ADDIS ABABA UNIVERSITY
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THE IMPACT OF EXTERNAL DEBT ON ECONOMIC GROWTH AND PRIVATE INVESTMENT IN ETHIOPIA

BY

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"The Impact of External Debt on Economic Growth And Private Investment in Ethiopia."

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LIST OF ACRONYMS

ADF-Augmented Dickey Fuller test

AIC- Akaike Information Criterion

GDP- Gross Domestic Product

R&D- Research and Development

RGDP- Real Gross Domestic Product

GNP- Gross National Product

HIPC-Heavily Indebted Poor Countries

HQ- Hannan-Quinn Statistics

LDCs- Less Developed Countries

IFS –International Financial Institution

IFS –International Financial Statistics

MEDAC- Ministry of Economic Development and Cooperation

MoFED- Ministry of Finance and Economic Development

NBE- National Bank of Ethiopia

ODA- Official Development Assistance

OECD - Organization of Economic Cooperation for Development

OLS- Ordinary Least Square

SB- Schwartz-Bayesian Criterion

USA - United States of America

USD - United States Dollar

UNDP- United Nations Development Program

VAR- Vector Autoregressive

VECM- Vector Error Correction Model

WB- World Bank

ABSTRACT

Ethiopia, one of the highly indebted poor countries, has continued to experience difficulties in managing and servicing its huge stocks of external debt. Consequently, there have been significant net outflow of resources to meet the debt obligations. Hence, the main focus of the study is to examine the impact of external debt on economic growth and private investment of Ethiopia using a cointegrated VAR model over the period 1960/61 to 2008/09. The result of cointegration test, using Johansen Maximum likelihood approach, indicates the existence of long run relationship among the variables entered in both growth and private investment models.

The estimated short run models points out the current level of external debt flow has a positive while the past debt accumulation has a negative impact on economic growth and private investment of Ethiopia. This confirms the existence of debt overhang hypothesis in the Ethiopian economy. However, in the long run both external debt stock as well as total debt servicing have a negative and significant impact on economic growth and private sector capital accumulation activity. On the other hand, debt cancellation appears to have a positive contribution to economic growth and private investment of Ethiopia. Hence, mitigate the problems of external finance, external borrowing decisions must be linked to a general policy frame work that will guarantee profitability of invested funds and generation of sufficient foreign exchange earnings for external debt servicing. Besides, creating credibility including political will to reforms is required to spur investors' confidence for both local and foreign investments.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Many developing countries have been greatly exposed to external inflow in the past three to four decades. Such external flows are now becoming the source of external debt problems in Africa in general and Ethiopia in particular (Alemayehu and Daniel, 1998). In the 1950s, countries were encouraged to borrow from abroad and create an environment conducive to foreign investment to boost their economic growth. In the process, little attention was paid to the liabilities side of the current account deficit, which increased the external indebtedness of these countries (Were, 2001). As a matter of fact, foreign borrowing can be explained in terms of the technical, managerial and financial requirements necessary to support development programs and economic growth. Between the 1960s and 1970s, deficit in the current account financed by borrowing abroad were highly favoured as a way of boosting economic growth.

During the last decade of the 1980s, the external debt facing the Sub Sahara African countries received increasing attention. According to Fosu (1996), the immediate causes of the region's debt crisis in the 1980s were the economic slowdown and the sharp increases in international interest rates resulting from monetary contractions in some OECD countries and the fiscal policies that were pursued by the USA. The failure of many SSA countries to adapt to the changed external environment, especially their domestic policies, tended to aggravate the debt servicing problem.

To many observers, debt is a new form of colonialism, different kind of North – South relations, a relation in which Western creditors, IFIs and other lenders hold the poor countries in perpetual state of domination and control. A war in which instead of bombing bridges, infrastructure etc with military hardware, communities, households and people lives are being systematically destroyed using debt as a principal weapon.

While external debt-servicing difficulties have affected many countries in the developing world, the challenge has been particularly great for African economies. Most of these economies, including Ethiopia, have not been able to generate the requisite resources to meet repayment obligations especially since the early 1980s (Greene, 1989). Africa's external debt burden increased significantly between 1970 and 2004. From just over 11 billion USD in 1970, Africa had accumulated over 200 billion USD of external debt in the midst of 2004. Total external debt then worsened significantly during the period of structural adjustment in the 1980s and early 1990s, reaching a peak of about 340 billion USD in 1995, the year immediately preceding the launch of the original HIPC. Overall, Africa's external debt averaged USD 39 billion during the 1970s, before ballooning to just over 317 billion USD in the late 1990s. Over the same period, total debt service paid by the continent increased from about 3.5 billion USD to a peak of 26 billion USD (World Bank, 2002). Ethiopia, which is one of the severely indebted poor countries, has not been spared either, the country is incapable of servicing its debt and attaining a reasonable level of economic growth (Abenet, 2005). For example, the external debt as a percentage of GDP of the country which was 10.2 percent in 1970 rose to 102.9 percent in 2002.

1.2 STATMENT OF THE PROBLEM

In the last several decades, many developing countries around the world, especially those in Sub-Saharan Africa experienced large and persistent budget deficits that promoted massive borrowing from external sources to fill the resource gap. This situation is even worse for the non-oil exporting Sub-Saharan African countries, particularly those affected by civil conflicts, large external debt burden, declining terms of trade, un-diversified export bases, and cumbersome trade policies (Salisu, M, 2005). However, inflow of foreign money in different ways has resulted to the accumulation of large external debt stocks and outflow of resources in the form of capital flight in developing countries.

There has been growing concern the extent to which accumulated large stocks of external debt by less developed countries (LCDs) as a deterrent to their growth and development. The debt crisis, it has been argued, resulted from a complex combination of elements, some of which were external to the debtor countries, while others were the direct results of economic policies pursued with in particular indebted countries (Sachs and Larrian, 1994). Ethiopia as a developing nation has not been spared either.

Ethiopia's external debt is not simply unsustainable; even the most generous debt relief would not bring the country in meeting its responsibility within the context of global poverty-reduction goals (Melese, 2005). In line with this, according to the World Bank classification of Highly Indebted Economies, the country is one of the severely indebted low-income countries. Ethiopia's external debt has changed significantly in magnitude, structure and composition over the last four and half decades. In 1975, it stood at about USD 343.7 million, equivalent to 14% of the GDP, and USD 9.1 billion (214% of GDP) in 1991. As at June 30, 1999 this figure had increased to an equivalent of USD 10.2 billion and recently, in 2008/09,

following the debt relief granted in accordance with development initiatives designed to benefit the Heavily Indebted Poor Countries (HIPCs), it had declined to USD 4.15 billion. Thus, high growth of debt and indebtedness, indicated by accumulation of interest and principal arrears, has changed the ability of the country to meet its obligation. Since most of the studies undertaken in this area failed to examine the crowding out impact of debt on private investment, the study aims to fulfil this research gap by examining the impact of external debt on economic growth and private investment in Ethiopia.

1.3 OBJECTIVE OF THE STUDY

The general objective of the study is to examine the impact of external debt on economic growth and private investment in Ethiopian economy. To achieve this broad objective the study has the following specific objectives:

a) Examining the effect of debt cancellation on the economic growth and private investment in Ethiopia.
b) Analyzing the main features of country's debt, including the size, type and sources
c) Empirically investigate the relationship between private and public investment in Ethiopia.

1.4 DATA AND METHODOLOGY

The study relies on secondary data for the period 1960/61 to 2008/09. The major sources of data are Ministry of Finance and Economic Development, National Bank of Ethiopia and Central Statistical Authority of Ethiopia. Moreover, International Financial Statistical of the IMF (IFS), IMF CD-ROM, WB CD-ROM and various World Debt Tables are also used. To

pursue this analysis, two equations (namely investment and growth equations) are specified and estimated by using the Johansen Maximum Likelihood estimation technique.

1.5 HYPOTHESIS OF THE STUDY

Based on empirical literature on the relationship between debt and economic growth in developing countries, the writer propose the following relationships to hold true in our analysis.

a. There is a negative and significant impact of external debt stock on economic growth and private investment in Ethiopia.
b. There is positive and significant contribution of debt cancellation on the economic growth of the nations.

1.6 SIGNIFICANCE OF THE STUDY

Most of the studies carried out so far in this area have focused on the impact of external debt on economic growth both in the developed and less developed countries but has failed to examine its indirect impact on private investment over the years. Apart from this, they have failed to examine the role debt cancelation on the economic growth of Ethiopia. These are a very serious loophole in most of these studies. Therefore, the study aims to fill the gap which has been lacking in almost all empirical studies by analyzing the impact of external debt on economic growth and private investment in Ethiopia. Moreover, it will contribute to the existing literature by extending the works of others in this area.

1.7 SCOPE AND LIMITATION OF THE STUDY

The study would explore the possible ways through which external debt burden affects economic growth and private investment. To achieve this objective, the period range from 1960/61 to 2008/09 is chosen. The period begins in 1960/61, a date chosen not only the appearance of dark spot on the economy but also it marks the beginning of the countries indebtedness.

Although this study attempts to shed light on the impact of external debt on growth and private investment in Ethiopia, yet it suffers from limitation. That is, the problem arises from the problem of inconsistent in data by different institutions. Hence, to avoid this problem an attempt was made by taking one variable from one source.

1.8 ORGANIZATION OF THE PAPER

The paper is structured as follows. The following section (section two) summarizes in brief the macroeconomic performance and external debt in Ethiopia. Theoretical and empirical literature reviews are presented in section three. Section four discuses the model and methodology whereas section five presents estimation results. Finally section six concludes and provides policy recommendations.

CHAPTER TWO

MACROECONOMIC PERFORMANCE AND EXTERNAL DEBT IN ETHIOPIAN ECONOMY

2.1. GENERAL OVERVIEW OF THE ETHIOPIAN ECONOMY

Ethiopia, one of the poorest countries in the world, comes at or near the bottom of several global rankings. In its various world Development Reports, the World Bank locates it on the lowest rung on per capita basis (Befekadu, 2001). For example, in the year 2008/09 the per capita income of the nation was 161USD which was low as compared to the average per capita income of the whole Sub Sahara Africa (580 USD).

The Ethiopian economy being predominantly dependent on agriculture and its performance has particularly been susceptible to unpredictability of weather. In addition to this, the performance of the Ethiopian economy also depends on the external environment which is important bearing on the functioning of both the agricultural, and more importantly, the country's main source of foreign exchange comes from few products like coffee, skins, hides and others.

Ethiopia has witnessed broadly three policy regimes: the Imperial era (Prior to 1973/74), the Socialist (Derg) regime (1974/75 – 1990/91) and the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF) regime (1991/92 on wards). The first regime adopted non interventionalist approach, the second followed rigid inward looking strategy and the third initiated economic reforms to address the long-term structural problems of under development.

The Ethiopian economy has passed through different growth episodes in the period of study (1960/61 – 2005/06). These periods are characterized with different strategies and ideologies that were manifested in the outcome of the economy. The following table summarizes the growth rates of real and per capita GDP in different policy regimes.

Table 2.1: Trends of Growth of Real GDP, Population, Per capita GDP and Sectorial Contributions (Period average)

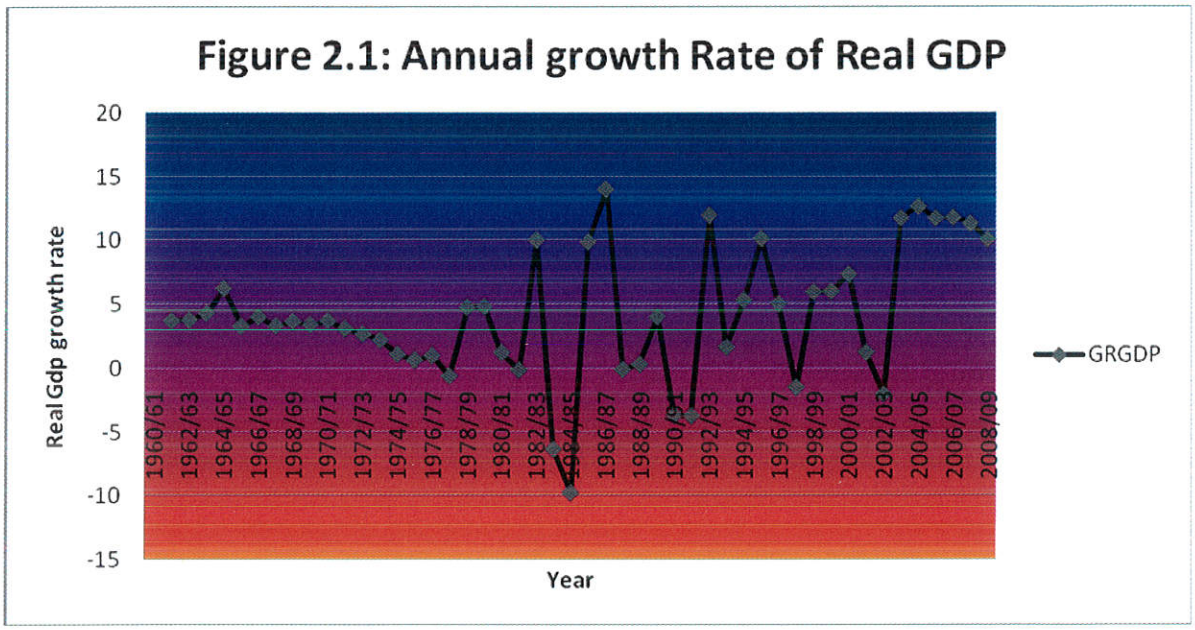
Macroeconomic variables	Period			
	1970/71-1973/74	1974/75 – 1990/91	1991/92 – 2005/06	1970/01–2005/06
Growth rate of real GDP	2.7	1.7	4.9	3.1
Agriculture as % of GDP	1.3	1.1	3.3	1.9
Industry as % of GDP	2.3	1.1	6.5	3.3
Distributive Service as % of GDP	4.9	0.6	5.9	3.8
Other Service as % of GDP	7.0	4.7	6.4	6.03
Growth rate of Per capita GDP	0.07	-1.2	2.7	0.52
Population growth rate	2.6	2.9	2.1	2.53

Source: Ministry of Finance and Economic Development (MoFED) and Author's calculation

Table 2.1 summarizes the average population, per capita and real GDP growth rate of the Ethiopian economy from 1970/71 – 2005/06. In the entire period under review, on average , the Ethiopian economy grew by 3.1 percent per annum, while population and per capita GDP grew by 2.53 and 0.52 percent respectively.

The Ethiopian economy, in the last four years of the Imperial era (1970/71 – 1973/74), had been growing at a linear growth rate of 2.7 percent per annum while population and per capita

GDP were growing by 2.6 and 0.07 percent per year, respectively. But, due to civil war, recurrent drought, high population growth and inappropriate economic policy and management, the performance of the Ethiopian economy and average per capita GDP fall to 1.7 and -1.2 percent per annum, respectively. The negative growth rate of per capita GDP was due to high population growth rate (2.9 percent per annum). The following figure illustrates the annual growth rate of real GDP over the period of 1960/61 to 2008/09.



The post 1991 period, Ethiopia witnessed several economic reforms under the structural adjustment program. This becomes compulsory due to serious balance of payment crisis in Ethiopia. The new government, which took over in 1991, initiated a set of reforms to address both the need for immediate macroeconomic recovery and long term structural problems of under development. The reforms include market oriented policies targeted at removing price and cost distortions, encouraging private sector, promoting export, and progressive liberalization of the economy with a corresponding reduction in the role and size of the government sectors. As a result, between 1991/92 – 2005/06, relatively good economic performance is recorded though it experienced fluctuations. On average, during this period,

the economy and per capita income have been growing by about 4.9 and 2.7 percent per annum respectively. If there had not been frequent drought and the Eritrean regression of May 1998, the growth rate of GDP would have been expected to be higher (Befekadu and Birhanu, 2001).

2.2. THE STRUCTURE OF ETHIOPIAN ECONOMY

It is well known that agriculture is the back bone of the Ethiopian's economy, although its performance disappointing and its techniques of production are backward. The growth rate of real GDP can also be looked from its sectorial components. The following table demonstrates the average share of agriculture, industry and service sectors to GDP in the three regimes.

Table 2.2 Average percentage Sectorial Contribution of GDP in Three Regimes

Sectors	The share of value added to GDP by period			
	1960/1 – 1973/4	1974/5 – 1990/1	1991/2 – 2005/6	1960/1 – 2005/6
Agriculture	67.7	55.5	49.61	56.09
Industry	9.28	11.5	12.49	10.90
Service	23.02	33	37.89	33.01

Source: Ministry of Finance and Economic Development (MoFED) and Author's calculation

Table 2.2 reports that agriculture , as compared to other sectors, contributed a lion share in the real GDP of Ethiopia during the entire period under review (1960/01 – 2005/06). That is, the share of agriculture was 56.09 percent, while the shares of industrial and service sectors were 10.9 and 33.01 percents respectively. Hence agriculture was the backbone of Ethiopian economy during the last four and half decades.

During the last 15 years of the Imperial regime, on average, the agriculture sector contributed 67.7 percent of GDP, while the industrial and service sectors contributed 9.28 and 23.02 percent of GDP respectively. In this period, the share of the industrial sector grew steadily from 7 percent in 19960/61 to 28.7 percent in 1974/75. The steady growth in the percentage share of the industrial and service sectors can be viewed as the right track to economic growth and development.

The average contribution of agriculture declined to 55.5 percent of total output in the Derg (Socialist) regime (1974/75 – 1990/91). The industrial and service sectors were 11.5 and 33 percent per annum respectively. The share of the agricultural sector declined which was accompanied by an increase in the share of service sector. The share of industrial sector exhibited little change from the figure of Imperial regime. In the contemporary EPRDF regime, the sectorial profile of the economy experienced similar changes as that of the previous regimes. The average share of agricultural sector declined to 49.61 percent, while the service and industrial sectors contribution increased to 37.89 and 12.49 percents respectively.

2.3. GROSS DOMESTIC SAVING AND INVESTMENT IN ETHIOPIA

Physical capital formation is regarded as one of the requirements which lead to economic growth. However, the low rate of investment has greatly impeded the country's economic growth. Investment is financed from different sources. The main source is Gross domestic Saving (GDS) and the gap between the two, if it exists, can be obtained from external sources through external debt, aid and foreign direct investment (FDI).

Gross domestic saving, which is one of the major sources for financing gross capital formation, stimulates the accumulation of physical capital through investment. The trend of GDS as a percentage of GDP has not been satisfactory. The following table summarizes the trends of capital formation and domestic saving from 1960/01 to 2007/08 in Ethiopia.

Table 2.3: Average Percentage Share of Gross Domestic Saving and Capital Formation to GDP

Macroeconomic indicators	period			
	1960/1 – 1973/4	1974/5 – 1990/1	1991/2 – 2007/8	1960/1 – 2007/8
Gross Capital Formation (% of GDP)	15.82	13.27	21	15.92
Gross Domestic Saving (% of GDP)	14.15	7.09	7	9.12
Resource gap (% of GDP)	-1.67	-6.8	-16	-6.18

Source: Ministry of Finance and Economic Development (MoFED)

Table 2.3 illustrates that, during the entire period under review a country registered gross capital formation of 15.92 percent of GDP. The performance of gross capital formation shows that between 1960/61 and 1973/74 its share in GDP had been 15.82 percent, which declined to 13.27 percent and went up again to 21 percent during the Derg and post Derg periods respectively. The lower share during the Derg regime was not a result of the increase private consumption from the previous levels, but presumably due to poorly structured and ill managed economic environment. In this particular period, ownership of means of production was mainly restricted to the government and the role of the private sector in the economy was deliberately reduced. In addition, foreign direct investment declined due to socialist ideology and the political turmoil that prevailed during these periods. Even the public owned large enterprises, which could have expanded the rate of physical capital formation, were less productive and contributed low level. In contrast to the Derg regime, the higher share of gross capital formation registered during EPRDF (21 percent). This was mainly due to better economic environment which encourages private sector participation in the economy by reducing the role of the government.

The table also displays that during the entire period under review, on average, gross domestic saving amounted 9.12 percent of GDP. The trend of gross domestic saving, as a percentage of GDP, of Ethiopia confirms that the achievement during the Imperial regime (1960/61 – 1973/74) was remarkable with average share of 14.15 percent. This very good record has never been attained. Rather, it has deteriorated to 7.09 percent in the Derg period (1974/75 – 1990/91) and further down to 7 percent during the post dereg time of 1991/92 – 2007/08.

The trend of saving and capital formation resulted in an extended resource gap. The gap (measured as a percentage of GDP) was low in the Imperial regime with an average of 1.67 percent. Nevertheless, it widened drastically to 6.18 percent in the Derg era which further increased to 16 percent between 1991/92 to 2007/08. This shows how important foreign borrowing in bridging the resource gap.

2.4. EXTERNAL DEBT IN ETHIOPIA

2.4.1 TRENDS OF EXTERNAL DEBT

The poor performance of the Ethiopian economy has made external assistance a prominent feature of the country's economic structure. Since 1974, at which Ethiopia applied for loan from the IMF, the country has shown more and more dependent on external assistance and has reached a stage where it cannot function without it (Befekadu and Birhanu, 1999/2000).

Ethiopia's external debt has changed significantly in its magnitude, structure and composition over the last four and half decades. In the last four years of the Imperial regime (1970/01 – 1973/74) the country's external debt stock and debt service grew at an average of 13.18 and 3.11 percent per annum respectively. In 1974/75, when the Imperial regime was overthrown by the Derg government, the total debt stock stood at 372 million USD or 14 percent of GDP

at current market percent of GDP at current market price. On May 28, 1991, the military government was in turn overthrown by the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), whose budget was issued June 30, 1992. At the time the country's external debt was 8.8 billion USD, equivalently 95 percent of GDP at market price. Thus, during its 17 year tenure, the military government increased the country's total external debt by 24 – fold, at annual average growth rate of 21 percent (see Table 2.4 below). The following table summarizes the external public debt of Ethiopia in different policy regimes.

Table 2.4: Summary of External Public Debt (in million USD)

Period	Total external Debt	GDP (nominal)	Ratio of External Debt to GDP	Total Debt Service	Total Export	External Debt service Ratio
1974/75	372.00	2,657.14	14	56.8	249.12	22.8
1991/92	8,843.00	9,308.42	95	253.2	389.16	65.06
1999/00	5, 394.10	6,526.36	82.65	130.90	983.75	13.31
2000/01	5,479.00	6,507.89	84.19	152.60	958.16	15.93
2001/02	6,211.00	6,081.12	102.14	91.9	939.98	9.78
2002/03	6,784.00	6,652.36	101.98	83.18	1,139.63	7.30
2003/04	7,367.00	8,027.35	91.77	93.14	1,346.00	6.94
2004/05	5,917.00	12,526.22	47.24	108.67	847.20	12.83
2005/06	5,988.00	15,487.24	38.67	108.26	1000.30	10.82
2006/07	2,314.60	20,234.06	11.44	99.38	1,185.10	8.39
2007/08	2,767.10	29,525.58	9.37	88.67	1,465.90	6.05
2008/09	4,151.80	33,610.63	12.35	78.00	1,447.90	5.39

Source: Various years MoFED data and author's calculation

Between the fiscal year 1992/93 to 1998/99 the foreign debt of Ethiopia grew by 10.41 percent, while the debt service dropped by 25.03 percent. Out of the total outstanding loan, the long term loan, short term loan and IMF credit were 95.5, 4.23 and 0.56 percent

respectively. According to the World Bank (1998), Ethiopia's long term debt increased from 169 million USD in 1970 to 8,843 million USD in 1991. This huge increase was due to increasing public finance and current account deficit during the Derg regime.

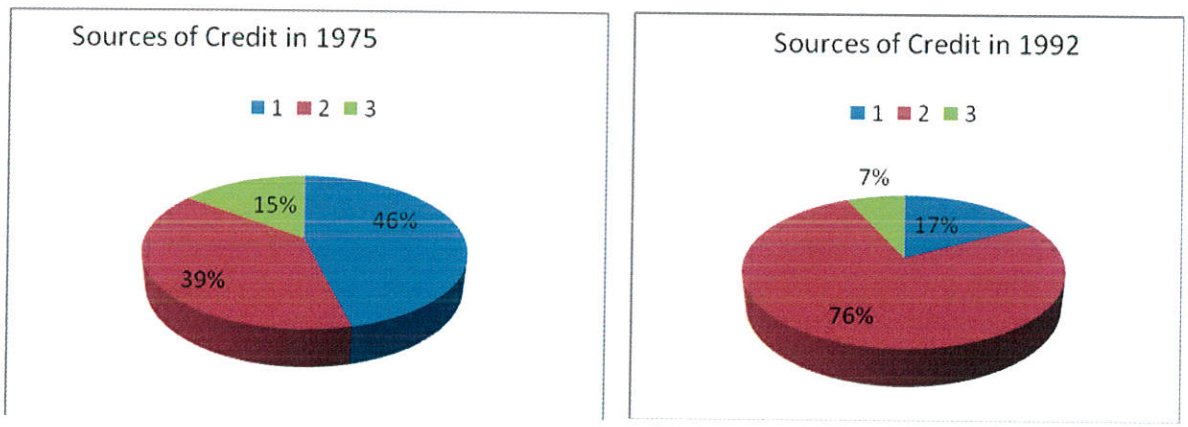
Table 2.4 also illustrates, the yearly total debt stock between 1999/00 to 2003/04 was increased by 37 percent. That is, from 5,394.0 million USD in 1999/00 to 7,367.00 million USD in 2003/04. Between the 1999/00 to 2000/01, the debt stock increased marginally from 5,394.00 million USD to 5,479.00 million USD. But, during the rest of the period from 2001/01 to 2003/04, debt stock rose from 5, 479.00 million USD to 7, 367.00 million USD registering 34 percent increase.

The increase in total debt between 1999/00 to 2003/04 was attributed to two factors. First, positive transfers from external creditors facilitated Sustainable Development and Poverty Reduction Program (SDPRP) implementation. Second, currency depreciation, especially USD against EURO, influenced the total debt stock to increase over the reference period. It is also noted that, although debt from bilateral and commercial creditors remained steady, the increasing trend in multilateral credit was the main reason for increasing the total debt stock by 1,973.0 million USD from 1999/00 to 2003/04. After 2003/04, the total debt stock of the nation had decreased from 7, 367.00 million USD in 2003/04 to 4.15 million USD in 2008/09. This huge decline in debt stock was associated debt relief obtained as per the Enhanced – Highly Indebted Poor Countries (HIPIC) initiative.

