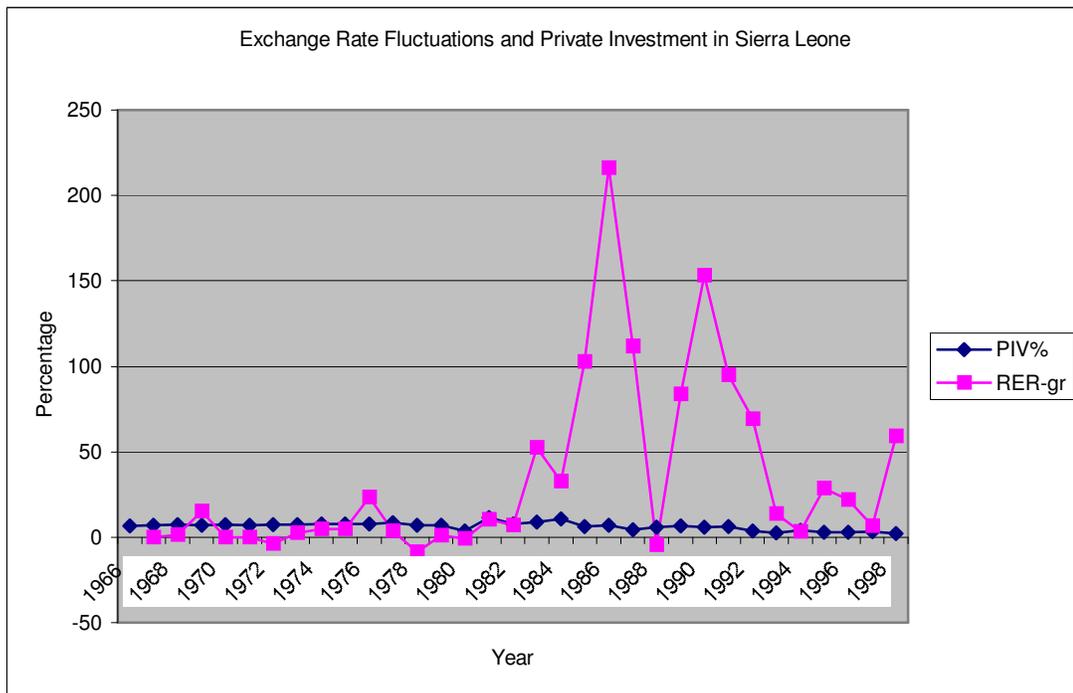
Figure 5C: Interest Rate and Private Investment in Sierra Leone
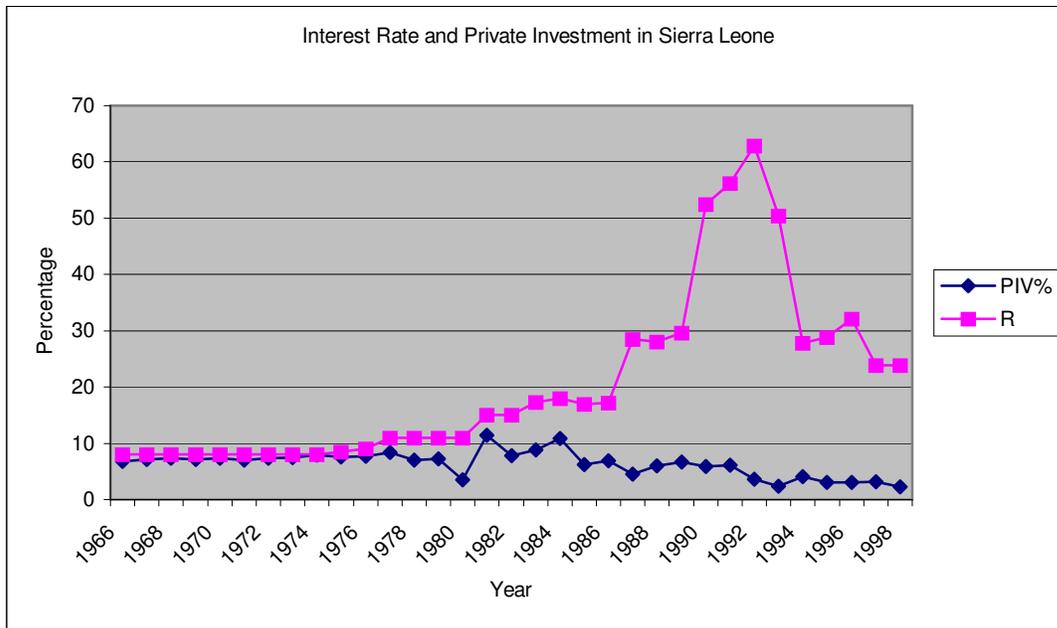

Interest Rate and Private Investment in Sierra Leone

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university. All sources of material used for this thesis has been fully acknowledged.

Declared by:

Name   _____

Signature   _____

Date   _____

Place: Addis Ababa University, Addis Ababa.

This thesis has been submitted for examination with my approval as an M.Sc. thesis Supervisor.

Name   _____

Signature   _____

Date   _____