2.4.1. SOURCES OF CREDIT

Although the country's indebtedness increased in magnitude during the last three and half decades, the changes in the sources of long term credit are particularly conspicuous. The total debt outstanding can be categorized in to multilateral, official bilateral and commercial creditors. In 1975, the shares of multilateral, bilateral and commercial debt were 46, 39 and 15 percent respectively. While in 1992, the shares of these sources of credit were 17, 76 and 7 percent respectively. The change in the relative share in favour of bilateral at the cost of multilateral and commercial was mainly due to military credit from the former Soviet Union, which accounted nearly 60 percent of the total external debt stock. For comparative purpose, the following charts show sources of credit at two critical periods[1] in the country's history over the last 36 years.

Figure 2.2: Sources of Credit in 1975 and 1992



Source: MoFED

Key: Multilateral Credit

Bilateral Credit

Commercial Credit

[1] The two periods are 1975 and 1992 were the Imperial and the Derg governments are over thrown by the socialist (Derg) and EPRDF governments respectively.

In 1999/00, the multilateral credit accounted 52 percent of the total debt stock where as bilateral and commercial credit constituted 46 and 21 percent respectively. The increase in the proportion of multilateral debt was associated with loans obtained mainly from the World Bank, the IMF and the African development finance structural adjustment programmes (SAPs). The sharp decline in the share of commercial credits was the result of the commercial debt buyback operation completed in 1996, as well as the significant reduction in the debt contracted by Ethiopian Airlines as a result of regular and timely repayments. The following table summarizes the different sources of external debt of Ethiopia in different time periods.

Table 2.5 Sources of External Debt (in million USD)

Year	Multilateral	Bilateral	Commercial	Total debt outstanding
1999/00	2, 795.10	2,483.00	116.00	5,394.10
2000/01	2, 929.00	2,443.00	107.00	5,479.00
2001/02	3, 630.00	2,486.00	95.00	6,211.00
2002/03	4, 247.00	2,450.00	87.00	6,784.00
2003/04	4, 670.00	2,444.00	253.00	7,367.00
2004/05	4,891.40	669.80	355.85	5,917.05
2005/06	4, 865.30	776.26	356.97	5,998.53
2006/07	1, 193.06	806.90	314.60	2,314.56
2007/08	1, 536.86	953.48	275.81	2,766.15
2008/09	2, 033.21	1,041.04	1,077.6	4,151.80

Source: Various years MoFED data and author's calculation

As of June 30, 1999, the debt owed to multilateral creditors totalled 2,795.1 million USD or 51.8% of external debt of the country and 65% excluding the amount owed to Russia. This share had continuously increased to 4,891.4 million USD in 2004/05. The reason for the increment in credit from multilateral sources was due to continuous reduction in bilateral credit from 2,483.00 million USD in 1999/00 to 669.8 million USD in 2004/05. However,

after 2004/05 the share of multilateral credit had decreased to 2,033.21 million USD (48.98 percent of the total external debt). This decline was marginally compensated by the rise in credit from bilateral sources 669.8 in 2004/05 million USD to 1041.04 million USD in 2008/09. In 2008/09, out of the total external debt of the country, multilateral credit contributed a lion share of 48.98 percent while bilateral and commercial credit contributed 25.08 and 25.96 percent respectively.

CHAPTER THREE

LITERATURE REVEIW

3.1 THEORETICAL REVIEW

3.1.1 GROWTH THEORIES AND THE DEBT COMPONENT

This section provides various theories of economic growth and how the debt component can be integrated in to these theories. The theoretical view about economic growth can be classified under three broad headlines, namely: (1) the Keynesian prospective (Harod-Domar growth model), (2) the neo-classical (Solow) growth model, and (3) the endogenous growth theory.

3.1.1.1 THE HAROD-DOMAR MODEL

Early theoretical formulations that relate external finance with economic growth were based on the Harod-Domar model. This model uses saving as a ladder to growth (Hansen and Tarp, 2000). The model is based on the assumptions that potential output is proportional to the stock of capital and factor inputs are employed in fixed proportion with no possibility of substitution. The model further assumes that; the economy is closed, there are only two factors of production (labour and capital), labour is homogeneous and grows at a constant rate, and there is no technical progress. Therefore, in the Harod-Domar framework, change in potential output will be:

$$\Delta Y = \frac{1}{V} \Delta K \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where; Y = potential output, K= physical capital and V= constant capital output ratio.

According to the model, change in capital stock equals to gross investment. Hence, considering constant rate of capital depreciation (δ) the growth rate of potential output will be:

$$\frac{\Delta Y}{Y} = \frac{1}{V}\frac{1}{Y} - \delta \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.2)$$

The model shows that output and capital formations are linearly related. That is, when there is more capital stock (which is financed by saving including one of its foreign component – external debt), the higher would be the growth of an economy. From the outset, the Harod-Domar model was used to calculate the amount of finance required to bridge the gap between the available savings and the required amount that must be channeled to investment to bring about the targeted growth rate (Easterly, 1998). This implies, in the Harod- Domar model, constraints on savings is the binding limit to growth. That is, when domestic savings alone are inadequate to bring about the investment level necessary to attain the targeted growth rate then growth is said to be constrained by the savings gap (i.e., short fall of actual savings from the desired level). Therefore, the role of foreign finance, which includes external debt, in this regard is to augment domestic savings so as to achieve the targeted rate of growth.

Studies beginning from the 1960's extended this analysis to include the gap between import and export (referred to as trade gap) as the other source that limits growth. This approach is based on the assumption that all investment goods are not produced locally (i.e. some level of capital import is necessary in order to achieve the desired investment level). When foreign exchange earned through export are insufficient, actual import will be lower than the level required to achieve a targeted growth rate (Weiskopf, 1973). Thus, the role of foreign inflow here is to finance the import bill left uncovered through export earnings so as to achieve the targeted growth rate. This approach got emphasis since developing countries depend on imported capital goods and intermediate inputs.

The incorporation of this gap led to the Two-Gap model where both savings and foreign exchange act as the constraints that impede growth. In this model, both gaps represent separate or independent limit to growth where inflow of foreign fund is used to fill the gaps (Chenery and Strout, 1966). Moreover, according to the model, it is one of the two constraints that would be binding at a given point in time. That is, it is the larger of the two gaps that constrains growth. Therefore, the impact of foreign transfer relies basically on identifying the binding constraint (Weisskopf 1973). The desired rate of growth cannot be attained if foreign finance is not sufficient to finance the larger gap. In addition, if the foreign exchange constraint is binding, the growth impact of external borrowing will not be facilitated via its impact on the level of savings. Rather, it affects growth through relieving the limits on import. This means, in contrast to the Harod-Domar model where the effect of debt on growth is through saving, growth can be directly influenced by foreign inflow if the trade gap is binding (Hansen and Tarp, 2000).

In the late 1980's, the role of fiscal limitation in affecting growth gained attention in the gap analysis. In this framework, the gap between government revenue and expenditure is considered as the other source of growth hindrance (Taylor, 1994). Actually, fiscal gap is one component of saving gap. However, in theory, the inclusion of this gap plays an important role at a time when a country suffers from external shock and/or when underutilization of capital persists. For instance, expenditure on education, infrastructure, health and so forth is required to expand economic capacity. But, government revenue must be sufficient to meet the expenditure. Otherwise, growth will be limited by fiscal gap (Hjertholm, Laursen and White, 2000). Therefore, fiscal limitation has the potential to be the binding constraint in affecting growth than the other two gaps.

The Harod-Domar model and the extended versions point that the approaches suffer from basic limitations. First, the underlying assumption that growth is proportional to capital stock is unlikely to be true. That is, a linear association of capital and output would imply that as long as the finance (including external debt) required for capital formation is available, any growth target would be achieved. This assumption is incorrect that even Evsey Domar (co-founder of the Harod-Domar model) had admitted it to be unrealistic and dismissed the original model (Easterly, 1998). Thus, the level of capital formation alone does not guarantee growth as postulated by the Harod-Domar model. Several factors that affect productivity at the same time must be addressed. This includes identifying the relationships between debt, investment, policies and growth. Moreover, the growth impact of foreign debt is not one - for-one as postulated by the Harod-Domar type of analysis (Hjertholm, Laursen and White, 2000). Rather, foreign borrowing may substitute domestic resources, affect the exchange rate and, therefore, may bring undesirable result. Hence, the simplistic view of early theories does not adequately address the macro economic impact of external debt. In addition to this, gap analysis is developed based on the assumption that the structure of the economy does not change. The theory, therefore, is inapplicable in times of policy changes that reshape a country's economic structure.

3.1.1.2. THE NEO-CLASSICAL (SOLOW) GROWTH MODEL

In contrast to early studies, several attempts have been made to assess the debt-growth relationship within the neoclassical and endogenous growth frameworks. Unlike the Harod-Domar model, the neoclassical growth model allows for factor input substitution and diminishing marginal returns in the production process. The basic neo-classical growth model shows that for the growth of an economy capital accumulation is the central issue. The model further shows that aggregate saving (investment) determines the growth of capital stock,

which, in turn plays a key role in the growth of an economy. Technology is considered as exogenous, whose prime role is to augment labour. In this framework, the rate of investment and population growth determines the growth rate of per capita output (Johns, 1998). Nevertheless, growth continues only in the transition to a new steady state. In the long run, the rate of technological change which is exogenous by assumption, determines the growth rate of the economy. This implies that policy measures do not affect long run growth rate. Thus, the standard neoclassical growth model does not emphasize the contribution of policy for long run rate of growth (Durbarry, Gemmell and Greenway, 1998). This model can be briefly explained as follows.

The Solow model studies the growth path of economies by assuming a neoclassical production function which combines two factors to produce output: capital and labour. Both factors are perfectly substitutable (Morrissey, 2001) and exhibit diminishing returns to scale (Ray, 2001):

$$Y(t) = K(t)^{\alpha} L(t)^{1-\alpha} \quad \text{..... (3.3)}$$

Where; $0 < \alpha < 1$

Output is denoted by Y, K is capital, L equals labour and A is technology. The assumption of diminishing returns implies that each additional investment project produces a smaller return until the point where the next project is not profitable (Concessional Budget Office, 1994). When no profit exists there are no incentives to invest and no capital is accumulated.

The neoclassical model describes how an economy will eventually converge to a steady state where the growth rate of per capita output is constant in the long run. The growth rate of the

economy is determined by the growth of the labour force and the savings rate which are taken as exogenous. The per capita savings rate is defined as:

$$S_i = \frac{I_i}{Y_i} \quad \text{..... (3.4)}$$

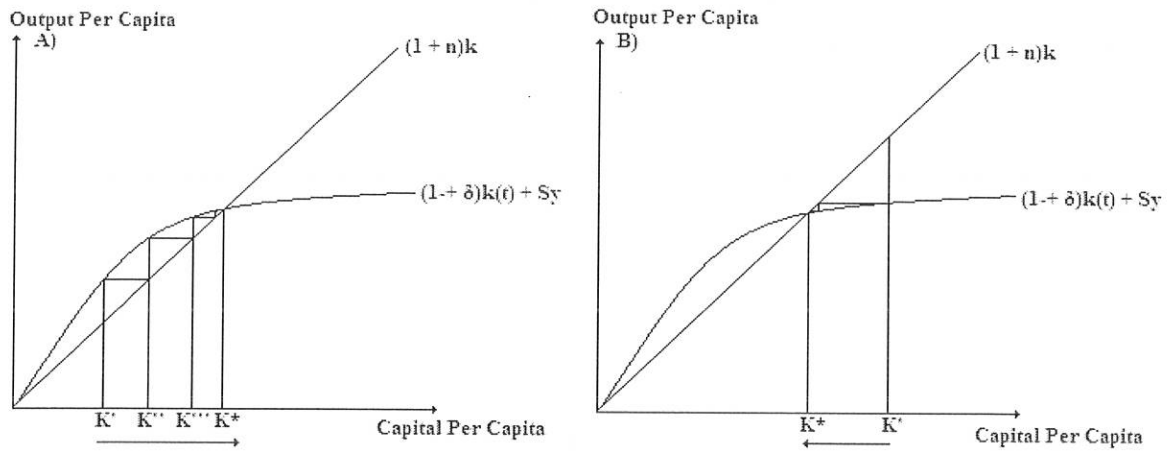
The above equation represents the connection between savings and investment which are the driving force behind growth in the Solow Model. Household's savings are lent to investor via banks. These investors can then use the funds to expand production, or replace machinery, which causes capital to accumulate. The capital movement equation (Ray, 2001) takes the following shape:

$$(1+n)\,k(t+1) = (1+\delta)k(t) + sy(t) \quad \text{..... (3.5)}$$

Where, $0< \delta<1$

$(1+\delta)$ represents the level of capital depreciation, k(t) denotes the level of capital at time t and sy(t) indicates the fraction of income which is saved, and combining all the components on the right hand side of the equation explains how much capital is available in the next time period i.e. k(t+1). Capital tomorrow depends on the existing capital today minus depreciation plus the fraction of income which is invested. It is assumed that the population grows at a constant rate n, which has a negative effect on capital in the next period. As the population grows, capital is dispersed over a larger number of people causing capital per capita to fall. The evolution of growth in the Solow model can be seen in figure 3.1 below:

Figure 3.1: Dynamics of the Solow Model



Source: Ray, D (1998) "Development Economic."

At point k' in panel A, the stock of capital is greater than the growth of population [(1+ δ) k(t) + sy(t) > (1+ n) k(t + 1)] which results in higher capital per capita and a movement from k' to k''. This increase in capita per capita caused a decrease in the capital-output ratio due to diminishing returns to capital. This means capital will continue to increase at a decreasing rate until point k* which is known as the steady state. At this point capital accumulation equals population growth.

Panel B shows a situation where growth in the population outstrips accumulation in capital causing the economy to converge back to the steady state (K' to K*). In the long run diminishing returns imply that the economy will always converge back to a point with a constant growth rate. The neoclassical model implies that external finance stimulates growth via higher investment levels (Boone, 1996).

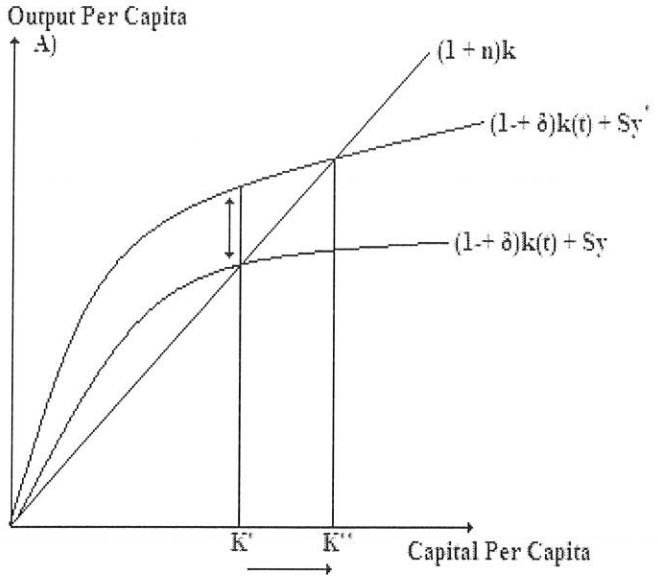
The marginal propensity to save is very high in developing countries, but the problem is that average propensity to save is low. This is because the developing world suffers from the savings gap and/or the foreign exchange gap. The savings gap stems from a vicious circle in

which poor countries initially start with low growth levels which correspond to low income levels. The average propensity to save is low because any income is immediately consumed via basic commodities. Lack of saving prevents capital accumulation which further restricts growth. However, external finance which incorporates foreign debt can be used to bridge this gap by relaxing the budget constraints faced by individuals. Often, developing countries cannot domestically produce all the capital needed for growth. They have to import from more advanced nations, however, they lack the foreign exchange needed to buy the foreign goods. Foreign borrowing can eliminate this 'foreign exchange' gap by providing the necessary currency. Consequently investment can occur and growth can increase.

Figure 3.2 illustrates how greater savings due to foreign borrowing, increase economic growth (although at a decreasing rate), with higher saving levels shifting the $(1+ \delta)\ k + Sy$ curve upwards. Remaining at point K' means that capital has accumulated faster than population therefore capital per capita increases, causing a gradual movement to a new steady state, K''. Increasing the amount of capital per worker will cause productivity levels to increase which will ultimately raise GDP.

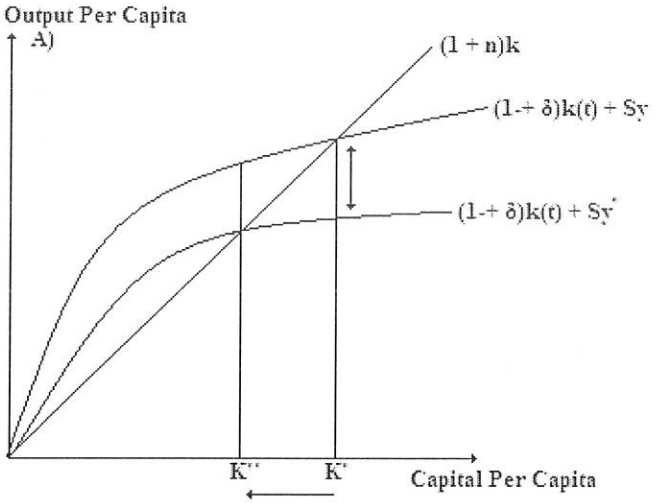
To represent the growth path in the presence of distortionary government policy, consider the introduction of a tax. This tax will cause people to save less which shifts the $(1+ \delta)k + Sy$ curve downwards as less capital is accumulated. Remaining at K' means that the population is growing faster than capital accumulation. Gradually capital per capita falls, and the economy moves to K''.

Fig 3.2: Solow Growth Model with External Debt.



Source: Ray, D (1998). "Economic Development."

Figure 3.3: Solow Model with Policy Distortion (Tax)

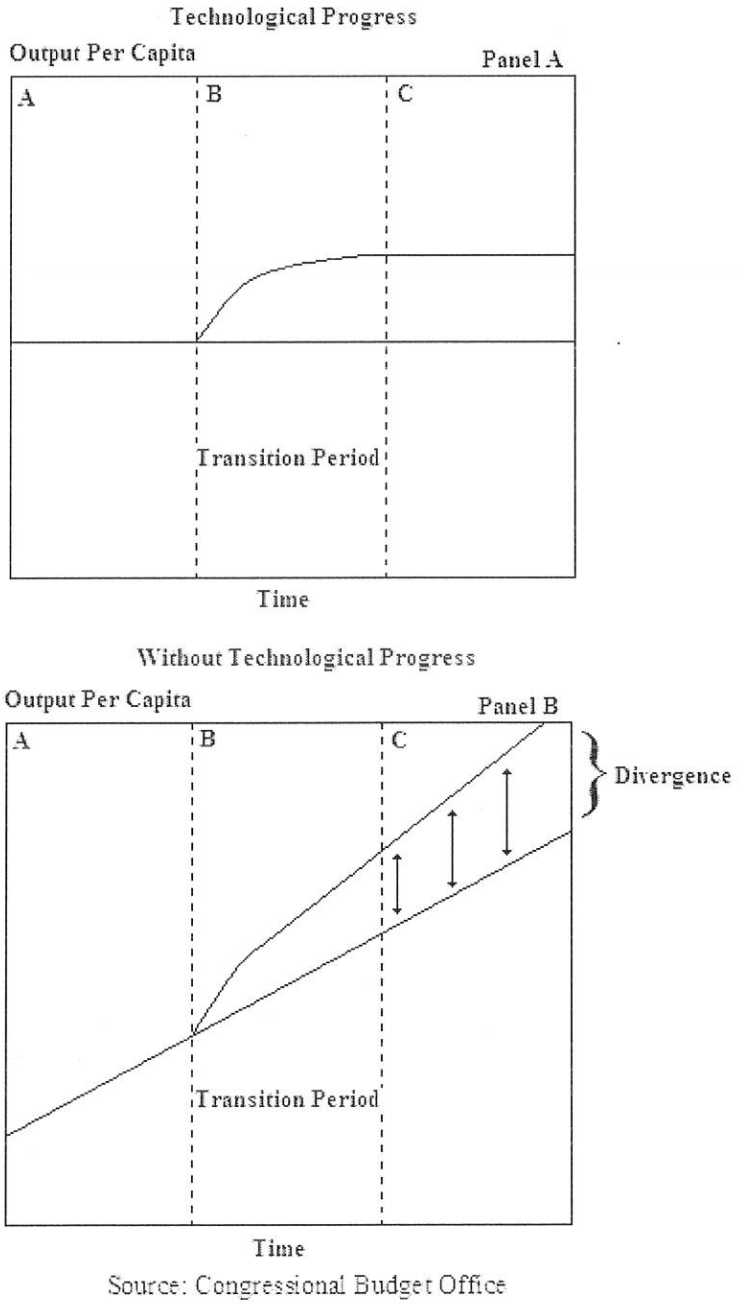


Source: Ray, D (1998). "Economic Development."

The Solow Model, however, is hindered by two basic limitations: firstly the inability to explain long term growth. Secondly, the assumption of diminishing marginal returns. The first limitation is that the Solow Model only describes changes in the level of growth in the long run, whilst the rate of growth cannot be changed. Figure 3.4, panel A, shows that an increase in the rate of savings only increases the level of growth and not the rate. This is because the

new growth path remains parallel to the original. However, as shown in section B of panel A, as the economy moves onto a new growth path, growth increase temporarily during the transition period, but in the long run the growth rate is constant.

Figure 3.4: The Effects of an Increase in the Savings Rate in the Neoclassical Model of Economic Growth, with and without Technological Progress.



Source: Congressional Budget Office

The Solow Model can be augmented with technological progress which means the economy can move onto a new growth path which experiences an increasing growth rate, shown in panel B of figure 3.4. However, this technology is taken as exogenous (Mankiw, Romer and Weil, 1992) and the model fails to explain the sources of the technology. This reliance on exogenous factors without explanation of the source is perhaps the models most serious limitation. This means that an economy cannot experience long term growth without technological progress which just falls from heaven with no explanation.

3.1.1.3 THE ENDOGENOUS GROWTH MOEDL

To overcome the limited long term effects of the Solow Model; human capital is introduced into the theory. Human capital is not subject to diminishing returns (Romer, 2006) allowing growth to occur continuously at a rate of human capital accumulation. This addition into the growth theory changes very little, with foreign debt and policy distortions having the same impact in the short run. However, this endogenous model does drop the assumption of diminishing returns which allows for unbounded long term growth. This is because non diminishing returns to capital mean that the returns on investment projects will never equal the cost (depreciation) which allows for a profit on each subsequent investment. This endogenous model, inspired by Romer (2006), suggests equilibrium can be reached where continuous long term growth exists. This means that foreign borrowing will increase growth well into the long run.

Romer states that growth is closely related to the level of human capital. Firms directly benefit from knowledge accumulation due to new innovations and designs that allow for greater productivity. Increase external debt leads to greater accumulation of human capital via increase education and widespread Research and Development. Additional human capital

causes a higher rate of technological progress, via new innovations. Higher technological progress increases output per capita allowing for unbounded long run growth.

The endogenous growth model basically differs from the neo-classical one because the former endogenizes improvements in technology. In the endogenous growth setup, the role of externality that arises from research and development is considered as growth stimulant factor, unlike the neo-classical model. Because of this, rate of growth continues even in the steady state (Johns, 1998). Therefore, new growth models acknowledge that policy measures could have significant impact on long run growth. In both models, external debt is treated as a component of total saving. However, the Solow model argues that foreign debt is most productive when the country is poorest (Bulir and Lane, 2002). To capture the macroeconomic complication associated with foreign debt, modern theories have extended their analysis to examine the influence of debt on several other variables. This includes examining the impact of debt on economic growth and private investment.

3.1.2 IMPACT OF EXTERNAL DEBT ON PRIVATE INVESTMENT AND ECONOMIC GROWTH

In various theoretical models, reasonable levels of current debt inflows are expected to have a positive effect on growth. In traditional neoclassical models, allowing for capital mobility increases transitional growth. There is an incentive for capital scarce countries to borrow and invest since the marginal product of capital is above the world interest rate (Paltilo et al, 2002). However, beyond a certain level debt has an adverse impact on growth. Therefore, the effect of external debt on private investment and economic growth in developing countries

has been identified through three broad channels, namely: the debt overhang, import compression and general macroeconomic disequilibrium theories.

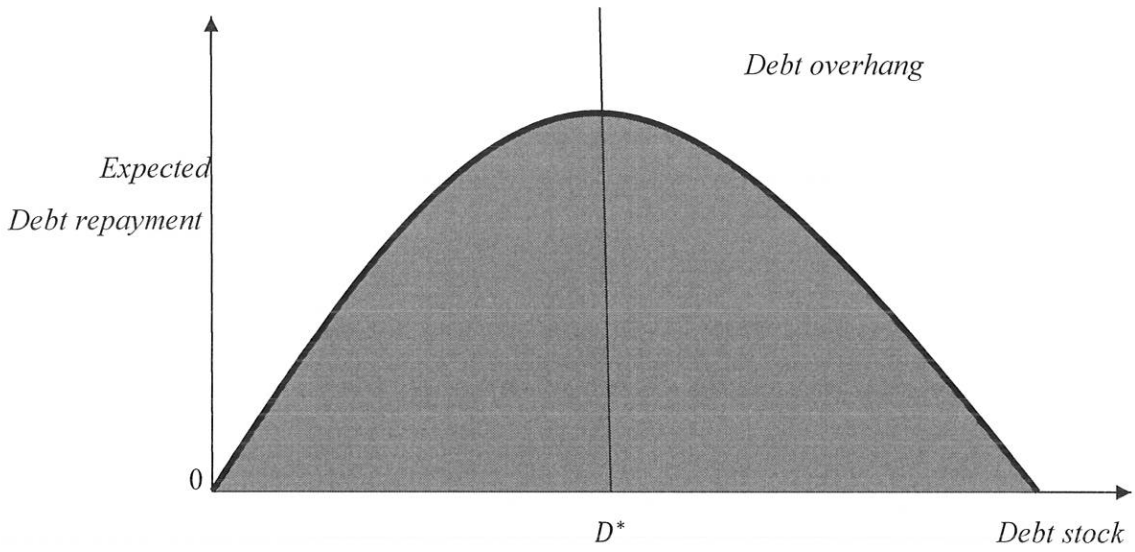
3.1.2.1 DEBT OVERHANG THEORY

The dominant theory underlying the adverse consequence of an excessive debt stock is the "debt overhang" hypothesis. Debt overhang is a situation in which the expected repayment on the external debt falls short of the contractual value of debt. If the country's debt level is expected to exceed the country's repayment ability with some probability in the future, expected debt service is likely to be an increasing function of the country's output level. Thus some of the returns from the domestic economy are taxed away by the existing foreign creditors, which discourages investment and economic growth (Krugman, 1988).

The theoretical literature suggests that foreign borrowing has a positive impact on investment and growth up to a certain threshold level; beyond this level, however, its impact is adverse. As indicated in Cohen (1993), the relationship between the face value of debt and investment can be represented as a kind of "Laffer curve"[2]. The graphical representation is given below.

[2] The debt Laffer curve depicts the relationship between a country's nominal debt stock and the market expectation of the repayments that these loans will generate. Repayment can be measured the secondary market price of debt multiplied by the existing stock.

Figure 3.5: The Debt Laffer curve



Source: *Pattilo et al, 2002*

The above graph, according to Krugman (1989), shows that initially there is a positive correlation between debt stock and expected debt repayment until point D^*, a point where expected debt repayment level reaches maximum. Beyond point D^* the relationship between the two variables become negative. Therefore, the high debt stocks tend to be associated with lower probabilities of debt repayment. On the upward-sloping or "good" section of the curve, increase the face value of debt is associated with increase in expected debt repayment, while increase in debt reduces expected debt repayment on the down-ward sloping or "bad" section of the curve.

3.1.2.2 IMPORT COMPRESSION AND DUTCH DISEASE

Servicing of external debt erodes the foreign exchange available for imports. This has led to import compression problem that adversely affects both public and private investment

(Alemayehu, 1998). Cutting imports, which are essential inputs for development, has a large loss on the present and future output of the country.

The other aspect of external finance is the "Dutch disease". The name Dutch disease is derived from what the Netherlands experienced in 1970s following the discovery of natural gas reserves. That is, with the boom in the traded sector, the Dutch economy suffered from an increases in inflation and unemployment and a decline in the competitiveness of the export sector that led the economy to have lower growth rate (Hjertholm et al, 2000). According to Alemayehu (1997), external finance can lead to Dutch disease[3] if part of this is spent (the spending effect) on non tradable goods, which in turn leads to a real appreciation (that is a rise in relative price of non tradable goods). This in turn leads to resource movements (resource movement effect) out of the non booming tradable sector in to the non traded sector.

3.1.2.3 MACROECONOMIC DISEQUILIBRIUM

Debt repayment constrained a country's prospective by transferring resources to other countries. The problem is more serious in SSA countries where earnings from exports are very low (Abenet, 2005). Debt burden has the following major implications on the country's economic performance.

First, resources used to service debt crowds out investment. The higher the current debt service, the less resource is available to finance investment without reducing consumption (Cohen, 1993). Other things being equal, higher debt service can raise government's interest bill and budget deficit, reducing public saving. This, in turn, may either raise interest rates or crowds out credit available for private investment, that dampening economic growth. Higher

[3] Dutch disease occur where there exists a booming and lagging sectors in the traded goods sector.

debt service payment can also have an adverse effect on the composition of public spending by squeezing the amount of resource available for infrastructure and human capital, with negative effect on growth (Clement et al, 2003).

Second, debt shock also creates a debt overhang problem which shatters the confidence of both foreign and domestic private investors who are usually sensitive to uncertainties (Alemayehu, 1998).This uncertainty is born on investors mind because debt service will be financed with discretionary types of taxes, such as the inflation tax (Age'nor and Montiel, 1996). Following this, the investors will prefer to exercise their option of waiting (Serven, 1997) or resort to activities with quick return rather than long term, high risk, irreversible projects (Clements et al, 2003). This would have the effect of precipitating the chances of establishment of big, long term projects with positive externality, and exploitation of economics of scale. In addition to the reduction in the volume of investment, debt burden can affect the efficiency of investment through poor macroeconomic policy. Governments will have less incentive to undertake difficult reforms such as trade liberalization or fiscal adjustment that involves incurring cost today as increased output in the future will be taxed by creditors (Corden, 1998).

Third, according to Ajayi (1998), huge expansion in the size of debt relative to income leads to capital flight which creates the following three major difficulties for SSA countries. First, any amount of money sent away to foreign lands cannot contribute to domestic investment. Moreover, this money is not available for importation equipments and material such are necessary for growth of domestic industry and the economy. Thus, capital flight leads to a net loss in the resources available for the purpose of investment. Second, since income and wealth generated and held abroad are outside the overview of the domestic authority, it cannot be

taxed. This leads to a reduction of government revenue and constrained its capacity of debt servicing. Third, income distribution is subject to austerity measures in order to pay for external debt obligations to international creditors, who in turn pay interest to citizens from these countries with assets abroad (Abenet, 2005).

Finally, the huge expansion in the size of debt relative to income will also discourage future funding for development in the region (Osie, 1995). Nowadays, many developed countries prefer giving aid than loan for SSA countries because they recognize that many of these countries cannot pay back their debt. The failure to be credit worthy highly affects their future growth prospects. Because in most of the cases the aid given by the donors is not available in the countries requirement and sometimes is highly condition.

3.1.3 EVOLUTION OF AFRICAN DEBT CRISIS

Many low and middle-income countries began to borrow heavily in the 1970s and 1980s to fund development projects, reduce poverty and increase economic growth. Low-income countries primarily borrowed from public institutions including governments, export credit agencies and multi-lateral lenders (e.g., World Bank, United Nations Development Program, etc.). Lower-income countries tended to have limited access to private sources because of their lack of financial resources and current economic status and so relied more heavily on public institutions for debt. High-income country governments established export credit agencies to promote the export of products to other nations including developing countries. Middle-income countries with more stable finances typically borrowed from commercial banks located in developed countries (Greene, 1998).

Both low and middle-income countries began to have problems making debt service payments in the early 1980s. Difficulties in paying debt were primarily due to regional conflicts, adverse economic shocks, reduced export earnings, high interest rates and poor financial management by the national governments. Most of the indebted poor countries usually had low rates of foreign direct investment (FDI) and a limited source of exports to supply themselves with foreign currency. These factors imposed relatively small limits on the amount of foreign debt that the country could service. External debt became a particularly difficult burden for low-income countries that were also grappling with poverty and development issues.

The debt crisis started in August 1982 when Mexico informed its creditors that it was unable to service its vast foreign debts. Since then, a series of countries have experienced profound difficulty in servicing their external debts, with dire consequences for their social and economic development. One of the major external problems of African countries is the external finance problem in general and the debt crisis in particular (Alemayehu, 2003). The African debt crisis, which resulted in acute current account deficits in most non-oil producing less developed countries, evolved from a complex combination of factors. Some of which are external while others were the result of the internal policies pursued by the African governments. A major cause of the African debt crisis was the two oil price shocks of the early and late 1970s. To be precise, the oil price hikes from 1973 to 1974 and 1979 to 1980 contributed to rapid expansion of Eurodollar market, offshore banking network based in Europe, as the oil exporters deposited their money in those banks. Those banks in turn lent this new inflow to developing countries at very low interest rates (indeed negative in real terms). However inflation in the developed world led tight monetary policy that provoked a

rise in interest rate. Moreover, recession in developed world caused a steep fall in export price. Hence, developing countries found themselves in crisis.

The situation became worse during the second oil shock which happened jointly with a sharp increase in world real interest rates. The global recession of 1981-1982 compounded the problem by adversely depressing demand for the key exports of developing countries. Moreover, the deteriorating terms of trade caused by the recession created balance of payment problems for oil exporters and worsened those of oil importers. However, based on the assumption that the global recession would be short lived and the prices of non-fuel commodities would recover quickly, most of these countries resorted to heavy external borrowing to finance the fiscal and external imbalances (Maier and Becker, 2007).

Africa's external debt is the highest in the proportion of GDP; some countries in the region are spending more than half of their export earnings to service foreign debts. The debts of many African countries are so large in relation to their foreign exchange earnings potential that would be impossible to pay them off even if growth resumed and was sustained at unrealistically high levels. Largely as a consequence of debt servicing, capital from Africa is significantly more than flow of new capital to the region (ILO, 1995).

As the report of World Bank (1992), the external indebtedness problem of African countries is becoming acute. For instance, when we see the external debt stock of Africa in 1992, it was around USD 290 billion which was about two and half times greater than 1980s while that of SSA had more than tripled. In 1986 alone the US government collected 50 million dollar in interest payments from the poorest African countries. Moreover, to settle its external debt Africa paid 26 billion dollar to its creditors in 1991, a billion more than the previous year.

Hussian and Underwood (1991) also argued that the standard debt indicators shows that SSA debt is a bigger than that of highly indebted regions. From an estimated total USD 6 billion at end-1970, external debt of SSA countries had risen to an estimated $161 billion by end-1990 (World Bank, Debt Tables, 1990-91) representing over 110% of GNP.

Consequently, the debt overhang of the region has affected public investment in both physical and social infrastructure due to the massive outflow of resources in debt-service payment. Similarly, it has inhibited private investment, since private investors are scared of policy distortions in environments marred by severe external imbalances and fluctuating exchange rates. Investing less in public health, social infrastructure and human resource development, implies that the external debt burden has compromised some of the essential conditions for sustainable economic growth and poverty reduction.

As the external debt stocks of low-income countries, especially those of Sub- Saharan Africa, continues to accumulate to unsustainable levels, it became clear to the international financial community that a comprehensive strategy of debt relief is needed to deal with the issue. Distinct international actors started to come together and influence official thinking on debt relief. The growing influence of international civil society, with Non- Governmental Organization (NGO) networks as a key driving force, rallied the multilateral creditors and the Group - 8 governments to transform the international debt regime. The efforts of this alliance led to a call by the World Bank at its annual meetings in 1994 and 1995 to study multilateral debt and develop an effective strategy to deal with low-income countries debt. Concerns were raised within the Bank about the rising debt problem particularly in Sub-Saharan Africa. However, it was initially presumed that these poor countries only had a cash-flow constraint

that can be resolved by policy reform. To this end, structural adjustment programs, which provided resources to resolve the short-run cash-flow problems, were designed.

By 1990s, however, structural adjustment programs failed to produce the expected results. The lack of ownership of reform programs combined with poor governance, weak management of public expenditures, inadequate investment on infrastructure, private sector development, and agricultural productivity had hindered supply responses to macroeconomic policy adjustment. As a way of resolving the rapidly increasing multilateral debt of low-income countries, the World Bank and IMF established a working group charged with the responsibility of assessing the magnitude of the multilateral debt problem and to develop possible ways of dealing with it. The group proposed a mechanism, "the multilateral debt fund", which is designed to deal with the Heavily Indebted Poor Countries (HIPCs) debt problem provided they adopt and pursue strong programs of adjustment and reform (World Bank, 2003).

The development community welcomed the proposed mechanism, which was later transformed into a proposal for the HIPC Initiative in 1996. The Initiative, through more uniform rules, marked a significant advance from traditional debt relief mechanisms for eligible low-income countries. It transformed the debt regime towards more open and accountable norms, and introduced some key innovations, including, for the first time, a systematic treatment of multilateral debt, the notion of debt sustainability, and the focus on poverty reduction.

The Initiative allows low-income countries to exit once and for all from debt rescheduling process and normalize relations with the international financial community by ensuring financial flows and meeting repayment obligations. In addition, repeated rescheduling

involves significant financial costs for the creditors and creates uncertainty about future debt relief. The initiative would also reduce the "debt overhang", which is the negative impact of large external debt on economic growth. A debt overhang can discourage domestic investment, and could delay private capital flows required to generate sustainable growth (IMF 1997).

Officially the debt crisis was over in 1994, except for around 40 severely indebted countries, which mainly through poverty have been unable to service their debts. Cancellation of un payable debt of the HIPCs has recently attracted great interest and is being promoted by some NGOs, especially Jubilee 2000 Coalition. The case for more debt cancellation has focused on the HIPCs, which consists of a group of 41 countries. Although figures on the level of indebtedness of developing countries are generally somewhat unreliable, the figure for total external debt of developing countries in 1997 was provisionally estimated at USD 2,171 billion with HIPC accounting for about11% of the total. The 1997 HIPC initiative offered the opportunity of more debt forgiveness but not total debt cancellation (World Bank, 1998).

3.2 EMPIRICAL LITERATURE

A number of studies have dealt with the impact of external debt on economic growth and private investment during the last two decades. Almost all of them showed that external debt has a negative and significant effect on the economic growth and private investment of developing countries. To mention some, Fosu (1996) tested the relationship between economic growth and external debt with an empirical study for the sample of Sub-Saharan African countries over the 1970-1986 periods by employing the OLS method. This study examined to which degree debt had a negative impact on economic growth of Sub-Saharan African (SSA) countries. This study estimates the direct effect of debt hypothesis and indirect

debt hypothesis. The direct effect of debt hypothesis proposed that if debt service payments do not decrease investment and saving levels considerably, the debt negatively affects growth directly by reducing productivity. It is also argued that the direct effect of debt hypothesis suggests that both debt service payments and debt outstanding may affect GDP growth rate negatively even if debt outstanding and debt service payments do not affect investment levels. The results show that by using a debt-burden measure, direct effect of debt hypothesis reveals that GDP growth is negatively influenced via a diminishing marginal productivity of capital. The findings of this study also show that on average a high debt country faces about one percentage reductions in GDP growth rate annually. This explains one-third of all reduction of growth rate in sample countries.

Afxentiou and Serletis (1996) investigated the impact of debt indicators among four groups of countries to per capita GNP. Using an ordinary least square (OLS) framework they investigated the relationship between per capita GNP and debt during the period 1970 - 1990 for 55 developing countries facing debt servicing difficulties. They found that per capita GNP had a negative and significant relationship with debt. It meant that debt overhang happened for severely indebted low income countries and severely indebted middle income countries. Fosu (1999) finds support for the debt overhang hypothesis by analyzing thirty five sub-Saharan African countries. In contrast, Hansen (2001) find that inclusion three additional explanatory variables (the budget balance, inflation and openness), lead to rejection of any statistically significance negative effect of external debt on growth. The sample countries are 54 developing countries (including 14 HIPCs).

Karagol (2002) also examined the relationship between external debt service and GNP in Turkey. He found a long run relationship exists between GNP and debt burden and accepted

the debt overhang hypothesis in Turkey. However, in the case of Sri Lanka, Wijeweera et al. (2005) found conversely that external debt affected GNP positively in the long run equation and negatively in the short run. Both studies followed the model of Cunningham (1993). Study by Were (2001) investigate relationship between external debt service and growth for Kenya. The result confirmed that external debt service has a negative effect on growth. Therefore this study concludes that debt overhang phenomenon happened to these countries.

Deshpande (1997), similarly, also attempted to explain the debt overhang hypothesis by an empirical examination of the investment experience of 13 severely indebted countries. The severely indebted countries are Algeria, Argentina, Ivory Cost, Egypt, Honduras, Kenya, Mexico, Morocco, Peru, Philippines, Sierra Leone, Venezuela and Zambia. The author explains that debt overhang, which in contrast to the normal debt obligations is the actual amount of paid debt service is determined by creditors and debtor countries. Hence, any increase in production and exports are used for debt payment to creditors. As a consequence, this gives a disincentive to investors. Investors are not willing to invest a large amount of money. The author argues that the adjustment measures, which are applied by severely indebted countries, have an impact on the indebted countries, since the investment crisis has typically implied a growth crisis for the highly indebted countries. This has further worsens severely indebted countries' debt service capacity. The period for evaluation is 1971 to 1991. The author uses two period, the first period is 1975 - 1983 and the second period is 1984 - 1991 with OLS estimation for panel data. For a variety of reasons, external debt is found to exercise a negative effect on the investment. Firstly, for the period of 1971 - 1991, the investment ratio for the sample countries shows a rising and then a declining tendency at the end of the eighties. The relationship between external debt and investment is negative.

Moreover, the first period has a positive influence on investment, in the second half of this period, time effects turn to negative.

The empirical literature has found mixed empirical support for the "debt overhang" hypothesis. Relatively few studies have econometrically assessed the direct effects of the debt stock on investment. In most studies, reduced-form equations for growth are employed, under which the stock of debt is presumed to affect growth both directly (by reducing the incentives to undertake structural reforms) and indirectly (via its effects on investment). In middle-income countries, Warner (1992) concludes that the debt crisis did not depress investment, while Greene and Villanueva (1991), Serven and Solimano (1993), Elbadawi, Ndulu, and Ndungu (1997), Deshpande (1997) and Chowdhury (2001), on the other hand, find evidence in support of the debt overhang hypothesis. Fosu (1999), in his empirical study of thirty-five sub-Saharan African countries, also finds support for the debt overhang hypothesis. In contrast, Hansen (2001) finds that in a sample of 54 developing countries (including 14 HIPCs), the inclusion of three additional explanatory variables (the budget balance, inflation, and openness) leads to rejection of any statistically significant negative effect of external debt on growth. In a similar vein, Savvides (1992) finds that the ratio of debt to GNP has no statistically significant effect on growth. Djikstra and Hermes (2001) review a number of studies on the "debt overhang" hypothesis and conclude that the empirical evidence is inconclusive. Furthermore, few studies give a clear idea of the level of the debt-to-GDP ratio at which debt overhang effects come into play.

A recent study finds strong support for a nonlinear, Laffer-type relationship between the stock of external debt and growth. Using a large panel data of 93 developing countries over the period 1969–1998, Pattillo et al (2002) find that the average impact of external debt on per capita GDP growth is negative for net present value of debt levels above 160-170 percent of

exports and 35–40 percent of GDP. These results are robust across different estimation methodologies and specifications, and suggest that doubling debt levels slows down annual per capita growth by about half to a full percentage point.

High debt stocks appear to affect growth through their dampening effects on both physical capital accumulation and total factor productivity growth. In a follow-up paper, Pattillo and others (2003) apply a growth accounting framework to a group of 61 developing countries in sub-Saharan Africa, Asia, Latin America, and the Middle East over the period 1969 – 1998. Their results suggest that on average, doubling debt reduces by almost 1 percentage point both growth in per capita physical capital and growth in total factor productivity. Moreover, the policy environment also affects the debt/growth relationship. External debt service (in contrast to the total debt stock) can also potentially affect growth by crowding out private investment or altering the composition of public spending. Other things being equal, higher debt service can raise the government's interest bill and the budget deficit, reducing public savings; this, in turn, may either raise interest rates or crowd out credit available for the private investment, dampening economic growth. Higher debt service payments can also have adverse effects on the composition of public spending by squeezing the amount of resources available for infrastructure and human capital, with negative effects on growth. Indeed, in the view of some nongovernmental organizations (NGOs), high external debt service is one of the key obstacles to meeting basic human needs in developing countries.

Relatively few empirical studies have assessed the effects of debt service on private investment or the composition of public spending. Greene and Villanueva (1991) find external debt service dampens private investment, while Serieux and Samy (2001) find a similar link between debt service and total investment. For a large sample of developing

countries, including some HIPCs, Savvides (1992) finds that debt service crowds out public investment spending. Using a panel of 24 African HIPCs, Stephens (2001) finds that each additional USD 1 in debt service results in: (a) a USD 0.33 decrease in education spending; (b) a USD 0.14 to 0.23 fall in government wage expenditure; and, surprisingly, (c) a USD 0.12 to 0.23 increase in health spending. Hence, his results indicate that an increase in debt service may not necessarily lead to a decline in investment in human capital (in this case, health spending). Reduced-form equations have also been employed to assess the impact of debt service on growth, under the presumption that debt service affects growth via its consequences on the composition of spending or the crowding out of private investment. The empirical evidence in this regard is mixed: Elbadawi, Ndulu, and Ndung'u (1997), for example, find a statistically significant relationship between debt service (as a share of exports) and growth in Sub-Saharan Africa, while Fosu (1999) finds no such relationship for countries of that region. Using a broader set of countries, Pattillo et al (2002) also find no statistically significant relationship between debt service and growth.

Different studies were conducted to assess the effect of debt relief on the economic growth for different developing countries. For instance, in a study conducted in Zambia and Tanzania, Bigsten et al. (2001) used computable general equilibrium model to indicate that the macroeconomic impact of debt relief per se is relatively modest. In Zambia GDP growth rate increases by 0.2 % where as in Tanzania a combination of debt relief, increased public spending and accumulation of human capital would increase real GDP by 0.2 %. And similar to Clements et.al the Tanzanian case illustrates that this impact could even be higher if additional public investment succeeds to improve private sector productivity.

Another similar study in Kenya was by Were (2001) indicates prospects that resources obtained from debt relief could be targeted at productive public investments with the resultant crowding in effects on private investment. Contrarily Easterly (1999) found evidence from 41 HIPC that incremental debt relief over the past 2 decades has led to asset deccumulation and new borrowing. He argues that debt relief may have a perverse incentive effects as countries borrow in anticipation of debt forgiveness and delay policy reforms waiting for the best deal. It leads to moral hazard incentives to borrow in the expectation that part of the debt will be forgiven. He also argues that debt relief makes the poor worse off if it creates incentives to delay reforms needed for growth. In addition, according to Easterly, debt relief would lead to replacement of Foreign Direct Investment and private lending by official lending since countries loss their credit worthiness. There is a concern that official and multilateral lending may not follow the same standards of creditworthiness as private lending. He concluded that debt relief is futile for countries with unchanged long run preferences.

Much of the studies on debt relief have addressed the question whether debt relief would promote growth or not. The existing literature on the wide implications for development and transcending the economic impacts and touching social and ecological effects is scant. Easterly (2001) has investigated whether debt relief has made the poor better off. He argues that debt relief worsens poverty since it is not the poor people but their governments who owe debt. Most of the time spendthrift governments try to redistribute economic resources to the privileged political elites rather than trying to enlarge the economic pie through sound policies. He argues that it is not the debt burden but this action of government which makes African countries poor.

Easterly (2001) also found that debt relief does not allow African countries to spend on health and education. The primary reason he mentioned was the fungibility of money. Debt relief is most of the time used to buy weapons such as it happened in Angola and Rwanda. In addition debt relief recipient do not usually have the capacity to track where government spending goes. For instance, the study found that only 13% of grants in Uganda were actually spent on local schools. In addition, similar to his earlier study he reaffirms that debt relief will not boost foreign investment in Africa due to bad creditworthiness. Thus, commercial banks will be reluctant to give out new loans to debt relief recipient. According to him, 36 poor countries that received more than 10 adjustment loans in the 1980s and 1990s had an average percentage growth of per capita income of zero.

Different researchers, in addition to the above issues, conducted studies to know the relation between external debt relief and adjustment effort or investment. Much of the literature seems to agree on two conclusions. First, debt relief can increase investment if initially there is a debt overhang[1]. There are several reasons for this, although the one emphasized by many authors is that investment depends on expected tax rates which, in turn, depend on the face value of the debt (Helpman, 1989). Hence, debt relief may be in the interest of the debtor as well as the creditor (Sachs, 1989).[4]

The second conclusion is that one reason why governments engage in adjustment is because of the existence of a large external debt. To facilitate repayment, governments try to increase growth by resorting to measures such as liberalization, stimulation of the tradable sectors and fighting corruption. In the absence of a debt overhang, debt relief decreases the pressure to adjust and thus represents a disincentive to invest (Corden, 1989; see also Callier, 1989, for an

[4] A debt overhang means that the probability of full repayment of the debt is less than unity, so while expected debt repayments may increase following a debt reduction, the face value falls.

extension). Based on these two conclusions it can be argued that debt relief only promotes investment in the presence of a debt overhang. This argument is used in the HIPC debate today (e.g., Arslanalp and Henry, 2004, and IMF and IDA, 2004).

In sum, the existing empirical literature provides limited evidence on how the stock of external debt and debt service affect growth, particularly in low-income countries. In particular, there is scope for additional work to clarify the size of these effects, especially for low-income countries that are benefiting from debt relief. Furthermore, more work is needed to explore the channels through which debt affects growth. This study attempts to fill this gap in the literature, with special attention being paid to the effects of external debt service on public investment.

3.3 THE ETHIOPIAN CASE

A number of studies have been undertaken to investigate the origin of Ethiopia's external debt crisis. Most of the general causes are the same as the rest of the African countries. It is a combination of multiple domestic policy orientation and external shocks. Regarding debt sustainability, almost all studies indicated that Ethiopian external debt is unsustainable. For example, Melese (2002), by using a time series data during 1970 – 2002, concluded that Ethiopia's external debt is unsustainable.

Like other countries, in Ethiopia, there are several studies which examined the relationship between external debt and economic growth. Abenet (2005) investigated the relationship between real GDP growth rate and debt burden indicators during the period1962/63 to 2003/04. He found that the real GDP growth rate had negatively correlated with debt burden indicators (external debt to GDP and debt servicing ratios). Melese (2002), by using a

structural macroeconomic model, also found that all debt burden indicators have a negative relationship with economic growth during period 1970 to 2002.

Befekadu (1992), using a simple macroeconomic model, showed that there was positive correlation between external resource inflow and economic growth between 1960 and 1974, but negative correlation between 1975 and 1988. The different outcome was explained by the different policy regimes pursued by two governments, that is, external capital contributed to growth positively to growth in Ethiopia during the Imperial era and negatively during the Derg regime. He emphasized that the negative correlation of external debt during the Derg era was a result of the policies pursued. The policies in that era were diverted resources away from agriculture to other sectors. As a result the share of export earning of coffee, which is the most important export commodity, has declined by 60 percent. In addition to this, Alemayehu and Befekadu (1999) , using an Error Correction Model (ECM), concluded that there is a positive long run relationship between aid and growth, although the correction was negative in the short run.

CHAPTER FOUR

MODEL SPECIFICATION AND METHODOLOGY

4.1 THEORETICAL FRAMEWORK

4.1.1 DEBTS - GROWTH RELATIONSHIP

The growth model, which is used in this study, is based on endogenous growth model. The endogenous growth models developed by Lucas-Romer extend the old neo-classical model by emphasizing the role of endogenous factors (i.e., human capital stock and R&D activities) as the main engines of economic growth. While early neo-classical models assume total factor productivity growth (or technical progress) as exogenously given, the newer endogenous growth models attribute this component of growth to the 'learning by doing' effect occurring between physical and human capital, which result in increasing returns to scale in production technology (Lucas, 1988).

The most distinctive difference between the neo-classical exogenous and endogenous growth theories is that the former assumes constant returns to scale with diminishing marginal productivity of capital per capita (MP_K) (Solow, 1956), whereas the latter generally assumes constant or increasing returns to scale with non-diminishing MP_K. The assumption of non-diminishing MP_K provides a possible way to long-run sustained growth in endogenous growth theories. These theories of endogenous economic growth stress the point that the opening up of the investment opportunities under a liberalised market-friendly economy brings about high economic growth. Besides, the financing gap model of the World Bank which is offered as an alternative policy framework for growth believes that growth of real output is related to

total investment, where investment is considered as one of the demand factors in determining growth.

A wide range of endogenous growth models has treated human capital as a critical factor in determining growth rate of output (Lucas, 1988). It is an important source of long-term growth, either because it is a direct input into research (Romer, 1990) or because of its positive externalities (Lucas, 1988). Policies that enhance public and private investment in human capital, therefore, promote long-run economic growth. The inclusion of human capital variables in endogenous growth models are intended to capture quality differences in the labour force, as non-physical capital investment increases the productivity of the existing labour force. They commonly relate to education and are measured by an index of educational attainment, by mean years of schooling, or by school enrolment (Barro and Lee, 1993). Therefore, the production function under endogenous growth theory can be written as:

$$Y_t = f(PK_t, LAB_t, HCD_t) \quad \text{..... (4.1)}$$

Where $Y_t, PK_t, LAB_t,$ and HCD_t are levels of production, stock of physical capital, number of labour and human capital at period t respectively. These variables are known as supply-driven factors.

Output growth of a nation, in addition to supply -driven factors, is also affected by foreign capital via effect on the productivity of investment. External finance, particularly foreign borrowing, is ought to accelerate economic growth especially when domestic financial resources are inadequate and need to be supplemented with funds from abroad. Economic theory also postulates that reasonable levels of borrowing promote economic growth through factor accumulation and productivity growth. This is because the countries at the initial stages

of their development usually tend to have smaller capital stocks and their investment opportunities are limited, which promise high rates of returns in them.

Obadan (1991), using theory of dual-gap-framework, explains the theoretical foundation associated with foreign borrowing and accumulation. The requirements of foreign borrowing rely greatly on its total expenditure vis-à-vis total domestic product. From the perspective of national income accounting, excess of investment (I) expenditure over domestic savings (S) is adjudged to be equivalent to a surplus of imports (M) over exports (X):
This is represented as:

$$I - S = M - X \quad \ldots\ldots (4.2)$$

$$S - I = X - M \quad \ldots\ldots (4.3)$$

In order that national income may be in equilibrium exports must result in import added to savings. In the same vein, for balance of payments to remain at equilibrium without foreign borrowing, export must be restricted to domestic savings. Thus for investment to increase without negative implications on balance of payments exports should expand simultaneously in the appropriate proportion where savings schedule should shift upward while import schedule shifts downward.

For a country desiring to achieve a particular targeted growth rate, the growth could be restricted by the availability of domestic savings. Where foreign exchange is a severe constraint, dual-gap analysis stresses the additional role of foreign borrowing aimed at supplementing foreign exchange, without which a fraction of domestic savings might not be applied because actual growth is constrained by inability to import essential inputs. If the X-M is larger, then foreign borrowing to fill the gap will also fill the S-I gap and is larger.

Foreign borrowing to fill it will certainly cover the smaller foreign exchange gap. It is instructive therefore that investments in foreign borrowing finance the variance between investment requirements to sustain the desired target rate of growth. It leads to increase in savings generated by rising income;

$$FB_t - FB_0 = I - S \quad \text{..... (4.4)}$$

Similarly, increments in foreign capital requirements finance the difference between increases in imports to sustain the target rate of growth and the increment of exports;

$$FB_t - FB_0 = M - X \quad \text{..... (4.5)}$$

Where, FB_0 and FB_t represents the required foreign borrowing in base year and year t respectively.

Following the above theoretical relationship of external debt and foreign borrowing, equation (4. 1) can be augmented with debt indicators as (see Fosu, 1999 and Iyoha, 2000):

$$Y_t = f(PK_t, LAB_t, HCD_t, ED, TDS) \quad \text{..... (4.6)}$$

Where, ED_t *and* TDS_t are stock of external debts and debt service payment in period t respectively. These variables represent external debt indicators of the nation. In addition to the above debt indicators, it possible to assess the impact of debt forgiveness on economic growth of a nation by incorporating a dummy variable of debt cancellation on the above production functions as:

$$\mathrm{Y_t} = \mathrm{f}(PK_t, \mathrm{LAB_t}, \mathrm{HCD_t}, \mathrm{ED}, \mathrm{TDS}, \mathrm{DCAN}) \quad \text{..... (4.7)}$$

Where, DCAN is a dummy variable for debt cancellation. The basic rationale for incorporation of debt cancellation is that it could effectively provide predictable additional resources directly to the budget (via the repayments that no longer have to be made) and could offer a way to force coordination on conditionality among donors. Equally important, debt cancellation could allow a poor country to obtain access to loans from private foreign investors. Private investors may be unwilling to lend to a highly indebted country for fear that the country will be unable to repay, but if official debt is completely forgiven, they will jump in to lend, because even the worst debtor can be trusted to service small amounts of debt. Thus, official creditors may be able to expand a country's access to private resources through debt forgiveness (R. Rajan, 2005).

Finally, the growth model incorporates trade openness[5] as one variable. It is suggested in literature that the more open is an economy, the more it is likely for the economy to develop financially and hence adds more to economic growth. Besides creating conducive environment for financial sector, the financial openness promotes growth through increased international trade. It is expected that as the ratio of total trade to nominal GDP increases, the financial sector depth improves and leads to economic growth. Hence, following the works of Fosu (1999) and Iyoha (2000), the growth model which is used in this study can be expressed as:

$$Y_t = f(PK_t, LAB_t, HCD_t, ED_t, TDS_t, DCAN, \mathrm{XM_t}) \quad (4.8)$$

[5] Trade openness is the extent and the degree to which one economy is trading with the rest of the world. In this study we are going to use the ratio of the sum of the exports and imports to the nominal GDP to capture the degree to which the economy is open to the rest of the world.

Where, PK_t and XM[6] represents gross capital formation and trade openness in period t, respectively. Where, gross capital formation is used as a proxy for physical capital stock. Moreover, expenditure on education and training is used as a proxy for human capital formation. Expenditure on education is used because of insufficient data on other variables which can be used as a proxy for human capital.

4.2.2 INVESTMENT – DEBT RELATIONSHIP

To examine the relationship between private investment and the debt overhang, a macroeconomic model is developed. The model follows closely Fitz Gerald et al (1992), and Alemayehu (1997).

We start with a simple accelerator model that defines private investment as the difference between the desired capital stock ($K_{pt}{}^{*}$) and the inherited from the previous period (K_{pt-1}). Thus our private investment (I_{pt}) function as:

$$I_{pt} = \lambda_t(K_{pt}{}^{*} \_ K_{pt-1}) \quad \text{(4.9)}$$

Where, λ_t represents an adjustment coefficient reflecting implementation lags, functional constraints or uncertainty about future conditions.

The desired private capital stock for the current year ($K_{pt}{}^{*}$) depends up on the current level of output (Y_t); the shock of public capital already installed (K_{gt-1}); import (M_t); capital flight (J_t); current level of external debt ($\mathrm{E_xD}_t$) and the previous level of external debt ($\mathrm{E_xD}_{t-1}$). Thus the desired level of capital stock is expressed as:

$$K_{pt}{}^{*} = \alpha_1 Y_t + \alpha_2 K_{gt-1} + \alpha_3 M_t + \alpha_4 J_t + \alpha_5 \mathrm{E_xD}_t + \alpha_6 \mathrm{E_xD}_{t-1} \quad \text{(4.10)}$$

[6] MXt can be calculated as import plus export divided by GDP

Substituting equation (4.10) in equation (4.9), gives:

$$I_{pt} = \lambda_t[(\alpha_1 Y_t + \alpha_2 K_{gt-1} + \alpha_3 M_t + \alpha_4 J_t + \alpha_5 E_x D_t + \alpha_6 E_x D_{t-1}) - K_{pt-1}] \quad (4.11)$$

To circumvent the capital stock data problem, we take the first difference of equation (4.11). This gives the following result:

$$I_{pt} - I_{pt-1} = \lambda_t\alpha_1\Delta Y_t + \lambda_t\alpha_2\,\Delta K_{gt-1} + \lambda_t\alpha_3\Delta M_t + \lambda_t\alpha_4\Delta J_t + \lambda_t\alpha_5\Delta E_x D_t + \lambda_t\alpha_6\Delta E_x D_{t-1} - \lambda_t\Delta K_{pt-1} \quad (4.12)$$

Let $\beta_i = \alpha_i\lambda_i$, and from the definition $\Delta K_{gt-1} = I_{gt-1}$ and $\Delta K_{pt-1} = I_{pt-1}$. Hence equation (4.12) can be written as:

$$I_{pt} = \beta_1\Delta Y_t + \beta_2 I_{gt-1} + \beta_3\Delta M_t + \beta_4\Delta J_t + \beta_5\Delta E_x D_t + \beta_6\Delta E_x D_{t-1} - \lambda_t\Delta I_{pt-1} + I_{pt-1} \quad (4.13)$$

Replacing $\Delta E_x D_t$ by $(\Delta E_x D_t - \Delta E_x D_{t-1})$ and $\Delta E_x D_{t-1}$ by $(\Delta E_x D_{t-1} - \Delta E_x D_{t-2})$ in equation (4.13) and collecting like terms. Thus it possible to write equation (4.13) as:

$$I_{pt} = \beta_1\Delta Y_t + \beta_2 I_{gt-1} + \beta_3\Delta M_t + \beta_4\Delta J_t + \beta_5 E_x D_t + (\beta_6 - \beta_5)E_x D_{t-1} + \beta_6 E_x D_{t-2}] + (1-\lambda)I_{pt-1} + u_t \quad (4.14)$$

We impose the linear restriction that $(\beta_6 - \beta_5)$ is not equal to zero, so that the variable representing debt overhang $(E_x D_{t-1})$ is non-zero. This analysis will be tasted in the analysis section.

The variables are defined as follows: I_{pt} *and* I_{pt-1} are private investments at time t and t-1 respectively, whilst I_{gt-1} is public investment at time t-1. E_xD_t , $E_xD_{t-1,}$ and E_xD_{t-2} are the stocks of external debt at time t, t-1 and t-2 respectively. Y_t, M_t, J_t and ΔE_xD_t are as defined earlier. Finally, u_t is assumed a white noise disturbance term.

Equation (4.14) is our main equation of focus in this study. The interesting features of this model are: (1) it has sound theoretical basis and thus overcome the ad hoc problem of both the single and simultaneous equations, and (2) the fact that some variables of non-stationarity. Dividing equation (4.14) by the current level of output (Y_t), so as to eliminate the problem of unit of measurement, will result in:

$$\left(I_p/Y\right)_t = \beta_1(\Delta Y/Y)_t + \beta_2(\Delta I_g/Y)_{t-1} + \beta_3(\Delta M/Y)_t + \beta_4\left(\Delta J/Y\right)_t + \beta_5\left(E_xD/Y\right)_t + [\beta_6 - \beta_5]\left(E_xD/Y\right)_{t-1} + \beta_6\left(E_xD/Y\right)_{t-2} + [1-\lambda](I_p/Y)_{t-1} + u_t \quad \text{..... (4.15)}$$

Let; $\left(I_p/Y\right) = PINV, = \left(I_g/Y\right) = GINV, \left(\Delta Y/Y\right) = RGDP, \left(\Delta M/Y\right) = IMPT,$

$\left(\Delta J/Y\right) =$ $CFTGDP, \left(E_xD/Y\right) = ED$ *and* $\left(I_p/Y\right) = PINV$

Then it possible to write the reduced form of private investment as:

$$PINV_t = f(RGDP_t, GINV_t, IMTGDP_t, CFTGDP_t, EDTGDP_t, DCAN_t) \text{ ... ... (4.16)}$$

Where;

- $RGDP_t$ = Real GDP growth (economic growth) rate in year t.
- $PINV_t$ = Current real private investment in year t (captures the accelerator principle).
- $IMPT_t$ = Level of Import in year t.

- $CFTGDP_t$= Capital flight to GDP ratio in year t.
- ED_t = Stock of external of country i in year t.
- $DCAN_i$ = Dummy variable for debt cancellation.
- $GINV_t$ = Public investment in year ***t***.

4.2 MODEL SPECIFICATION

The econometric model of both growth equation used in this study is based on Fosu (1999) and Iyoha (2000). The model is rewritten by converting all macro variables (in equation 4.8) in to natural logarithmic form as follows.

$$\boldsymbol{LRGDP_t = \alpha_0 + \alpha_1 LPK_t + \alpha_2 LLAB_t + \alpha_3 LHCD_t + \alpha_4 LED_t + \alpha_5 LTDS_t + \alpha_6 LMX_t + \alpha_7 DCAN_t + \varepsilon_t} \ldots\ldots (4.17)$$

Where *LRGDP, LPK, LLAB, LHCD, LED, LTDS* and *LXM* represents the logarithm of real gross domestic, physical capital, labour force, human capital, external debt stock, total payment for debt serving and trade openness at time t. Besides, DCAN refers to the dummy variable for debt cancellation. Similarly taking the natural logarithm of equation (4.16), it is possible to rewrite the private investment equation as:

$$\boldsymbol{LPINV_t = \beta_0 + \beta_1 LRGDP_t + \beta_2 LGINV_t + \beta_3 LIMPT_t + \beta_4 LED_t + \beta_5 DCAN + \varepsilon} \ldots\ldots (4.18)$$

Where LPINV, LGINV and LIMPT refer to the logarithms of private investment, public investment and import respectively.

4.3 DATA TYPE, SOURCE AND DESCREPTION

As the success of any econometric analysis ultimately depends on the availability and accuracy of data, it is, therefore essential to discuss about the source and nature of data. Regarding the type of data, the study used a sufficient length of secondary data. The major data sources for the problem under investigation were publications of National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED) and Central statistics Authority (CSA) of Ethiopia. Besides, IMF CD-ROM, WB CD-ROM, and UNCTAD-CD-Rom were used.

4.4METHODOLOGY

4.4.1 STATIONARITY AND NON - STATIONARITY

Recent development in econometrics has shown that there are problems associated with time series macroeconomic data analysis due to non – stationary. A data series is said to be stationary if its error term has zero mean, constant variance and the covariance between any two – time periods depends only on the distance or lag between the two periods and not on the actual time which it is computed (Harris, 1995). To avoid the pitfall of wrong inferences from the non-stationary regressions, the time series data should be stationary. If one regresses a non-stationary variable on another non-stationary variable the results obtained might look very attractive, which might be characterized by high R^2 and a low DW statistic whilst in actual fact they are spurious (Lutkepohl, 1993). So Ordinary Least Squares (OLS) may lead to inconsistent and less efficient parameters as they may show that there is a strong relationship whilst in actual fact there is no relationship at all and hence the results obtained from such regressions will not have a meaningful economic interpretation. Hence, prior to estimation of

the long run model(s) the time series properties of the variables, unit root test, should be conducted.

4.4.2 THE UNIT ROOT TEST

Several tests are usually employed to test whether time series variables are stationary or non-stationary; the Dick-Fuller (DF), the Augmented Dick-Fuller (ADF) test, Auto-Correlation Function (ACF) and Phillips-Peron test. In this study the researcher is going to employ the ADF test to determine the existence of a unit root. By incorporating the autoregressive process of order p, this model becomes superior to DF. Basically this test has been chosen for its consistency, accuracy and resourcefulness. The general form of the ADF equation where only an intercept is included is as follows:

$$\Delta Y_t = A_o + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad \text{.....(4.19)}$$

For the case where the auto regression includes the intercept and a trend, the equation is of the following form:

$$\Delta Y_t = A_o + \gamma_1 t + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad \text{..... (4.20)}$$

Where, Y_t is any variable in the model to be tested for stationarity, ε_t is an error term and Δ is the first difference operator.

The null hypothesis of ADF is $\delta = 0$ against alternative hypothesis that $\delta < 0$. Where $\delta = \gamma - 1$. A rejection of this hypothesis means that the time series is stationary or it does not contains a unit root while not rejecting means that the time series is non-stationary (Enders, 1995).

A time series is said to be integrated of order zero, I(0) if it is stationary in levels. Some series needs to be differenced several times before becoming stationary. The number of times a series needs to be differenced before being stationary is the order of integration. So if a time series is said to be integrated of order *d*, I(*d*), it means that it has to be differenced *d* times before the series become stationary. If the series are stationary, running a regression avoids spurious regressions.

4.4.3 CO INTEGRATION TEST

Most macroeconomic variables are found to be non stationary and showing trending overtime (Johanson, 1992). However, one can difference or de trend the variables in order to make the variables stationary. If variables become stationary through differencing, they are in the class of differencing stationary process. On the other hand, if they are de trended, they are trend stationary.

In the case where variables are difference stationary, it is possible to estimate the model by first difference. However, this gives only the short run dynamics in which case valuable information concerning the long run equilibrium properties of the data could be lost. In order to obtain both the short run and long run relationship one can appeal to what is known as co integration. Cointegration among the variables reflects the presence of long run relationship in the system. We need to test for Cointegration because differencing the variables to attain stationarity generates a model that does not show the long run behaviour of the variables. Hence, testing for Cointegration is the same as testing for long-run relationship. In general, if variables that are integrated of order 'd' produce a linear combination which is integrated of order less than 'd' (say 'b') then the variables are cointegrated and hence have stable long run equilibrium relationship (Gujarati, 1995).

There are two approaches used in testing for Cointegration. They are: (i) the Engle-Granger (two step algorism) and: (ii) the Johansen Approach.

4.4.3.1 ENGLE-GRANGER (TWO STEP ALGORISM)

The Engle-Granger (E-G) method requires that for co-integration to exist, all the variables must be integrated of the same order. Hence, once the variables are found to have the same order of integration, the next step is testing for cointegration. This needs to generate the residual from the estimated static equation and test its stationarity. By doing so we are testing whether the deviation (captured by the error term) from the long run are stationary or not. If the residuals are found to be stationary it implies that the variables are cointegrated. This in turn ensures that the deviation from the long run equilibrium relationship dies out with time (Enders, 1996). Hence, the presence of Cointegration makes it possible to model the variables (that are in first difference) through the error correction model. In the model a one time lagged value of the residual hold the error correction term where its coefficient captures the speed of adjustment to the long run equilibrium.

Although, the Engle-Granger (EG) procedure is easily implemented, it is subject to the following important limitations. First, in tests using three or more variables there may be more than one co-integrating vector. In fact, if there are n variables in a model there may be n co-integrating vector or less. The Engle Granger method has no systematic procedure for separate estimation of the multiple cointegrating vectors. This method makes the implicit assumption that the cointegrating vector is unique, which means that we are bound to end with a model that is a linear combination of independent co integrating vectors. Second, the EG approach relies on a two-step estimator. The first step is to generate the error series and the second step uses these generated errors for estimation, thereby carrying over errors

obtained from regression using the residuals. Hence any error introduced in the first step is carried in two the second step. Third, cointegration test may depend on the variable put in the left side of the cointegration. That is, the test is not invariant to the variable used for normalization (Enders, 1996). Finally, the method does not allow the variables in the right hand side to be potentially endogenous (Harris, 1995). (Therefore, this paper chooses to use the Johansen maximum Likelihood Procedure (1988) since it addresses the above stated weakness of the E-G method.

4.4.3.2 JOHANSEN (1988) MAXIMUM LIKELIHOOD

The Johansen (1988) procedure enables estimatingand testing for the presence of multiple co-integration relationships, in a single step procedure. Moreover, it permits to estimate the model without priorly restricting the variables as endogenous and exogenous. Under this procedure, the variables of the model are represented by a vector of potentially endogenous variables.

The starting point in this procedure is formulation of unrestricted vector autoregressive (VAR) model in the following form[7]. Considering K-lags of Zt,

$$Zt = A_1 Z_{t-1} + A_2 Z_{t-2} + \cdots + A_k Z_{t-k} + \mu + \varphi D_t + \xi_t \quad (4.21)$$

Where Zt is a (nx1) vector of stochastic I(1) variables, A_i (i=1,...,k) is (nxn) matrix of parameters, μ is a vector of deterministic component (i.e., a constant and trend), D is a vector of dummies and $\xi_t \sim IN(O,\Sigma)$ is a vector of error term and t = 1, ..., T (T is the number of observation).

[7] The discussion is taken from Juselius (1994) and Enders, (1996).

The above model can be re parameterized to give a vector error correction model (VECM). That is, adding and subtracting $(A_{k-1}\ldots A_2 - A_1 - I)\ Z_{t-k}$ from equation 4.- (I being the identity matrix) results the following specification.

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \cdots + \Gamma_{k-1} \Delta Z_{t-k+1} + \pi Z_{t-k} + \mu + \varphi D_t + \xi_t \quad (4.22)$$

Simplifying equation (4.20) gives

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \pi_j Z_{t-k} + \mu + \phi D_t + \xi_t \quad (4.23)$$

Where, $\Gamma_i = -[I - \sum_{j=1}^{i} A_j]$ containing information of the short run adjustment to change in Z_t and (i=1,2,....., k-1).

$\pi_j = -[I - \sum_{j=1}^{k} A_j]$, containing information of the short run adjustment to change in Z_t

The long run relationship among the variables is captured by the term $\pi_j Z_{t-k}$. In the Johansen (1988) procedure, determining the rank of π (i.e., the maximum number of linearly independent stationary columns inπ) provides the number of cointegrating vector between the elements in z. In this connection, there are three cases worth mentioning. First, if the rank of π is zero, it points that the matrix is null which means that the variables are not cointegrated. In such case the above model (equation 4.22) is used in first difference, void of long run information. Second, if the rank of π equals the number of variables in the system (say n), then π has full rank which implies that the vector process is stationary. Therefore, the VAR can be tested in levels. Finally, if π has a reduced rank [i.e., $1< r(\pi)< n$] it suggests that there exists r<(n-1) cointegrating vector where r is the number of cointegration in the system..

Therefore, the matrix π equals to $-\alpha\beta'$ where α and β are n x r matrices, β represents the cointegration parameters with a showing their corresponding feedback or adjustment mechanism to equilibrium (i.e., it shows the speed with which disequilibrium from the long run path is adjusted). In identifying the number of cointegrating vectors, the Johansen procedure provides n eigenvalues denoted by λ (also called characteristics roots) whose magnitude measures the extent of correlation of the cointegration relations with the stationery elements in the model.

In general, to identify the number of cointegrating vectors in the system, the Lambda max (λ_{max}) and Lambda trace (λ_{trace}) statistics are used. They are obtained from the following formulas.

$$\lambda_{max} = -T \log(1 - \hat{\lambda}_{r+1}) \quad , r = 0, 1, 2, \ldots\ldots, n\text{-}1 \qquad (4.24)$$

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \log(1 - \lambda_i) \qquad (4.25)$$

Where T is the sample size and λ_i is estimated eigenvalues.

λ_{max}Statistics tests the null hypothesis that there are 'r' cointegrating vectors against the alternative of 'r+1'. The trace statistics, on the other hand, tests the hypothesis of less than or equal to 'r' cointegrating vectors against the alternative of 'r+ 1. The distributions of both test statistics follow Chi-square distributions (Enders, 1995). Reimers (1992) (cited by Harris, 1995) points that, the Johansen approach tends to over reject the null hypothesis when the sample size is small. While testing for cointegration, therefore, he suggests adjustment to be made for the degrees of freedom. This is done by substituting 'T-nk' in place of T in equations

(4.20) and (4.21), where n is the number of variables and k is the lag length set in the test for cointegration.

The other important thing in the cointegration analysis is the issue of identifying endogenous and exogenous variables in the system. This is required because the Johansen procedure do not restrict the variables behaviour a priori. If a variable is weakly exogenous, it implies that its error correction term (i.e., the corresponding α-coefficient) does not enter in the error correction model. This implies that the dynamic equation for that variable contains no information concerning the long run relationship in the system. Hence, variables that are weekly exogenous should appear in the right hand side of the VECM. This restricts the exogenous variables to be contemporaneous with the dependent variable (Harris, 1995). The first step in the test is formulation of the null hypothesis which states that the variable is weakly exogenous against the general alternate. That is,

$H_0: \alpha_{ij} - 0$ for j = 1, ..., r (r being the number of cointegrating vectors)

$H_0: \alpha_{ij} \neq 0$

The test (for weak exogeneity) is conducted using the following formula.

$$-2\log(Q) = T\sum_{i=1}^{r}\log\left(\frac{1-\lambda^*{}_i}{1-\hat{\lambda}_i}\right) \quad (4.26)$$

Where $Q = \frac{(\text{restricted maximized likelihood})}{(\text{unrestricted maximized likelihood})}$

T = the number of observations, r = the number of rank, and $\hat{\lambda}_i$ and λ^*_irepresents Eigen values for unrestricted and restricted models respectively. If the result obtained from the above formula is less than the Chi-squared distribution, then the null hypothesis will not be rejected. This implies that the variable is weakly exogenous.

4.4.4 VECTOR ERROR CORRECTION MODEL (VECM)

Economic variables have short run behaviour that can be captured through dynamic modelling. If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic and long run interaction between the variables. In the previous discussion, we show that if two variables that are non-stationary in levels have a stationary linear combination then the two variables are cointegrated. Cointegration means the presence of error correcting representation. That is, any deviation from the equilibrium point will revert back to its long run path. Therefore, an ECM depicts both the short run and long run behaviour of a system. Engle and Granger (1987) (cited in Alogoskoufis and Smith, 1995) defined ECM as "a particular representation of a vector auto regression appropriate for cointegrated results." This means if there is long run relationship (i.e., cointegration among the variables), equation (4.19) can be rewrite to come up with the following VECM specification.

$$\Delta Z_t = \sum_{i=1}^{K-1} \Gamma_i \Delta Z_{t-1} + \alpha\left(\widehat{\beta}'_1 Z_{t-1} + \widehat{\beta}'_2 Z_{t-1} + \cdots + \widehat{\beta}'_n Z_{t-1}\right) + \mu + \varphi D + \varepsilon \ldots\ldots\ldots\ldots (4.27)$$

Where, the figure in the parenthesis represents the error correcting terms.

If there is only one cointegrating vector and if the endogenous and exogenous variables are identified in the long run analysis, we can develop the VECM by conditioning on the

exogenous variables. In this case, only the error correcting terms of the endogenous variables appear in the error correction model. Thus, assuming that Yt is endogenously determined in the model and Xjt represents weakly exogenous variables, we can model for Yt. This is performed using the lagged first difference of Yt, the current and lagged first differences of the explanatory variables as well as the error correcting term (designed to capture adjustment speed to the long run equilibrium). That is,

$$\Delta Y_t = \alpha + \sum_{i=1}^{K} \beta_i \, \Delta Y_{t-i} + \sum_{i=0}^{K} \theta \Delta Y_t X_{jt-i} + \gamma ECT_{t-1} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (4.28)$$

Where ΔX_{jt-i} and ECT_{t-1} represents a vector of the first differences of the explanatory variables and the error correcting term respectively. To achieve parsimony in the model, insignificant regressors from the general model are removed. In the process the adequacy of the model must be checked to support the reduction approach. This process is called "General to Specific Modelling".

4.4.5 IMPULSE RESPONSE AND VARIANCE DECOMPOSITION

Impulse response is a method of assessing the interaction among the variables in the VAR. it can be used either to assess the dynamic behaviour of the VAR or to investigate the policy impact of the variables that constitute the VAR (Alemayehu et al, 2009). The coefficients of VAR/VEC models only reveal the direct and ceteris paribus effect. They do not take account of the fact that the lagged explanatory variables in each equation are inter linked. That is both with a lag and contemporaneously and therefore do not reflect the full impact of one variable on another. For this reason, the analysis relies to a great extent on impulse response functions to estimate the total short and long run impacts of an increase in external debt on both

economic growth and private investment. Basically impulse response shows how one variable, say economic growth, responds over time to a shock in another variable (external debt burden indicators,) and compares this response to shocks from other variables. Impulse response just traces out time path of the effects of shocks of other variables contained in the VAR model on a particular variable. In other words, this approach is designed to determine how each variable responds over time to an earlier shock in that variable and to shocks in other variables. (Lutkepohl and Kratzig, 2004)

Impulse response functions represent the time profile of the effect of a shop to one variable on the contemporaneous and future values of all endogenous variables. They capture both the direct and indirect or feedback effects caused by endogeneity over time. However, given the interrelationships that characterize economic system, it is often more informative to undertake an impulse response analysis when short and long run impacts are of key interest. In cases where variables are interrelated, a shock to one variable may set off a chain reaction of knock on and feedback effects as it permeates through the system, impulse response analysis estimates the net effect of the direct and indirect effects of a shock not only in the long run but at all periods following the shock. The accumulated effects of unit impulses can be obtained by an appropriate summation of the coefficients of impulse response functions.

The variance decomposition helps in identifying the degree to which one variable influences the other. This study is going to use variance decomposition to break down and ascertain the degree to which foreign aid influence other variables in the system and vice versa. Variables in a system will have a forecast error and the error in forecasting can be attributed to the present and past values of the variable in question and the past and present values of all other variables in the system. So by breaking down this forecast error it is possible to determine the

degree to which the variable in question is being influenced by its past and present values and to the other variables in the system (Ibid).

The forecast error variance decomposition permits inferences to be drained concerning the proportion of the movements in a particular time-series due to its own earlier shocks vis-à-vis shocks arising from other variables in a VAR model. The technique breaks down the variance of the forecast error for each variance following a shock to a particular variable and in this way it is possible to identify which variables are strongly affected and those that are not (Ibid). The next section provides results of the estimation using the above discussed procedure. The estimation is performed using PCGIVE version 10.2 and EViews 6 softwares.

CHAPTER FIVE

ESTIMATED RESULTS AND INTERPRETATION

5.1 UNIT ROOT AND STRUCTURAL BREAK TESTS

Non-stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables lead to spurious regression results, from which further inference is meaningless. Hence, the first step in time series econometric analysis is to carry out unit root test on the variables of interest. The test examines whether the data series is stationary or not. To conduct the test, the conventional Dickey-Fuller (DF) and Augmented Dickey – Fuller (ADF) test were used with and without a trend. The null hypothesis in these tests claims that the series under investigation has unit root. On the other hand, the alternative hypothesis claims that the series is stationary. The results of the test for the variables at level and first difference are presented in Table 5.1 and 5.2 below respectively.

Table 5.1: Unit Root Tests of the Variables at Level

Variables	Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
	Lag Length 0		Lag Length 1		Lag Length 2	
	T_v	T_t	T_v	T_t	T_v	T_t
LRGDP	1.685	-1.143	2.037	-0.8952	1.933	-0.8668
LINV	-1.662	-1.850	-1.491	-2.023	-1.353	-2.634
LLAB	-0.2235	-1.058	-0.2752	-0.6156	-0.4742	-0.09810
LHCD	0.7417	-0.7513	0.3522	-2.389	0.5833	-1.634
LED	-2.243	-1.068	-2.332	-1.150	-2.337	-1.049
LTDS	-1.709	-2.403	-1.493	-1.758	-1.478	-1.846
LXM	-1.721	-3.136	-1.353	-2.569	-1.275	-2.514
LPINV	-1.647	-3.498	-0.9991	-2.600	-0.8398	-2.499
LGINV	-2.629	-2.803	-2.216	-2.396	-2.028	-2.216
LIMPT	-0.8857	-3.479	-0.5141	-2.975	-0.4930	-3.317

Table 5.2: Unit Root Tests of the Variables at First Difference

Variables		Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
		Lag Length 0		Lag Length 1		Lag Length 2	
		T_v	T_t	T_v	T_t	T_v	T_t
DLRGDP		-7.307**	-7.963**	-4.434**	-5.095**	-3.719**	-4.554**
DLINV		-7.413**	-7.797**	-5.590**	-6.176**	-3.253*	-3.770*
DLLAB		-6.161**	-6.105**	-3.662**	-3.630*	-3.291*	-3.265
DLHCD		-4.619**	-4.804**	-4.514**	-4.665**	-4.429**	-4.599**
DLED		-6.164**	-6.256**	-4.770**	-4.961**	-3.985**	-4.275**
DLTDS		-8.502**	-8.511**	-5.107**	-5.150**	-4.516**	-4.593**
DLXM		-8.427**	-8.329**	-5.603**	-5.536**	-5.166**	-5.095**
DLPINV		-9.344**	-9.301**	-6.000**	-5.997**	-5.270**	-5.287**
DLGINV		-8.027**	-7.969**	-5.678**	-5.646**	-4.912**	-4.887**
DLIMPT		-8.294**	-8.236**	-5.181**	-5.159**	-4.269**	-4.265**
Critical Value	1%	*-4.224 and -3.623 with and without trend, respectively.*					
	5%	*-3.535 and -2.945 with and without trend, respectively.*					

Where; ** and * *denotes rejection of the null hypothesis at 1% and 5% significance level respectively.*

T_v *is estimated value of test statistics when a drift term (constant) is included in the auxiliary regression for unit root test.*

T_t *is estimated value of test statistics when a drift term (constant) and trend are included in the auxiliary regression for unit root test.*

The ADF test statistics[8], as depicted in Table 5.1 and 5.2, illustrates that all variables are non - stationary at levels. That is, it is not possible to reject the null hypothesis of unit root both with and without trend in the auxiliary regression of unit root. But, the ADF test applied to the same variables in their first difference becomes stationary at the conventional 1% and 5% level of significance. However, according to Alemayehu et al. (2009), the Dickey – Fuller

[8] If the estimated Augmented Dickey-Fuller statistic is greater than the critical value we reject the null hypothesis that the series is non-stationary in favour of stationarity.

type tests of unit root are sensitive to structural breaks in the data. A truly structural variable with some structural breaks may be labelled to be non - stationary. Thus, Chows structural break test is conducted for all variables entered in both growth and private investment equations. The result confirmed that the null hypothesis of no breaks at specified breakpoints is not rejected at the conventional 1% and 5% levels of significance (see Appendix B). Hence, the variables are integrated of order one (I ~I(1)).

5.2 ESTIMATION OF THE REDUCED FORM VAR AND TEST FOR COINTEGRATION

The first step in estimating a VAR model is to determine the optimal lag length of the VAR (Alemayehu et al, 2009). Hence, the optimal lag length for this study has been determined using the AIC and HQ as these methods have been proven in most empirical papers to be superior to other tests. According to these criterions, the VAR estimate with the lowest AIC and HQ in absolute value is the most efficient one. In addition, the optimal lag length that is obtained from the AIC and HQ are also confirmed by the model reduction test. This result is reported in the following two consecutive tables.

Table 5.3: Model reduction Test for Growth Equation

Progress to date

Model	T	p		log-likelihood	SC	HQ	AIC
SYS(4)	45	63	OLS	226.20988	-4.7244	-6.3109	-7.2538
SYS(3)	45	112	OLS	327.36401	-0.93012	-4.9843	-6.7815
SYS(2)	45	161	OLS	264.58360	-2.2849	-5.1052	-7.3940
SYS(1)	45	210	OLS	397.22976	0.10977	-5.1783	-8.3213

Tests of model reduction (please ensure models are nested for test validity)

SYS(3) --> SYS(4): F(49,121)= 1.5326 [0.0402]*

SYS(2) --> SYS(4): F(98,110)= 1.1637 [0.2193]

SYS(1) --> SYS(4): F(147,70)= 1.0254 [0.4612]

As shown in the table above, the VAR estimates were conducted successively from lag length four to one. Based on AIC and HQ criterion, the second lag was found to be optimal for growth equation. This result is also confirmed by the model reduction test. That is, the model reduction from *VAR (2) to VAR (1)* or from *SYS (3) --> SYS (4),* is rejected based on the overall F test at 5% level of significance. Hence, this study is going to employ the optimal lag length of two for growth equation. Similarly, the optimal lag length determination procedure for private investment equation is presented as follows in Table 5.4 below.

Table 5.4 Model Reduction Test for Private Investment Equation

Progress to date

Model	T	p		log-likelihood	SC	HQ	AIC
SYS(4)	45	35	OLS	105.47564	-1.7271	-2.6084	-3.1323
SYS(3)	45	60	OLS	116.82566	-0.11670	-1.6276	-2.5256
SYS(2)	45	85	OLS	139.85176	0.97473	-1.1657	-2.4379
SYS(1)	45	110	OLS	170.56590	1.7245	-1.0455	-2.6918

Tests of model reduction (please ensure models are nested for test validity)

SYS(3) --> SYS(4): F(25,109)= 0.63549 [0.9041]

SYS(2) --> SYS(4): F(50,112)= 0.89792 [0.6599]

SYS(1) --> SYS(4): F(75,95) = 1.0530 [0.4035]

Table 5.4 indicates that reducing the model from VAR (4) to VAR (1) , VAR(3) to VAR (1) and VAR(2) to VAR (1) is acceptable based on the overall F test at different levels of significance. That is, model reduction from SYS(1) --> SYS(4), SYS(1) --> SYS(4) and SYS(1) --> SYS(4) is not rejected at different conventional level of significance. Therefore, the optimal lag length that is used for private investment equation is one. This result is also in line with AIC and HQ lag length determination procedure.

5.2.1 GROWTH EQUATION

The unit root test, as reported in Table 5.1 and 5.2, showed that all the variables contained in the growth equation are I(1). This permits to conduct the test for cointegration among the variables. The λ_{trace} statistics adjusted for degrees of freedom confirms that the null hypothesis of at most one cointegrating vector is not rejected at 5% significance level. This points the presence of one cointegrating vector. The test is reported in the following table.

Table 5.5: Johansen's Cointegration Test for Growth Equation

H_0: r ≤	Trace Statistics	Eigen Value	P - value
0	134.95	0.66108	[0.011] *
1	84.096	0.52750	[0.242]
2	48.858	0.30519	[0.687]
3	31.745	0.23504	[0.629]
4	19.152	0.22782	[0.493]
5	7.0011	0.13219	[0.584]
6	0.33730	0.0071510	[0.561]

The result, depicted in Table 5.5, reports that there is one cointegrating vector in the system. The null of no-cointegration vector ($r \leq 0$) is rejected by λ_{trace} statistics at 1 % significance level. On the other hand, the null that there exists at most one cointegrating vector ($r \leq 1$) is accepted. The existence of one cointegrating vector suggests that the first row of β and first column of α matrices are important for further analysis. Thus, table 5.6 below reports the β and α matrices of growth equation.

Table 5.6: Standardized Beta (β) Coefficient

LRGDP	LLAB	LINVT	LHCD	LED	LTDS	LXM	DCAN
1.0000	-1.4972	-0.082783	-0.46923	0.18894	0.31473	0.71693	-0.21505
-2.985	1.0000	-1.0010	1.896	0.63090	-2.2734	-17.210	-0.08182
0.094773	3.9232	1.0000	-0.84968	-0.48554	1.2343	1.8505	-0.01802
-9.7050	18.611	0.10934	1.0000	0.33743	3.5999	1.6127	2.8511
-8.3119	-9.0726	-3.7466	6.8318	1.0000	-4.9271	21.942	1.5699
2.0171	0.99702	0.17625	-1.7243	0.54511	1.0000	0.56004	0.16273
0.14664	0.66813	-0.29572	-0.09608	-0.45936	1.0726	1.0000	1.2824

Table 5.7: Standardized α Coefficients

LRGDP	-0.19958	0.0053233	0.0092984	-0.0061928	0.0044543	-0.010444	-0.0026872
LLAB	-0.13368	0.0096455	-0.022009	-0.0081468	-0.0003118	-0.022107	-0.0017196
LPK	-0.75176	-0.046783	-0.13845	0.024971	0.014884	-0.055815	-0.033002
LHCD	-0.21116	-0.043064	-0.028341	-0.0041576	-0.0041635	0.020823	-0.0021511
LED	-0.17248	-0.074098	0.11090	0.014098	-0.021005	-0.19412	-0.020601
LTDS	-0.72678	-0.040450	-0.092710	-0.0034204	0.0080525	-0.045892	0.017223
LXM	-0.19207	0.022100	-0.051585	0.0020017	-0.0056389	0.032131	-0.0029334

Note: number of lags used in the analysis is two, variables entered unrestricted are constants and trend and a variable entered restricted is DCAN.

Since the existence of only a unique cointegrating vector is statistically supported in the Johansen's cointegration test, only the first row of β and the first column of α in Table 5.6 and 5.7 are happen to be the relevant entries. The values of α obtained from the cointegration show the speed of adjustment of the long run parameters towards the equilibrium relationship. For instance, the error correction term inserts strong long run feedback effect on physical capital (LPK) and total payment of debt servicing (LTDS). This can be seen their speed of

adjustment towards long run equilibrium is as high as 75 and 71 percent respectively. Similarly, the speed of adjustment to long run equilibrium in the, human capital, real GDP, trade openness, external debt stock and labour function is 21.12, 19.96, 19.21, 17.25 and 13.37 percent respectively.

To identify the variables that are endogenously determined and conditional on other variables in the VAR, the test for weak exogenitey is conducted. This requires imposing zero restriction on the first column of α coefficients. The results, using the likelihood ratio test as shown in the Table 5.8, confirmed that the null hypothesis of weak exogeneity is rejected for real gross domestic product (LRGDP) at 5% level of significance. However, for the rest variables, the null hypothesis is not rejected at different level of significance. Therefore, the long run relationship can be formulated by taking LRGDP as endogenous variable, while, LLAB, LPK, LHCD, LED, LTDS, LXM and DCAN as exogenous variables.

Table 5.8: Test of Weak Exogenity (Test for Zero Restriction on α Coefficents)

α-Coefficients	**LR test of restrictions: Chi^2(1)**	**Probability Value**
LRGDP	5.9410	[0.0148]*
LLAB	2.3588	[0.1246]
LPK	2.5941	[0.1073]
LHCD	1.8202	[0.1773]
LED	0.11131	[0.7387]
LTDS	2.3587	[0.1246]
LXM	2.0568	[0.1515]

**denotes rejection of the null hypothesis of weak exogenity at 5% significance level.*

Once the long run relationship is defined, the next task is to formulate test of significance on the long run parameters. This test can be obtained by imposing restriction on β coefficients,

which is termed as exclusion test. It helps to determine which are relevant or statistically significant in the cointegrating vector. The result of the test along with their respective probability values are reported on Table 5.9 below.

Table 5.9: Test of Zero restriction on the Long – run β Parameters (Significance of long run Coefficients)

β-Coefficients	LR test of restrictions: Chi^2(1)	Probability Value
LRGDP	5.9147	[0.0150]*
LLAB	15.515	[0.0001]**
LPK	18.516	[0.0000]**
LHCD	2.5115	[0.1130]
LED	13.224	[0.0003]**
LTDS	8.5519	[0.0035]**
LXM	6.2335	[0.0125]*
DCAN	15.567	[0.0001]**

Where, ** and * *denotes rejection of the null hypothesis at 1% and 5% significance level respectively.*

As it is explained from the table, the long – run results depict that all explanatory variables, except human capital, were found to be significantly different from zero. That is, the result rejects the null hypothesis that the β coefficients are not jointly significantly different from at 1% and 5% level of significance. Moreover, the variables are with the hypothesized sign. Hence, the long run growth equation with the corresponding signs and significance is presented as follows:

$$LRGDP = 1.4972\ LLAB + 0.082783\ LPK + 0.46923\ LHCD - 0.18894\ LED$$
$$[0.0001]^{**} \qquad [0.0000]^{**} \qquad [0.1130] \qquad [0.0003]^{**}$$

$$-0.31473\ LTDS + 0.71693\ LXM + 0.21505\ DCAN \quad \ldots\ldots\ldots\ldots\ldots\ldots\ (5.1)$$
$$[0.0035]^{**} \qquad [0.0125]^{*} \qquad [0.0001]^{**}$$

MULTIVARIATE DIAGNOSTIC TEST

Vector AR 1-2 test: $F(98,78) = 0.90557\ [0.6808]$

Vector Normality test: $Chi^2(14) = 83.369\ [0.0000]^{**}$

Vector hetero test: $Chi^2(812) = 829.23\ [0.3296]$

*Where **denotes rejection at 1% level of significance*

The result of the diagnostic test confirms the adequacy of the model. That is, the null of no serial correlation and homoscedasticity are not rejected at any conventional significant level. The null hypothesis of normality, however, is rejected at 1% level of significance. Nonetheless, the Johansen result still holds. In line with the standard growth theory, the regression result shows that, both labour force and physical capital variables produced significant and positive influence on growth. The result implies that these variables (LLAB and LPK) play major role in inducing growth. The long run elasticity of LRGDP with respect to LPK is 0.082783, implying one percent increase in stock of physical capital produces 0.082783 percent increment in output. The result coincides with the findings of Abenet (2005) for the case of Ethiopia, Were (2001) for the case of Kenya and Iyoha (1999) for the case of SSA countries. However, human capital (LHCD) has a positive and insignificant effect on output. Probably the reason is due to high level of illiteracy rate in the Country. That is, almost 50% of the annual production of the nation in the rural areas by illiterate labour force where they are reluctant to adopt new methods and technologies.

Referring to the growth equation, it is seen that external debt to GDP has had a negative contribution on the economic growth of Ethiopia. In fact, the coefficient of -0.188894 connotes that a one percent increases in the external debt ratio accounted for 0.188894 percent decrease in the real GDP of Ethiopia and is the direct effect. This finding is consistent with the literature, particularly with Abenet (2005) for Ethiopia, Javed and Sahinoz (2005) for Turkey, Mohamed (2001) for Sudan, Iyoha (1996) and Fosu (1999) for Sub Saharan African countries. Elbadawi, et al. (1996) and Clements, Bhattacharya, and Nguyen (2003) also reported elasticities in the same range for developing countries.

Total debt servicing has also a significant negative effect on economic growth implying that debt overhang occurs in the long run period. The long run elasticity of real GDP with respect to external debt servicing is -0.31473. It means that when one percent increases in debt service, real GDP will reduce by 0.31473 percent. The result confirms the existence of debt overhang in Ethiopian economy. It is also consistent with the findings of Karagol's (2002) for Turkey and Were (2001) for Kenya for Nigeria. They proved that debt overhang hypothesis [9]exists for afore mentioned countries. On the other hand, trade openness and debt cancelation have a positive and significant contribution to the growth of the Ethiopian economy. The positive contribution of debt cancellation may be due to the fact that the amount which is forgiven is directed to public investment which in turn facilitates economic growth. This finding is consistent with the findings of Bigsten et al (2001) for Zambia and Tanzania.

[9] Debt overhang hypothesis argues that when foreign debt becomes excessive; actual payment to creditors becomes linked to the economic performance of the debtor country. Therefore potential increases in debt payment depress the return to productive investment and discourage capital formation.

5.2.2 PRIVATE INVESTMENT EQUATION

Once the order of integration among variables, as shown in Table 5.1 and 5.2, are integrated of order one (I(1)), it is necessary to determine whether there exists a sharing stochastic trend among these variables. In other words, a cointegration test is conducted using Johansen's cointegration test. The test is reported in the following table.

Table 5.10: Johansen's Cointegration Test for Investment Equation

H_0: r ≤	**Trace Statistics**	**Eigen Value**	**P - value**
0	74.667	0.48416	[0.018] *
1	42.893	0.35201	[0.135]
2	22.066	0.27710	[0.304]
3	6.4907	0.12572	[0.642]
4	0.041457	0.00086332	[0.839]

*Where * denotes rejection of the null hypothesis at 5% level of significance.*

The λ_{trace} test statistics, as shown in Table 5.5, rejects the null of no-cointegration vector ($r \leq 0$) at 5% significance level. While, the null hypothesis of at most one cointegrating vector ($r \leq 1$) is not rejected. Hence there is unique cointegrating vector in the system. This implies, there is only one relevant linear combination of variables, represented by the first row of β and the first column of α matrices. The following table reports the β and α matrices of private investment equation.

Tale 5.11: Standardized Beta Eigenvectors

LPIV	LRGDP	LGINV	LIMPT	LED	DCAN
1.0000	-0.029566	-0.011667	-0.57726	0.062490	-0.11174
0.069050	1.0000	-0.16532	-3.8840	-0.16521	-0.41712
0.78008	-0.53091	1.0000	0.12621	0.10142	-0.18493
0.13861	-0.43116	-0.13760	1.0000	-0.099609	-0.038453
-31.388	6.7295	9.0036	22.968	1.0000	-42.914

Table 5.12: Standardized α Coefficients

LPINV	-0.64392	0.013002	0.022706	-0.10961	-0.0000265
LIMPT	-0.0085350	-0.044576	-0.010170	-0.0015046	-0.00005585
LRGDP	-0.30485	0.047318	-0.34777	0.073747	0.00030473
LGINV	-0.024764	0.064882	-0.034277	-0.11884	-0.00003999
LED	-0.49958	0.15530	-0.10331	0.29720	0.00025938

The vector of cointegration indicates that the long run elasticity of private investment with respect to import (LIMPT), real GDP (LRGDP) and debt cancellation (DCAN) is positive; but negative with respect to stock of external debt. All determinants have got the hypothesized sign. The first column of table 5.12 shows the speed of adjustments towards the long run steady state equilibrium for all variables. For example, -0.64392, -0.49958 and -0.30485 indicates the speed of adjustment of private investment, external debt and real GDP towards the long run steady state path, respectively. That is, LPINV, LED and LRGDP adjusts to their long run equilibrium by 64.4, 50 and 30.5 percent respectively.

Once tasting for cointegration rank, the next procedure is weak exogeneity test. For testing it, a likelihood ratio test (LR – test) is employed by imposing a zero restriction on the α coefficients. This is simply a test whether the speed of adjustment α is significantly different from zero in the equation for the variables tasted.

Table 5.13: Test of Weak Exogeneity (Test for Zero Restriction on α Coefficients)

α-Coefficients	**LPINV**	**LRGDP**	**LGINV**	**LIMPT**	**LED**
LR test of restrictions: Chi^2(1)	10.213	0.0062993	0.24070	0.015108	0.81216
Probability Value	[0.0014]**	[0.9367]	[0.6237]	[0.9022]	[0.3675]

***denotes rejection of the null hypothesis of weak exogeneity at 1% significance level.*

Results reported in Table 5.13 shows, the null hypothesis of weak exogeneity is rejected for private investment (LPINV) at 5% level of significance. However, for the rest variables, the null hypothesis is not rejected at different level of significance. Thus, the long run relationship can be formulated by taking LPINV as endogenous variable, while, LRGDP, LGINV, LIMPT, LED and DCAN as exogenous variables. Before writing the long run investment equation, the long run coefficients of respective variables should be tasted for significance to determine which variables strongly constitute the cointegrating vector. This test is conducted by imposing a zero restriction on each coefficient (β's) and the result for the Likelihood Ratio (LR) statistics are summarized in the following table.

Table 5.14: Test of Zero restriction on the Long – run Parameters

α-Coefficients	LPINV	LRGDP	LGINV	LIMPT	LED	DCAN
LR test of restrictions: Chi^2(1)	10.946	0.19033	0.045570	4.6384	4.6644	4.8289
Probability Value	[0.0009]**	[0.6626]	[0.8310]	[0.0313]*	[0.0308]*	[0.0280]*

** and * *denotes rejection of the null hypothesis at 1% and 5% significance level respectively.*

The test statistics reported in Table 5.14 rejects the null hypothesis of $\beta = 0$ for all explanatory variables, except LRGDP and LGINV, at 5% level of significance. That is, except real GDP and government investment, all variables are statistically significant in explaining the long run private investment in Ethiopia. Hence, the long run investment equation with the corresponding signs and significance is presented as follows.

$$LPINV = 0.029566\,LRGDP + 0.011667\,LGINV + 0.57726\,LIMTGDP$$
$$[0.6626] \qquad [0.8310] \qquad [0.0313]*$$
$$-0.062490\,LEDTGDP + 0.11174\,DCAN \qquad (5.2)$$
$$[0.0308]* \qquad [0.0280]*$$

MULTIVARIATE DIAGNOSTIC TEST

*Vector Normality test: Chi^2(10)= 86.571 [0.0000]***

Vector hetero test: F(165,146)= 1.1711 [0.1645]

Vector hetero-X test: F(390,40)= 0.58335 [0.9943]

*Where * and **denotes rejection of the null hypothesis at 1% and 5% level of significance respectively. Values in parenthesis indicates the test of significance.*

The test summary reveals that the private investment equation is void of vector heteroscedasticity. That is the null of no homoscedasticity is not rejected at 5% significance level. But, vector normality problem is detected at 1%. However, Gonzalo (1994) (cited in Nachega 2001) stress that the Johansen procedure is robust even with non normal vectors. Therefore, the investment equation is reasonably acceptable. The figures in the parentheses confirmed, the null hypothesis of no significance is rejected for the import to GDP ratio, external debt to GDP ratio and debt cancellation variables at 5% level of significance. This suggests that the aforementioned variables are statistically significant in influencing private investment.

The result in general point out that real gross domestic product and government investment have insignificant but positive coefficient. This implies that for the period under consideration, the role of real GDP and government investment were negligible in improving private investment. That is, a one percent increase in real gross domestic product and government investment leads to 0.03 and 0.012 percent increase in private investment respectively. The positive relationship between real output, represented in terms of real domestic product, and private investment provides evidence for the validity of accelerator principle hypothesis, which presupposes investment is proportional to the change in output. This finding is similar with the findings of Badawi (2003) and (2005) for Sudan, Ouattara (2005) for Senegal, Ellis (1998) for Numibia and Green and Villanueva (1991) for developing countries. In addition to this, the result depicts there is complementarity of private and government investment in Ethiopia.

Level import, on the other hand, has positive and statistically significant contribution to private investment. This may be due to the fact that most of the time developing countries,

including Ethiopia, imported capital goods which are scarce in the domestic economy. These imported capital goods are served as a basic input to undertake private investment. Similarly, external debt cancellation has a positive and significant effect on private investment of Ethiopia. The rationale behind may be the resources obtained from the debt cancellation could be targeted at a productive public investment with the resultant crowding in effect on private investment. This result is consistent with the findings of Were (2001) for Kenya. Finally, external debt stock has a significant and negative effect on private investment. That is a one percent increase in external debt stock in relative to gross domestic product accounted for 0.06249 percent decrease in private investment. This is similar with the findings of Green and Villanueva (1997), Serven and Solimano (1993), Elbadawi, Ndulu, and Ndungu (1997), Fosu (1999), Deshpande (1997) and chowdhury (2001).

5.3. THE SHORT RUN DYNAMIC MODELLING (VECTOR ERROR CORRECTION MODEL)

Having obtained the long run model and estimated coefficients, the next step is to estimate Vector Error Correction Model (VECM), which captures both the long run and short run relationship. The change in the variables represent variation in the short run, while the coefficients obtained for the error correction term represents the speed of adjustment towards the long run relationship. A VECM was estimated starting with the general over parameterized model. Then, the VECM is subjected to a systematic reduction and testing process until a robust parsimonious model is obtained. In each round, all statistically insignificant regressors were dropped until further model reduction was rejected by the likelihood ratio test.

The estimated VECM of both growth and private investment equations depicted that the correlation of the residuals of the unrestricted reduced form is very low (see Appendix E). Thus, according Alemayehu et al (2009), there is no problem of simultaneity. Hence, it is possible to resort to single equation error correction model because Ordinary Least Square (OLS) will be efficient.

In modelling short-run dynamics, all weakly exogenous variables which are considered in the long run are entered in to the right hand side of the model by differencing once. The main reason for this is due to the fact that there will be high level of correlation between current and lagged values of a variable, which will therefore result in problems of multi-collinearity[10]. In addition, ECT, which is derived from the long run coefficients, enters in to the model by lagging one year. The rationality for lagging a year is to show how the time path matter to correct errors. According to Hendry and Juselius (2002), economic agents taking all available information at period $t-1$, they rationally undertake actions at period t, which helps to minimize errors.

A procedure adopted for estimating the single equation Error Correction Model (ECM) is the Hendry's approach of general to specific modelling. In this approach a large model is estimated first which includes as many explanatory variables and their lags as possible. Then all insignificant explanatory variables are continuously dropped until a parsimonious model with fewer explanatory variables but acceptable in terms of significance, economic interpretation and diagnostic validity is obtained. To check whether the reduction is justified an F test for model reduction is conducted at every step of the reduction process. The null hypothesis in the model reduction process is that the coefficient of the excluded variables are

[10] Multi-collineiarity is a situation where there is high R2 but imprecise parameter estimates and low t-valves, even though the model may be correctly specified.

zero and thus irrelevant to the model. If the null is not rejected, the reduction is valid and the reduced model is justified (see Doornik and Hendry, 1946). After step- by step elimination of elimination of insignificant variables from the estimate, the parsimonious Error Correction Model (ECM) for growth and private investment equation is summarized in Table 5.15 and 5.16 respectively.

5.3.1 GROWTH EQUATION

The existence of stationarity and cointegration permits to develop the following error correction model for growth.

$$\Delta LRGDP = \sum_{i=1}^{k} \Delta LRGDP + \sum_{i=0}^{k} \Delta LLAB + \sum_{i=0}^{k} \Delta LPK + \sum_{i=0}^{k} \Delta LHCD + \sum_{i=0}^{k} \Delta LED + \sum_{i=0}^{k} \Delta LTDS + \sum_{i=0}^{k} \Delta LXM + DCAN - ECT_{-1} \quad \ldots\ldots (5.4)$$

Where k represents the lag length and ECTt-1 denotes the error correcting term.

Following the above specification, a dynamic equation for growth function is reported in Table 15 below.

Table 5.15 Result for the Dynamic Growth Equation (Dependent Variable DLGDP)

Variables	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.0715529	0.01333	5.37	0.000	0.4589
DLLAB_2	0.404091	0.1149	3.52	0.001	0.2668
DLPK_2	0.0889766	0.01916	4.64	0.000	0.3880
DLHCD_2	0.0593365	0.07438	0.798	0.431	0.0184
DLED	0.0446984	0.02316	1.93	0.062	0.0987
DLED_1	-0.0161036	0.02152	-0.748	0.459	0.0162
DLTDS_1	-0.0432703	0.03105	-1.39	0.172	0.0540
DLXM	-0.274489	0.07970	-3.44	0.002	0.2586
DCAN	0.0266977	0.01619	1.65	0.108	0.0741
ECM_1	-0.387070	0.1940	-2.00	0.054	0.1048

```
R^2 = 0.601146      DW = 1.73      F(9,34) = 5.694 [0.000]**
```

SINGLE EQUATION DIAGNOSTIC TESTS

```
AR 1-2 test:      F(2,32)  =   2.1124 [0.1375]
ARCH 1-1 test:    F(1,32)  =  0.82054 [0.3718]
Normality test:   Chi^2(2) =  0.70360 [0.7034]
hetero test:      F(17,16) =  0.56196 [0.8755]
RESET test:       F(1,33)  =   2.6967 [0.1101]
```

The result reveals that, the estimated coefficients are significant with the theoretical expected sign. In line with the postulates of both modern and traditional growth theories, labour, physical and human capital have a positive effect on real gross domestic product of Ethiopia. The estimated short run growth equation also shows that the current flow of external debt has a positive contribution while; the past external debt accumulation has a negative impact on economic growth. This assures the existence of debt overhang hypothesis in the Ethiopian economy. However, the long run growth equation reveals the negative and significant relationship between external debt and economic growth. This finding is in line with the findings Javed and Sahinoz (2005), Mohamed (2001), Iyoha (1996), Fosu (1999), Bhattacharya and Nguyen (2003) and Elbadawi, et al. (1996). Finally, the dummy variables for debt cancellation and trade openness have a positive contribution to economic growth. The positive contribution of debt cancellation may be due to a simple reason that the amount that is forgiven would be used to relax the saving gap which is the usual problem of the country. This is also consistent with the results obtained by Bigsten et al (2001) for Zambia and Tanzania.

The lagged error correction term (ECT_{-1}) included in the model to capture the long run dynamics between the cointegrating serious is correctly signed (negative). This coefficient indicates a speed of adjustment 38.7 percent from actual growth in the previous year to equilibrium rate of economic growth. This implies that in one year the real gross domestic product adjusts itself to the equilibrium by 38.7%.

The various diagnostic test of the model points no problem regarding the regression analysis. That is, there is no an indication of serial autocorrelation as shown by the Breusch Godfrey LM test for serial correlation. The white test for heterocedasticity also does not reject the null

hypothesis of homocedasticity errors. Moreover, the ARCH test (Engle, 1982) indicates the absence of autoregressive conditional, hetrocedasticity errors. Similarly, the general test for misspecification as provided by Ramsey's (1969) RESET test does not reject the null hypothesis of no functional misspecification in the estimated equations. And finally, the Jarque Bera test for normality indicates that the null hypothesis of normality distributed error terms is not rejected. The goodness of fit of the above models (R^2) shows that (60.11%) of the total variation in the dependent variable (LRGDP) is explained by the independent variables in the model. In addition, the reported F-statistics rejects the null hypothesis that the coefficients of all explanatory variables except the constant term are jointly zero. Thus, overall, the estimated model is statistically satisfactory.

5.3.2 PRIVATE INVESTMENT EQUATION

The foregoing long run analysis confirms that private investment is determined endogenously in the system. Therefore, we can develop its dynamic model conditional on other variables as shown below.

$$\Delta LPINV = \sum_{i=1}^{k} \Delta LPINV + \sum_{i=0}^{k} \Delta LIMPT + \sum_{i=0}^{k} \Delta LGINV + \sum_{i=0}^{k} \Delta LED + DCAN - ECT_{-1} \ldots\ldots\ldots (5.4)$$

Where, ECT-1 is the error correcting term.

Using the general to specific model for the above equation, the following parsimonious specification is reported.

Table 5.16: Result for the Dynamic Equation (Dependent Variable LPIV)

Variable	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	-0.0207553	0.03028	-0.685	0.497	0.0119
DLRGDP	0.169972	0.2696	0.630	0.532	0.0101
DLIMTGDP	0.590732	0.1319	4.48	0.000	0.3396
DLGINV_1	0.0776101	0.04390	1.77	0.085	0.0742
DLEDTGDP	0.0729854	0.04517	1.62	0.114	0.0628
DLEDTGDP_1	-0.0275034	0.04474	-0.615	0.542	0.0096
DCAN	0.0296303	0.03640	0.814	0.421	0.0167
ECT_1	-0.516705	0.1746	-2.96	0.005	0.1833

*R^2 = 0.508269 DW = 2.04 F(7,39) = 5.759 [0.000]***

SINGLE EQUATION DIAGNOSTIC TESTS

AR 1-2 test: F(2,37) = 0.26768 [0.7666]

ARCH 1-1 test: F(1,37) = 1.3278 [0.2566]

Normality test:Chi^2(2) = 2.7405 [0.2540]

hetero test: F(13,25) = 1.6042 [0.1502]

RESET test: F(1,38) = 1.7153 [0.1982]

Table 5.15 reveals that the estimated coefficients are in line with the theoretical expected sign. The overall fit of the model is acceptable. The explanatory variables explain about 50.8 percent of the variation in the model. The F statistics rejects the null hypothesis that all the coefficients in the model are jointly insignificant. The Durban Watson (DW) test also suggests that there is no autocorrelation problem. Moreover, the various diagnostic tests do not detect any problem about the regression analysis. That is, the test does not reject the null of white noise error terms suggesting no problem of error autocorrelation. In addition, the test for autoregressive conditional heteroscedasticity (ARCH) points that no ARCH structure in

the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance. The Jacque Bera test for normality cannot reject the null hypothesis of normality. It points out that the error term is normally distributed. Finally, the Ramsey test for functional form misspecification accepts the regression specification of the dynamic model.

The regression result reveals that, in the short-run, import to gross domestic ratio and public investment produce significant and positive impact. The estimated short run private investment equation points that the current level of external debt flow has a positive impact while; the past external debt accumulation has a negative effect on private sector accumulation. This confirms the existence of debt overhang hypothesis in Ethiopian economy. However, in the long run external debt has a negative and significant impact on private investment. This result is in line with the long run analysis (i.e., section 5.2-B) as well as the findings of different researchers including Elbadawi, Ndulu, and Ndungu (1997) and Fosu (1999). On the other hand, debt cancellation holds positive sign as expected.

The above preferred model also confirms that the error correcting term is significant at 1%. It points out that about 51.67% of the disequilibrium from the long run path will be corrected in one year. The speed of adjustment further indicates that it takes almost two years for the deviation to be fully adjusted.

5.4 IMPULSE RESPONSE AND VARIANCE DECOMPOSITION ANALYSIS

To analyze the impulse response and variance decomposition, the first step is to check the stability of the VAR model. The test statistics, depicted by the companion matrix (presented in appendix: F), shows that both growth and investment models are stable. Hence it is possible to undertake impulse response and variance decomposition analysis.

5.4.1 IMPULSE RESPONSE

The impulse response function shows the increment to each variable due to one standard error shock of the other variable taking in to account all interactions between the variables. The impulse responses are eventually expected to converge to a level that is consistent with the estimated long run co-integrating relationship. Thus, the study uses generalized impulse response functions and in each case the shock to each variable is one standard error shock. The graphical representation of impulse responses to a one period shock on the variables are represented in appendix G.

As shown in the appendix the response of real gross domestic product to shocks emanating from the external debt stock is positive in the early periods but it becomes negative in the long run. This is consistent with the results obtained from both the long run co integrating analysis and the short run error correction model. In line with the regression results obtained the response of real gross domestic product to total debt servicing is always negative both in the short and long run. Finally, real gross domestic product responds positively the shocks originated from physical and human capital. However, it responds negatively in the short run and positively for in the long run to the shocks from labour force and trade openness. Similar to the response of real GDP, private investment responds negatively to the shocks emanating from external debt.

5.4.2 VARIANCE DECOMPOSITION

Variance decomposition depicts the proportion of movements in one variable that are due to errors in own shocks and to each other variables in the system. Basically they give information on how important is each variable in explaining variations in the variable in question in the system. The following table summarizes the variance decomposition of real GDP.

Table 5.17: Variance Decomposition of LRGDP

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.086558	94.37243	0.279510	0.005287	0.083219	3.411506	0.208269	1.639778
3	0.102613	89.56882	0.474620	0.018019	0.691197	4.172133	3.880554	1.194650
4	0.120776	83.37153	1.248607	0.319149	2.269582	4.963828	6.912829	0.914472
5	0.137731	78.86633	2.230246	0.909931	3.557395	5.277244	8.313964	0.844893
6	0.153892	75.98074	3.288074	1.466640	4.269286	5.358607	8.590974	1.045674
7	0.168826	74.23386	4.200364	1.817778	4.584308	5.314768	8.473286	1.375633
8	0.182643	73.19620	4.943429	2.035485	4.710503	5.165419	8.282027	1.666936
9	0.195618	72.53376	5.562251	2.212674	4.761753	4.952567	8.111699	1.865294
10	0.208115	72.04132	6.120916	2.390075	4.791277	4.706792	7.968287	1.981328

The variance decomposition of real gross domestic product, which is represented in the above table, shows that in the very early periods the forecast error of this variable in question is attributed to the variable itself. The deviation explained by the real gross domestic product decreases to 72 percent in the tenth period from as much as 100 percent in the first period. The deviation in economic growth explained by the variations in debt servicing (payment) is insignificant explaining zero in the first period and only rises to around 7.97 percent in the tenth period. The variations of real gross domestic product due to variation in external debt stock, although has been increasing, it explains only about 6.1 percent of the deviations in real

gross domestic product. In general the contribution of the other variables to the variation in the forecast error of real gross domestic product is of very less (all the variables explain only less than 28 percent of the total variation). Similarly, the variance decomposition of private investment can be presented as follows.

Table 5.18: Variance Decomposition of LPINV

Period	S.E.	LEDTGDP	LGINV	LIMTGDP	LPINV	LRGDP
1	0.401918	10.30037	7.293022	22.80432	59.60229	0.000000
2	0.536530	16.03605	5.833045	27.94769	47.54578	2.637432
3	0.654149	17.52322	5.464006	27.69792	46.77976	2.535106
4	0.753339	17.39235	5.695229	26.77501	47.69812	2.439288
5	0.838589	17.45682	6.489544	26.23384	47.38661	2.433193
6	0.914006	17.39791	6.960638	25.96122	47.10541	2.574815
7	0.979963	17.30370	7.255290	25.78492	46.86474	2.791346
8	1.037807	17.23541	7.392359	25.66876	46.66699	3.036475
9	1.088643	17.17898	7.408681	25.59391	46.50677	3.311657
10	1.133309	17.12174	7.384449	25.55674	46.34871	3.588356

The above table depicts that the variance decomposition of private investment. In the very early periods, around 60 percent of the forecast error of this variable in question is attributed to the variable itself. This deviation decreases to around 46 percent in the tenth period. The deviation in private sector capital accumulation due to variations in import and external debt stock in the tenth period is around 25 and 17 percent respectively. In general, the contribution of external debt to the variation in the forecast error of private investment greater as compared to real gross domestic product. The impulse response and variance decomposition of the other variables of the model are presented in appendix G and H respectively.

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATION

6.1 CONCLUSION

Most developing countries, like Ethiopia, have been faced a severe shortage of capital to undertake development programs. This in turn necessitates the reliance on external finance, which is something one cannot afford to ignore. However, deficit financing via external borrowing resulted in debt burden problem which is indicated by an increasing level of debt stock and its servicing. The debt burden problem of a country is of a great concern because it imposes a number of constraints on its economic growth. Hence, the central focus of this study is to examine the impact of external debt on economic growth and private investment of Ethiopia by using annual data covering the period from 1960/61 to 2008/09. The paper also assessed the trend, magnitude and composition of Ethiopia's external debt.

In the study both growth and private investment equations have been identified and estimated. The Johansen Maximum Likelihood estimation technique has been used to assess the short and long run dynamics of variables. Before looking in to the cointegration relationships of each function, the variables were tested for their order of integration using ADF test statistics and all the variables were found to be I(1). The λ_{trace} test statistics were employed to assess the number of cointegrating vectors presented for all cases and the result shows that the null hypothesis of zero cointegrating vector is rejected in favour of one cointegrating relationship.

The first investigation is concerned with the relationship between external debt and economic growth. The result points out that all variables have the hypothesized signs. In line with the

conventional and modern growth theories labour, physical and human capital have a positive contribution to real GDP both in the short and long run. On the other hand, total debt servicing has a significant and negative impact on economic growth of Ethiopia. The estimated short run growth equation also shows that the current flow of external debt has a positive contribution while; the past external debt accumulation has a negative impact on economic growth. This assures the existence of debt overhang hypothesis in the Ethiopian economy. However, the long run growth equation reveals the negative and significant relationship between external debt and economic growth. Finally, the dummy variables for debt cancellation and trade openness have a positive and significant contribution to economic growth of the nation.

Since investment is one of the channels through which external debt can affect growth, a private investment equation is developed to examine its interaction with external debt and other variables. The main outcome of the empirical assessment confirms that both in the short and long run; real GDP, level of imported capital, public investment and debt cancellation have a positive contribution to private capital formation activity in Ethiopia. The positive relationship between private and public investment assures the complementarity hypothesis of public investment to private sector development. Moreover, the estimated short run private investment equation points that the current level of external debt flow has a positive impact while; the past external debt accumulation has a negative effect on private sector accumulation. This confirms the existence of debt overhang hypothesis in Ethiopian economy. However, in the long run external debt has a negative and significant impact on private investment.

6.2 POLICY IMPLICATIONS

The servicing of external debt erodes the meagre foreign exchange available for imports. This has to lead import compression problem that adversely affects both public and private investment. Since many of the imports of Ethiopia are essential intermediate inputs for its capital formation activity, cutting these imports has a larger loss on present and future output of the country. Hence, external borrowing decisions must be linked to a general policy frame work that will guarantee profitability of invested funds and generation of sufficient foreign exchange earnings for external debt servicing. This can be done by investing on selective and productive investment areas including basic infrastructural developments that facilitate the productivity of other sectors of the economy.

The short and long run regression results also confirmed that, debt shock creates a debt overhang which explodes the confidence of both foreign and domestic private investors who are sensitive to uncertainties. These uncertainties are emanated from anticipation of future tax liabilities for debt servicing. This in turn will lead them to invest in any other countries where tax burden is less or believed to be credit worthy. Hence, in order to spur investors' confidence the government should create credibility including political will to reforms.

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APPENDICES

APPENDIX A: DEFINITION OF TERMS

The World Bank's Debtor Reporting System (DRS), International Monetary Fund (IMF), the Organisation for Economic Development and Cooperation (OECD) and the Bank for International Settlements (BIS) formed a Working Group which has published a common definition of external debt as defined below:

Gross External debt is the amount, at any given time, of disbursed and outstanding contractual liabilities of residents of a country to non residents to repay principal, with or without interest, or to pay interest, with or without principal (Klein, 1994; P. 56).

Contractual Liability: It is an obligation to make payments to an agreed schedule. (Equity participation is excluded).

Disbursed and Outstanding: Means that debt includes only committed amounts drawn-down, not yet repaid, or cancelled. It does not include future interest payments. Undisbursed amounts are exceeded. Disbursed debt outstanding equals to the cumulative disbursements, less repayments, amount cancelled and amount restructured.

Disbursements: Are drawings on loan commitment during the year specified. That is, the amount of a loan that is utilised in the accounting period.

Interest: The amount paid to the lender during the accounting period as compensation for use of his capital.

Total debt service payments: The sum of amortization and interest payments.

Write offs: The annulments of disbursed debt.

Restructuring: Are the amount of principal or interest payment due but deferred, rescheduled, refinancing or exchanged as a result of debt-restructuring agreement. Rescheduled principal

involves a transfer of the amount from the original loan to a new loan. Debt relief as debt cancellation is treated as a write-off.

Arrears: Arrears in total debt service at the end of any period equals the arrears in total debt service at the end of the previous period plus the debt service scheduled to be paid, but minus debt service paid, in the period.

Publicly Guaranteed External Debt: Is usually defined as an external debt obligation of a private debtor which a public entity guarantees for repayment.

Net Flows (or net lending or net disbursements) are disbursements minus capital repayments.

Net transfers are net flows minus interest payments of disbursement minus total debt service payments.

Creditworthiness: Refers to a country's acceptability for further credit by virtue of its record of repayment of past debts. It reflects the performance on external debt management. If it is positive, the creditworthiness rating of the country is high on the international capital market.

Flows: These are transactions in a defined period, such as a calendar year. Flow concepts are loan commitments received, disbursements, amortization payments, interest payments, debt cancellations, debt write-offs, and amounts restructured.

Stocks: Relate to amounts outstanding at any particular time. Stock concepts are disbursed and outstanding debt, undisbursed balances, and arrears of principal and interest.

Liquidity problem refers to the inability of a country to service its debts now in the amount initially contracted (Osei, 1995).

***Solvency*:** Relates to whether the value of a country's liabilities exceeds the ability to pay at any time. A country is insolvent when it is incapable of servicing its debt in the long run (Ajayi, 1991;Osei,1995).

Short-terms debts are those with original maturity of one year or less.

Long -term external debt is defined as debt that has an original or extended maturity of more than one year and that is owed to non residents and repayable in foreign currency, goods or services.

Variable interest rate LDOD is long term debt with interest rates that float with movements in a key market rate such as the London interbank offer rate (LIBOR) or the U.S. prime rate. This item conveys information about the borrower's exposure to changes in international interest rates.

Use of IMF credit denotes repurchase obligations to the IMF with respect to all uses of uses of IMF resources (excluding those resulting from drawings in the reserve tranche) shown for the end of the year specified. Use of IMF credit comprises purchases outstanding under the credit tranches, including enlarged access resources and all special facilities, trust fund loans, and operations under the structural adjustment and enhanced structural adjustment facilities.

Official debts are those obtained from national governments or their agencies or from international agencies like the World Bank and IMF.

Private debts consist of those obtained from private creditors which include the Euro-dollar loans, supplier credit experts and loans from private commercial banks.

APPENDIX B: STURACTURAL BREAK TEST

Variable: LRGDP
Chow Breakpoint Test: 1974 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	1.818444	Prob. F(4,41)	0.1437
Log likelihood ratio	7.675870	Prob. Chi-Square(4)	0.1042
Wald Statistic	7.273775	Prob. Chi-Square(4)	0.1221

Variable: LLAB

Chow Breakpoint Test: 1975 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	0.025628	Prob. F(4,41)	0.9987
Log likelihood ratio	0.117365	Prob. Chi-Square(4)	0.9983
Wald Statistic	0.102510	Prob. Chi-Square(4)	0.9987

Variable: LHCD

Chow Breakpoint Test: 1975 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	1.020266	Prob. F(4,41)	0.4082
Log likelihood ratio	4.459842	Prob. Chi-Square(4)	0.3473
Wald Statistic	4.081065	Prob. Chi-Square(4)	0.3951

Variable: LPK

Chow Breakpoint Test: 1975 1991
Null Hypothesis: No breaks at specified breakpoints
Equation Sample: 1962 2008

F-statistic	1.856376	Prob. F(4,41)	0.1366
Log likelihood ratio	7.823364	Prob. Chi-Square(4)	0.0983
Wald Statistic	7.425504	Prob. Chi-Square(4)	0.1150

Variable: LED

Chow Breakpoint Test: 1974 1991

Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	1.046891	Prob. F(4,41)	0.3949
Log likelihood ratio	4.570745	Prob. Chi-Square(4)	0.3342
Wald Statistic	4.187566	Prob. Chi-Square(4)	0.3812

Variable: LTDS

Chow Breakpoint Test: 1975 1991

Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	0.998491	Prob. F(4,41)	0.4194
Log likelihood ratio	4.368945	Prob. Chi-Square(4)	0.3584
Wald Statistic	3.993964	Prob. Chi-Square(4)	0.4068

Variable: LXM

Chow Breakpoint Test: 1975 1991

Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	0.068579	Prob. F(4,41)	0.9911
Log likelihood ratio	0.313414	Prob. Chi-Square(4)	0.9889
Wald Statistic	0.274317	Prob. Chi-Square(4)	0.9914

Variable: LPINV

Chow Breakpoint Test: 1974 1991

Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

F-statistic	0.778969	Prob. F(4,41)	0.5453
Log likelihood ratio	3.442642	Prob. Chi-Square(4)	0.4867
Wald Statistic	3.115878	Prob. Chi-Square(4)	0.5386

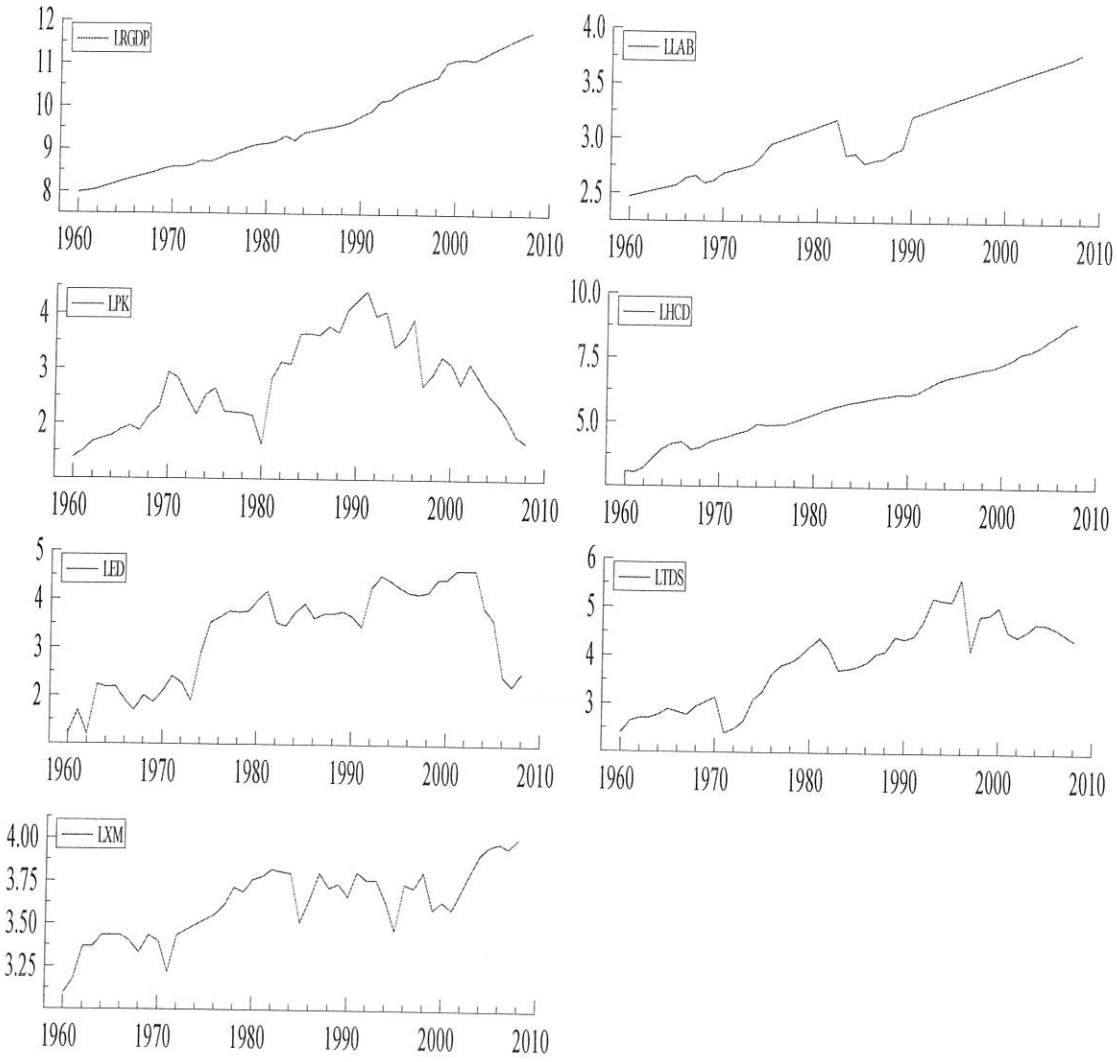
Variable: LIMTGDP
Chow Breakpoint Test: 1974 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1962 2008

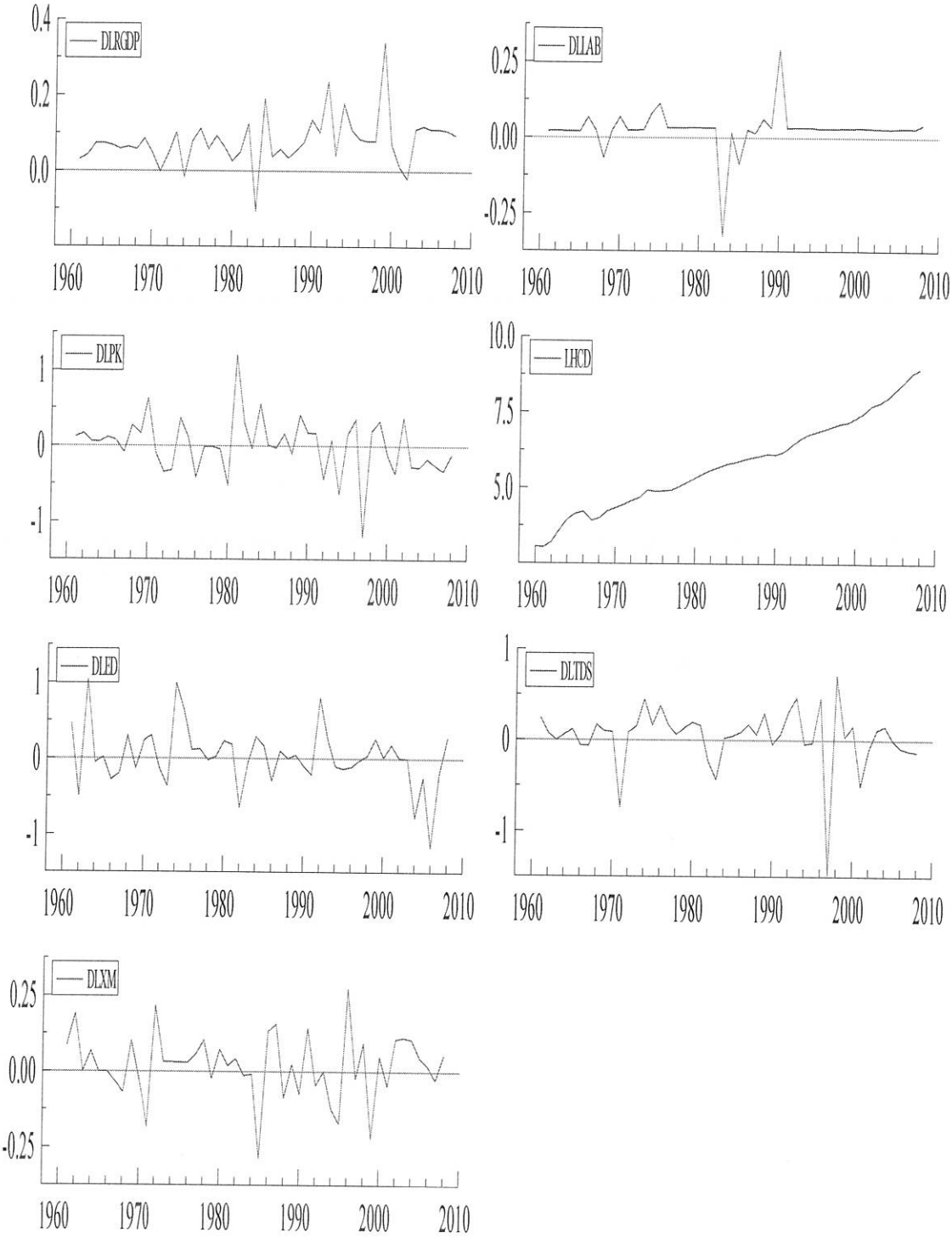
F-statistic	0.740563	Prob. F(4,41)	0.5698
Log likelihood ratio	3.278686	Prob. Chi-Square(4)	0.5123
Wald Statistic	2.962251	Prob. Chi-Square(4)	0.5642

APPENDIX C: PLOT OF THE VARIABLES

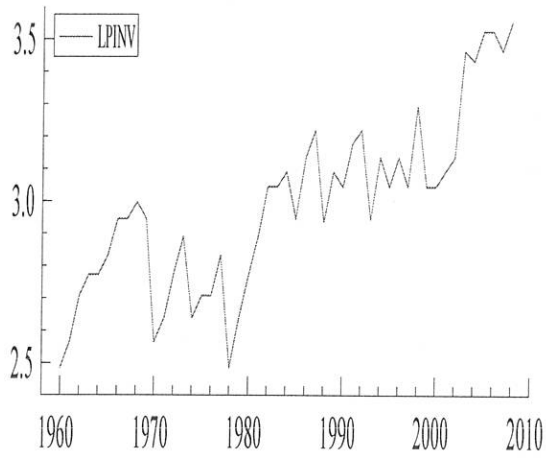
A) VARIABLES USED IN THE GROWTH EQUATION (IN LEVELS)

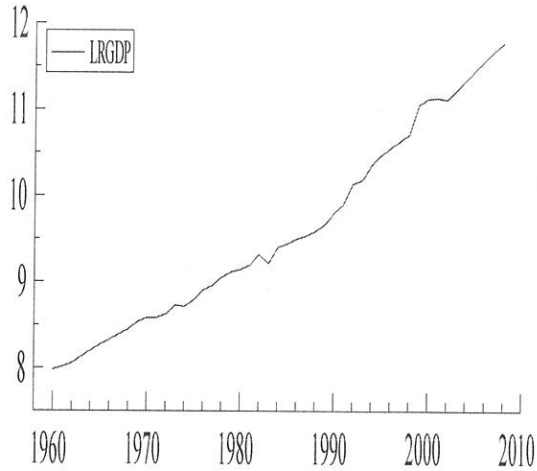


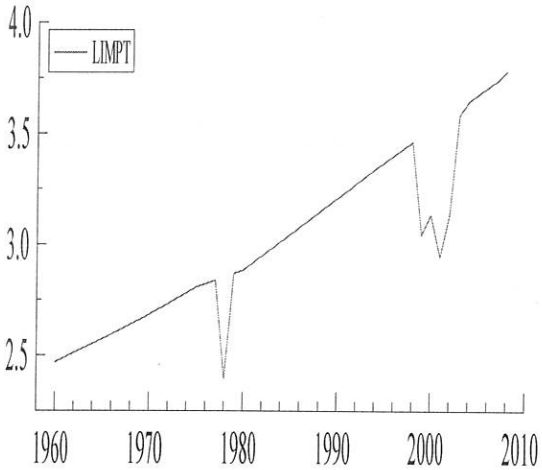
B) VARIABLES USED IN THE GROWTH EQUATION (AT FIRST DIFFERENCE)

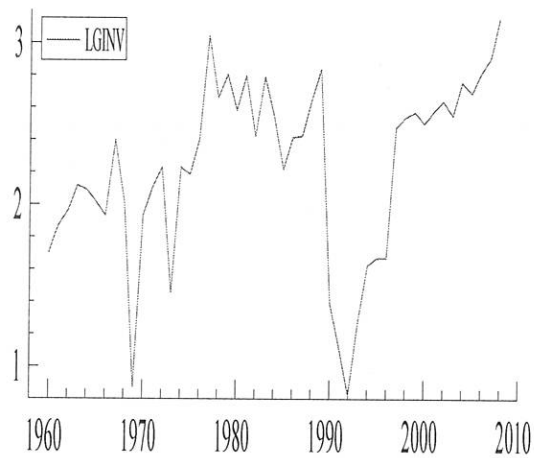


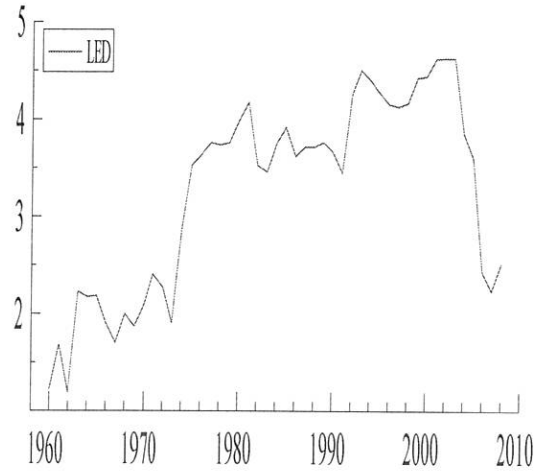
C) VARIABLES USED IN PRIVATE INVESTMENT EQUATION (IN LEVELS)



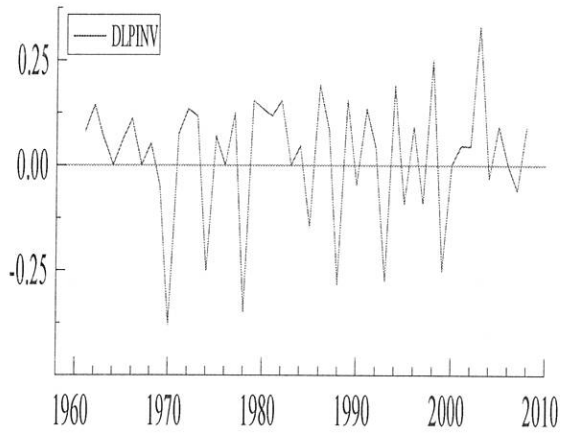


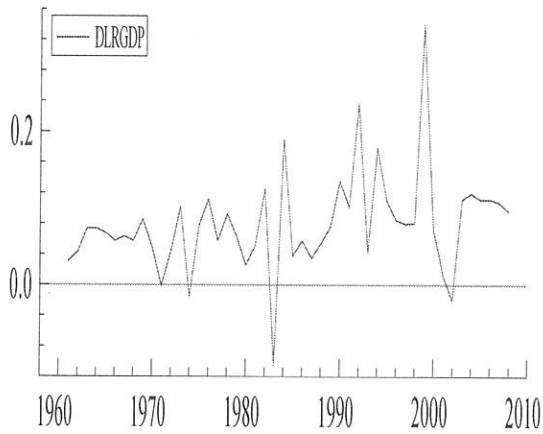


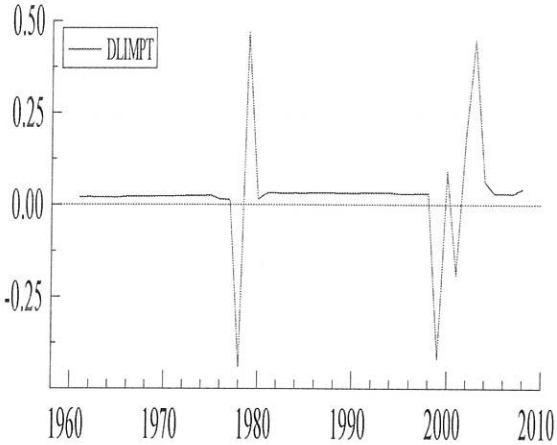


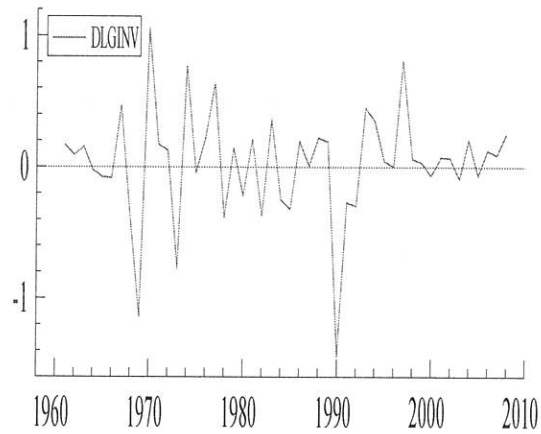


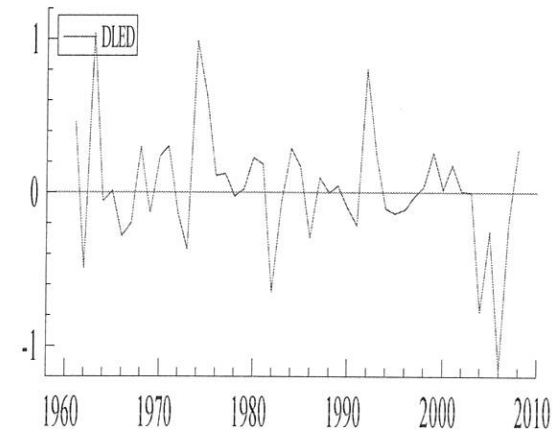
D) VARIABLES USED IN PRIVATE INVESTMENT EQUATION (AT FIRST DIFFERENCE)











APPENDIX D: DIAGNOSTIC TESTS

A. GROWTH EQUATION

LRGDP	: AR 1-2 test:	F(2,29) =	1.1219 [0.3394]
LLAB	: AR 1-2 test:	F(2,29) =	3.9176 [0.0312]*
LPK	: AR 1-2 test:	F(2,29) =	2.9528 [0.0680]
LHCD	: AR 1-2 test:	F(2,29) =	0.0029670 [0.9970]
LED	: AR 1-2 test:	F(2,29) =	0.26252 [0.7709]
LTDS	: AR 1-2 test:	F(2,29) =	1.4329 [0.2550]
LXM	: AR 1-2 test:	F(2,29) =	0.45812 [0.6370]
LRGDP	: Normality test:	Chi^2(2) =	16.110 [0.0003]**
LLAB	: Normality test:	Chi^2(2) =	29.269 [0.0000]**
LPK	: Normality test:	Chi^2(2) =	1.8743 [0.3917]
LHCD	: Normality test:	Chi^2(2) =	24.697 [0.0000]**
LED	: Normality test:	Chi^2(2) =	3.5577 [0.1688]
LTDS	: Normality test:	Chi^2(2) =	4.2189 [0.1213]
LXM	: Normality test:	Chi^2(2) =	10.391 [0.0055]**
LRGDP	: ARCH 1-1 test:	F(1,29) =	0.35015 [0.5586]
LLAB	: ARCH 1-1 test:	F(1,29) =	0.014632 [0.9046]
LPK	: ARCH 1-1 test:	F(1,29) =	0.86316 [0.3605]
LHCD	: ARCH 1-1 test:	F(1,29) =	0.11856 [0.7331]
LED	: ARCH 1-1 test:	F(1,29) =	0.50709 [0.4821]
LTDS	: ARCH 1-1 test:	F(1,29) =	1.0356 [0.3173]
LXM	: ARCH 1-1 test:	F(1,29) =	0.34304 [0.5626]
LRGDP	: hetero test:	F(29,1) =	0.029199 [1.0000]
LLAB	: hetero test:	F(29,1) =	0.035269 [1.0000]
LPK	: hetero test:	F(29,1) =	0.057474 [0.9997]
LHCD	: hetero test:	F(29,1) =	0.048466 [0.9999]
LED	: hetero test:	F(29,1) =	0.055557 [0.9998]
LTDS	: hetero test:	F(29,1) =	0.065067 [0.9995]
LXM	: hetero test:	F(29,1) =	0.017843 [1.0000]

MULTIVARIATE DIAGNOSTIC TEST

Vector AR 1-2 test:	F(98,78) =	0.90557 [0.6808]
Vector Normality test:	Chi^2(14)=	83.369 [0.0000]**
Vector hetero test:	Chi^2(812)=	829.23 [0.3296]

B. PRIVATE INVESTMENT

LPIV	: AR 1-2 test:	F(2,39) =	0.36434 [0.6970]
LRGDP	: AR 1-2 test:	F(2,39) =	1.4466 [0.2477]
LIMTGDP	: AR 1-2 test:	F(2,39) =	0.60674 [0.5502]
LGINV	: AR 1-2 test:	F(2,39) =	0.16943 [0.8448]
LEDTGDP	: AR 1-2 test:	F(2,39) =	0.87950 [0.4231]
LPIV	: Normality test:	Chi^2(2) =	4.9527 [0.0840]
LRGDP	: Normality test:	Chi^2(2) =	20.506 [0.0000]**
LIMTGDP	: Normality test:	Chi^2(2) =	17.118 [0.0002]**
LGINV	: Normality test:	Chi^2(2) =	6.8486 [0.0326]*
LEDTGDP	: Normality test:	Chi^2(2) =	2.4559 [0.2929]
LPIV	: ARCH 1-1 test:	F(1,39) =	0.96637 [0.3316]
LRGDP	: ARCH 1-1 test:	F(1,39) =	0.014974 [0.9032]
LIMTGDP	: ARCH 1-1 test:	F(1,39) =	0.42054 [0.5205]
LGINV	: ARCH 1-1 test:	F(1,39) =	0.73294 [0.3972]
LEDTGDP	: ARCH 1-1 test:	F(1,39) =	0.16429 [0.6875]
LPIV	: hetero test:	F(11,29) =	0.95397 [0.5067]
LRGDP	: hetero test:	F(11,29) =	0.57129 [0.8360]
LIMTGDP	: hetero test:	F(11,29) =	0.99543 [0.4734]
LGINV	: hetero test:	F(11,29) =	0.86700 [0.5802]
LEDTGDP	: hetero test:	F(11,29) =	0.77827 [0.6585]
LPIV	: hetero-X test:	F(26,14) =	1.1602 [0.3962]
LRGDP	: hetero-X test:	F(26,14) =	0.26681 [0.9982]
LIMTGDP	: hetero-X test:	F(26,14) =	0.71295 [0.7794]
LGINV	: hetero-X test:	F(26,14) =	0.65729 [0.8280]
LEDTGDP	: hetero-X test:	F(26,14) =	0.89630 [0.6099]

MULTIVARIATE DIAGNOSTIC TESTS

Vector AR 1-2 test:	F(50,126)=	0.84821 [0.7427]
Vector Normality test:	Chi^2(10)=	50.685 [0.0000]**
Vector hetero test:	F(165,155)=	0.61089 [0.9990]
Vector hetero-X test:	F(390,53)=	0.43811 [1.0000]

APPENDIX E: CORRELATION OF UNRESTRICTED RESIDUALS

A. GROWTH MODEL

Correlation of URF residuals (standard deviations on diagonal)

	DLRGDP	DLLAB	DLPK	DLHCD	DLED	DLTDS	DLXM
DLRGDP	0.058870	0.10521	-0.041455	-0.083362	-0.13750	0.22134	-0.23237
DLLAB	0.10521	0.072313	0.059672	-0.12541	0.018705	-0.025226	-0.037013
DLPK	-0.041455	0.059672	0.13777	-0.061327	0.27689	-0.033838	-0.032978
DLHCD	-0.083362	-0.12541	-0.061327	0.10341	0.13072	0.23182	0.24194
DLED	-0.13750	0.018705	0.27689	0.13072	0.23568	-0.10904	-0.20787
DLTDS	0.22134	-0.025226	-0.033838	0.11828	-0.10904	0.24244	-0.15161
DLXM	-0.15237	-0.037013	-0.032978	0.22194	-0.20787	-0.15161	0.098898

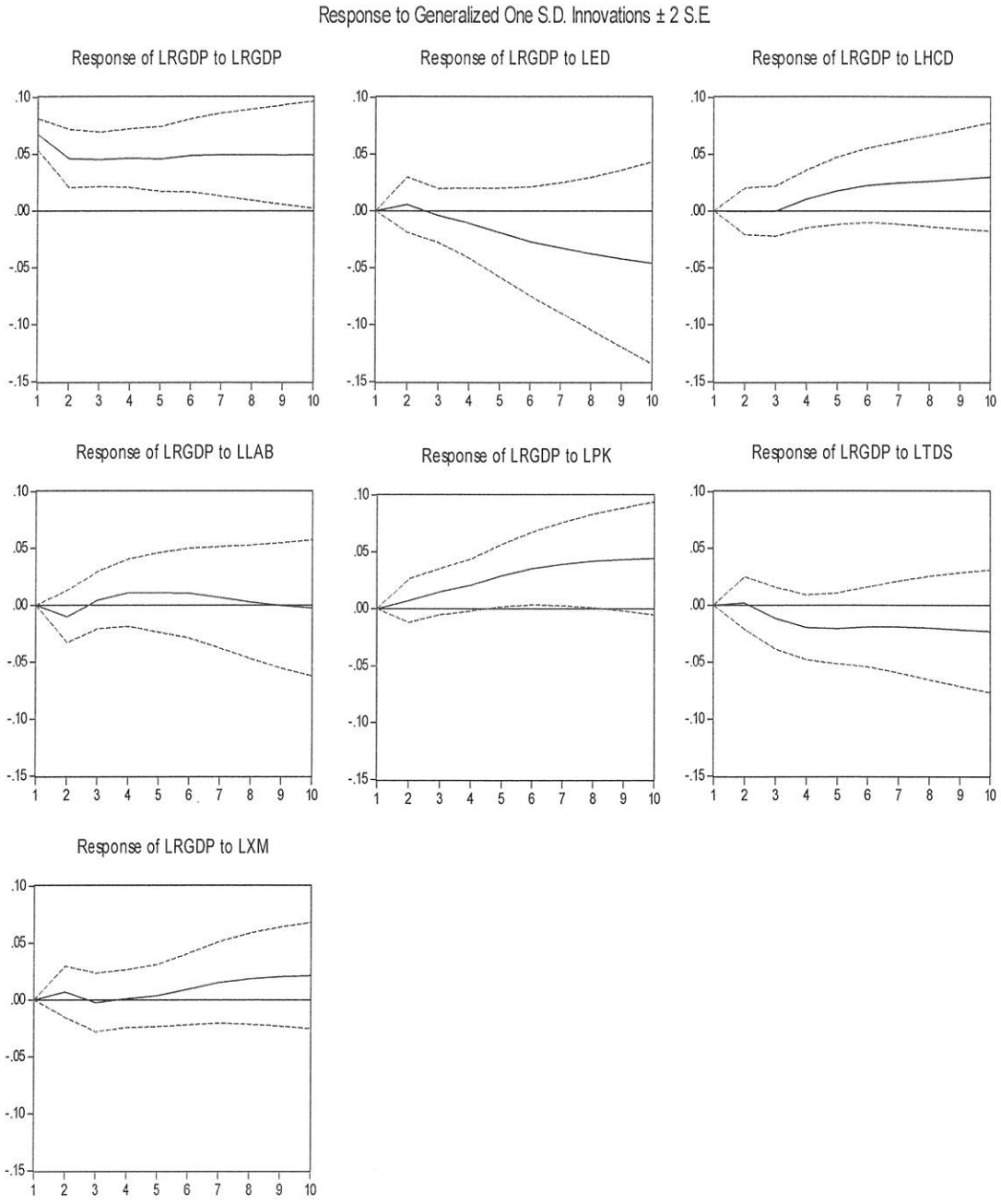
B. PRIVATE INVESTMENT EQUATION

Correlation of URF residuals (standard deviations on diagonal)

	DLPIV	DLRGDP	DLIMTGDP	DLGINV	DLEDTGDP
DLPIV	0.13856	-0.050222	0.24295	-0.27901	-0.31036
DLRGDP	-0.050222	0.071012	-0.23084	-0.23887	-0.016994
DLIMTGDP	0.15295	-0.23084	0.13532	-0.014020	-0.13113
DLGINV	-0.27901	-0.23887	-0.014020	0.24517	0.14874
DLEDTGDP	-0.31036	-0.016994	-0.13113	0.14874	0.14013

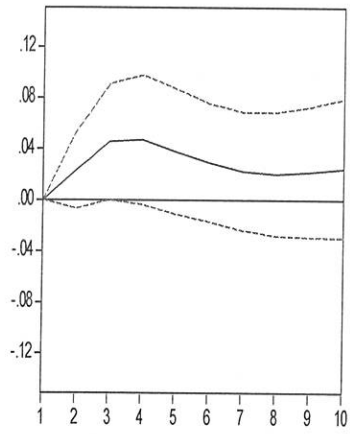
APPENDIX G: GRAPHICAL REPRESENTATION OF IMPULSE RESPONSE FUNCTIONS

A. GROWTH MODEL

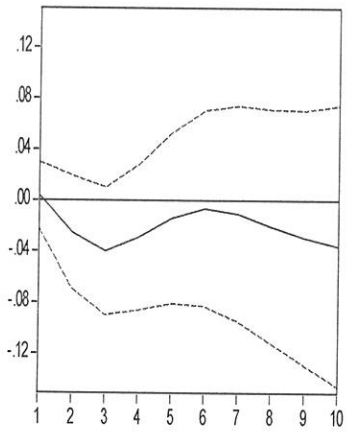


Response to Generalized One S.D. Innovations ± 2 S.E.

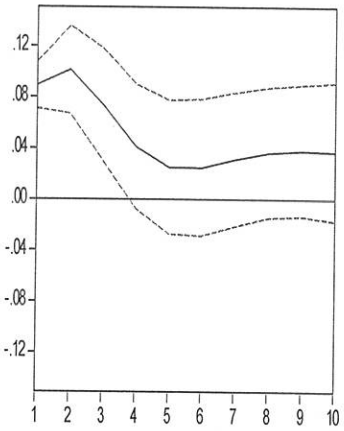
Response of LHCD to LRGDP



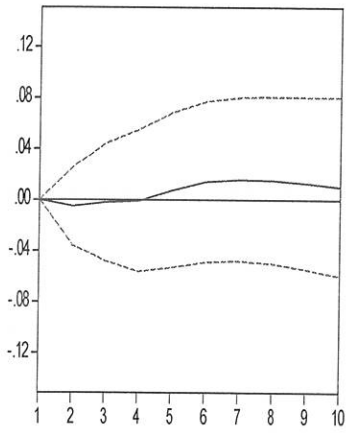
Response of LHCD to LED



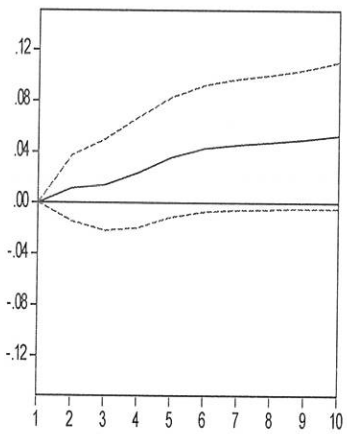
Response of LHCD to LHCD



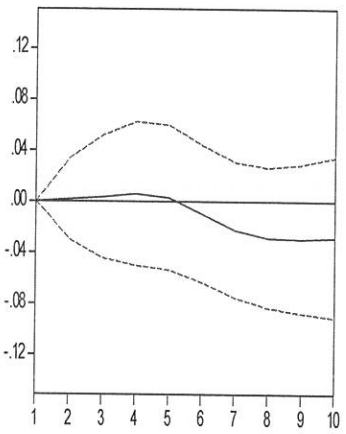
Response of LHCD to LLAB



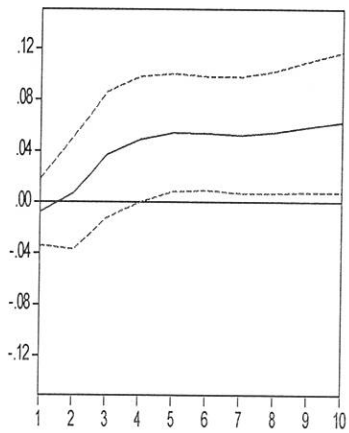
Response of LHCD to LPK



Response of LHCD to LTDS

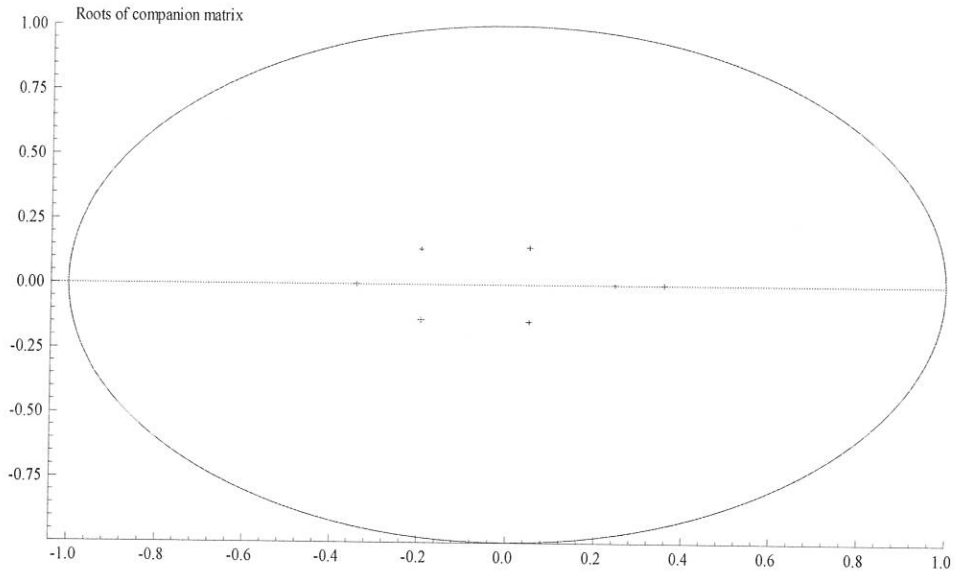


Response of LHCD to LXM

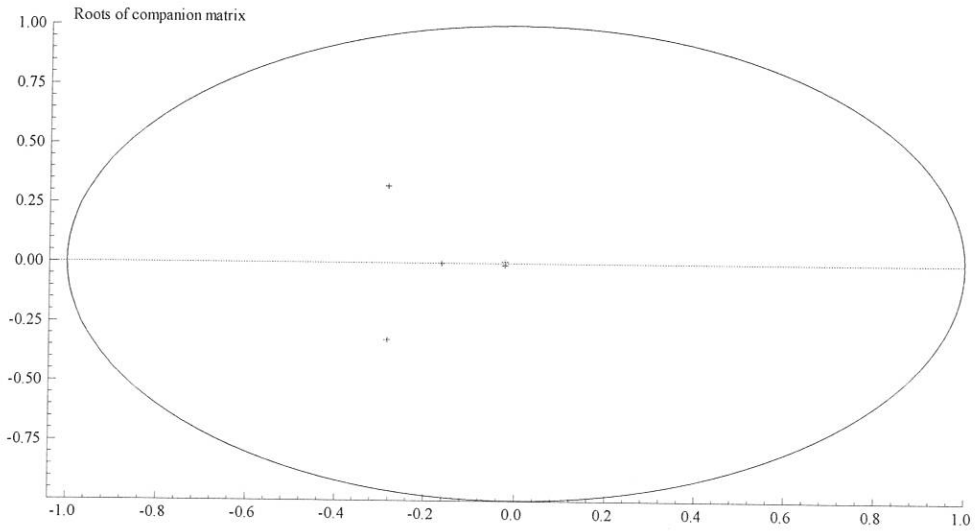


APPENDIX F: VAR STABILITY TEST

A. COMPANION ROOT MATRIX FOR GROWTH MODEL

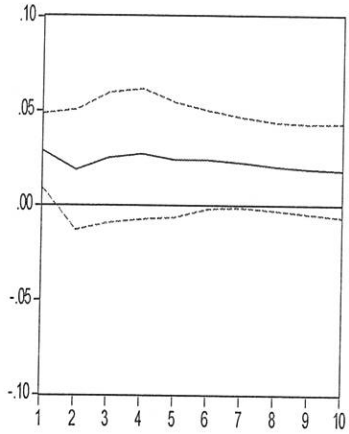


B. ROOTS OF COMPANION MATRIX FOR INVESTMENT EQUATION

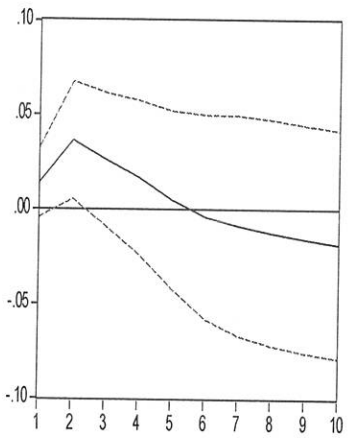


Response to Cholesky One S.D. Innovations ± 2 S.E

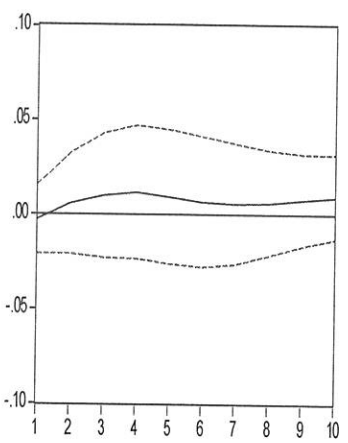
Response of LLAB to LRGDP



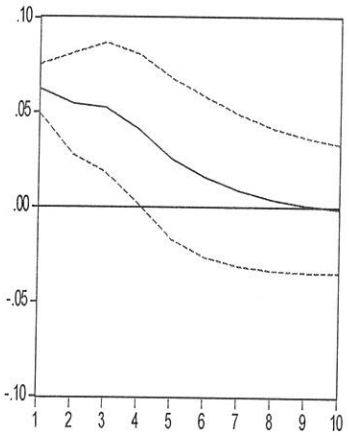
Response of LLAB to LED



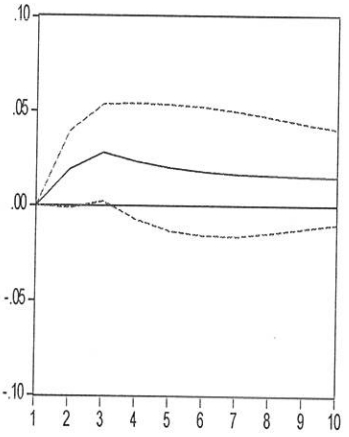
Response of LLAB to LHCD



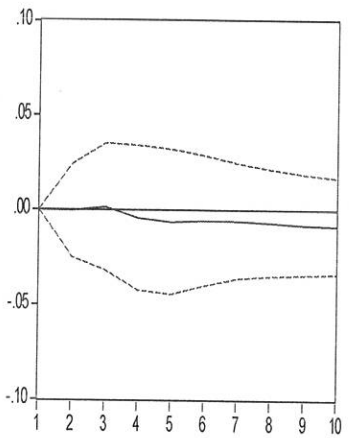
Response of LLAB to LLAB



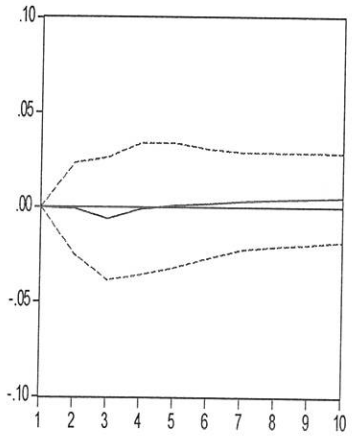
Response of LLAB to LPK



Response of LLAB to LTDS

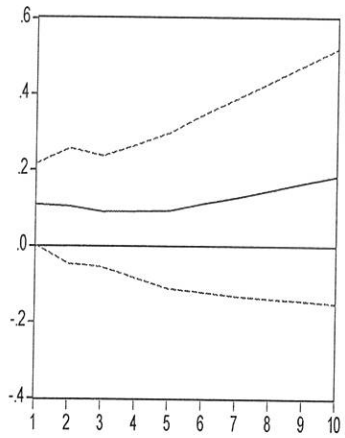


Response of LLAB to LXM

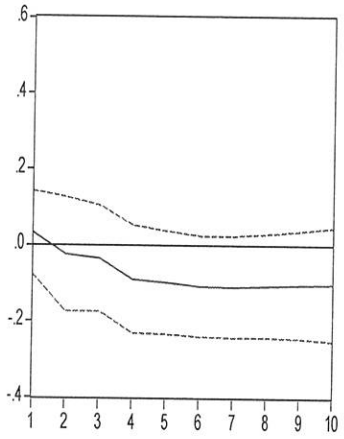


Response to Cholesky One S.D. Innovations ± 2 S.E

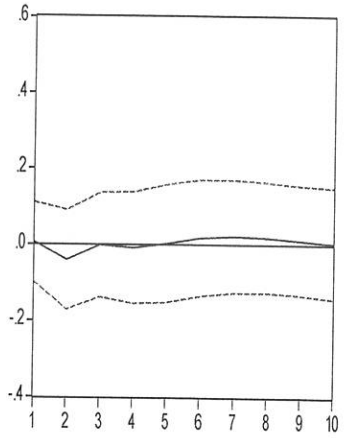
Response of LPK to LRGDP



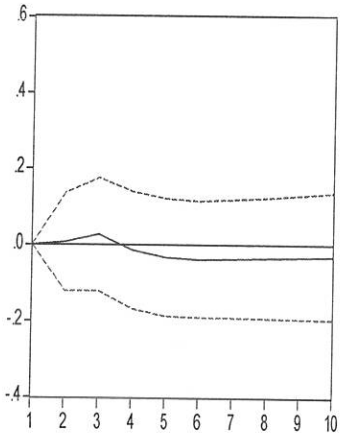
Response of LPK to LED



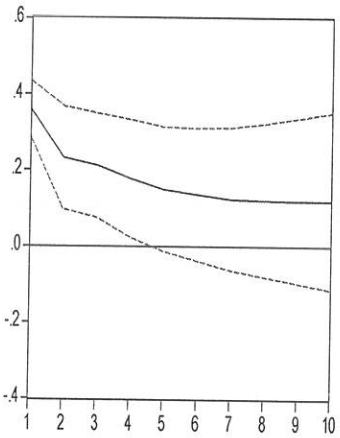
Response of LPK to LHCD



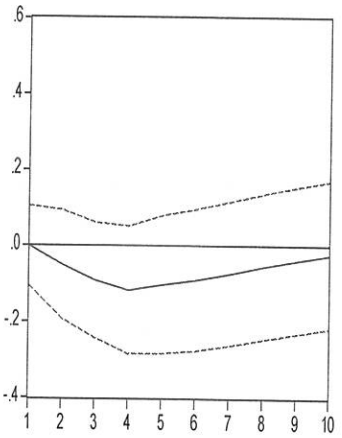
Response of LPK to LLAB



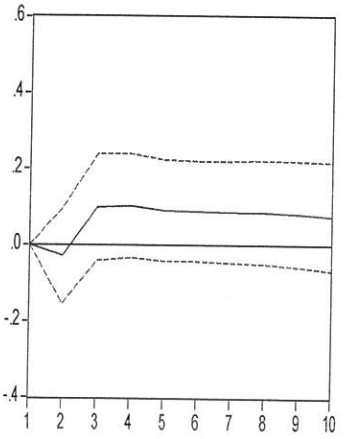
Response of LPK to LPK



Response of LPK to LTDS

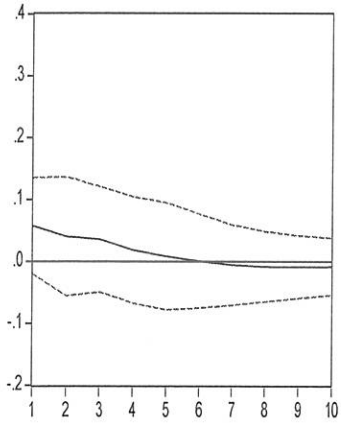


Response of LPK to LXM

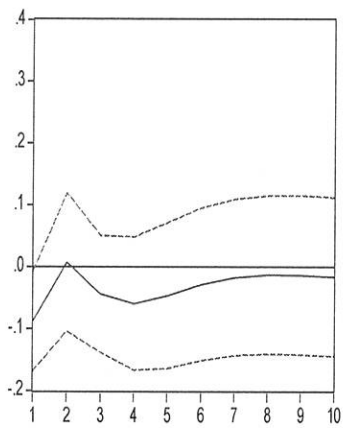


Response to Generalized One S.D. Innovations ± 2 S.E.

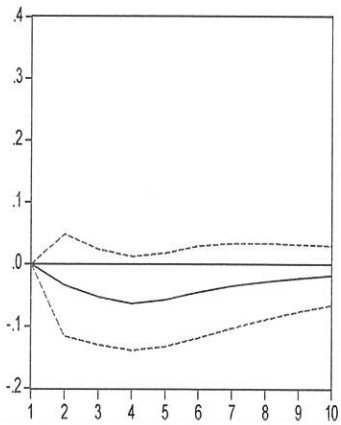
Response of LTDS to LRGDP



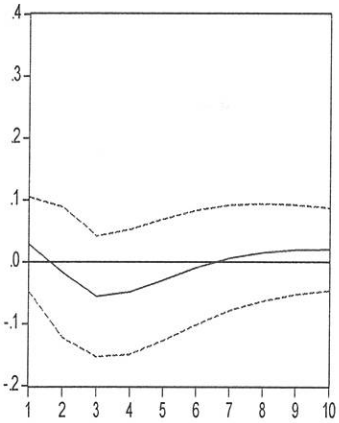
Response of LTDS to LED



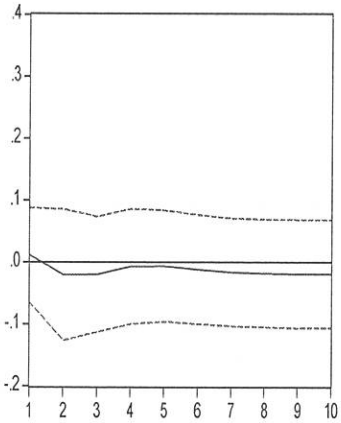
Response of LTDS to LHCD



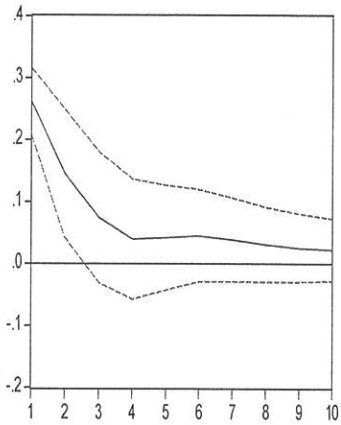
Response of LTDS to LLAB



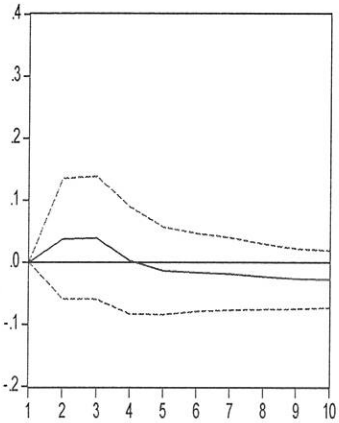
Response of LTDS to LPK



Response of LTDS to LTDS

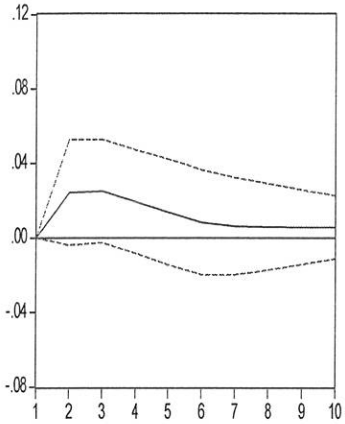


Response of LTDS to LXM

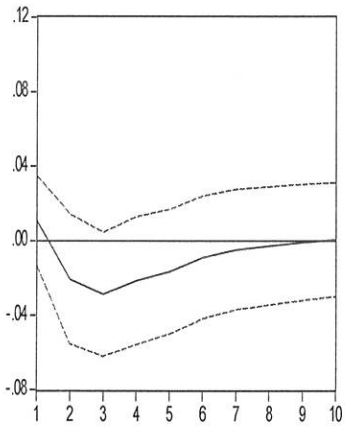


Response to Generalized One S.D. Innovations ± 2 S.E.

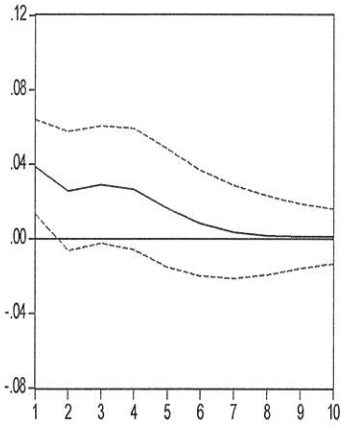
Response of LXM to LRGDP



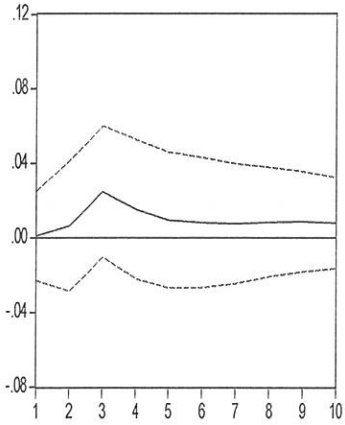
Response of LXM to LED



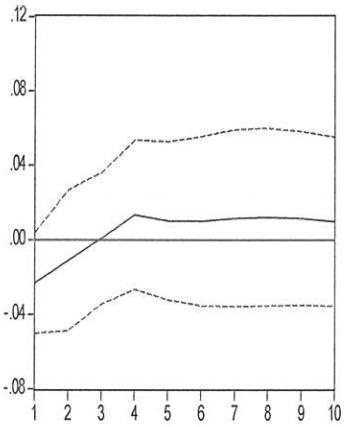
Response of LXM to LHCD



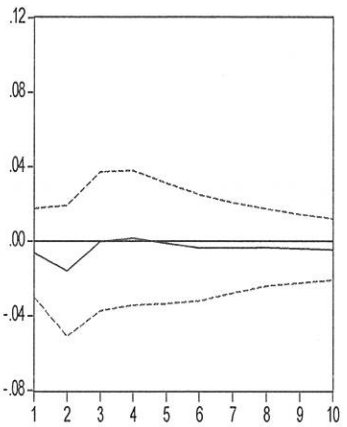
Response of LXM to LLAB



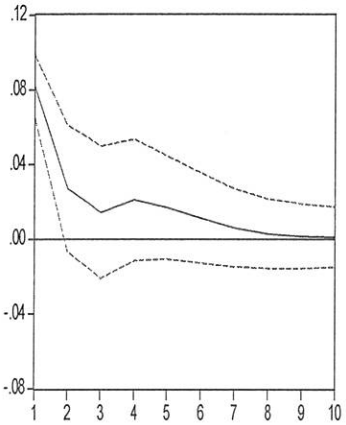
Response of LXM to LED



Response of LXM to LTDS

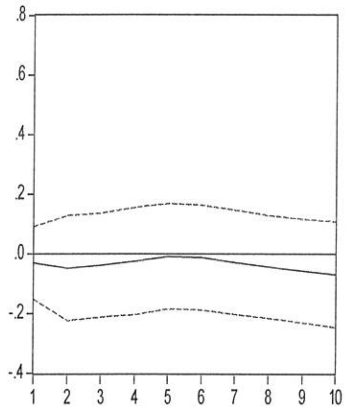


Response of LXM to LXM

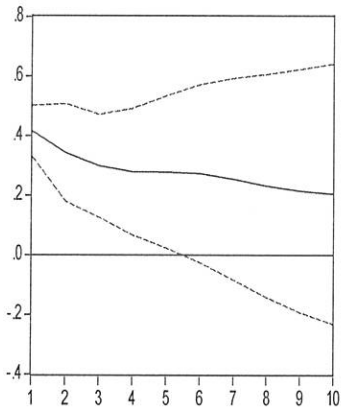


Response to Generalized One S.D. Innovations ± 2 S.E.

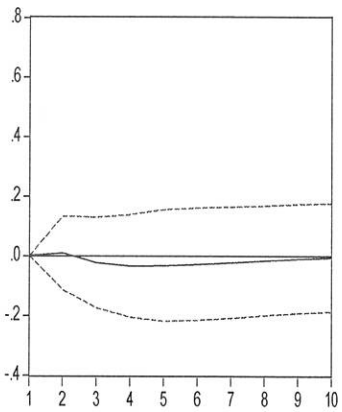
Response of LED to LRGDP



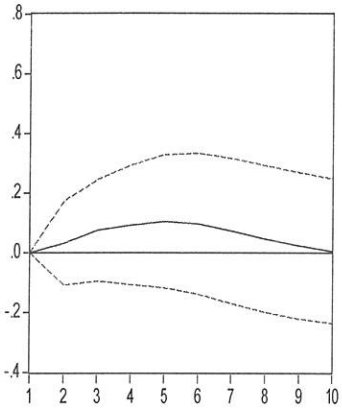
Response of LED to LED



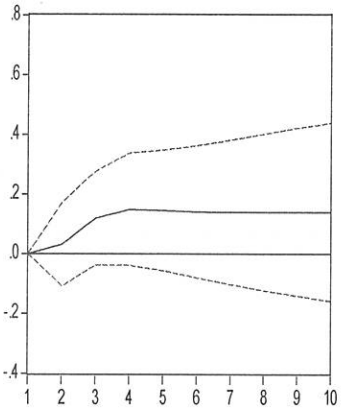
Response of LED to LHCD



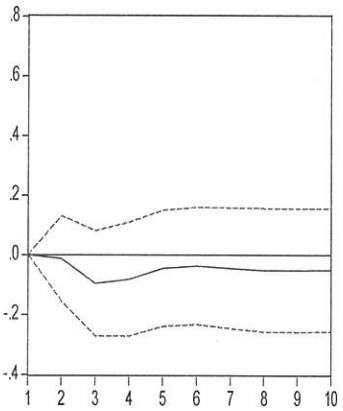
Response of LED to LLAB



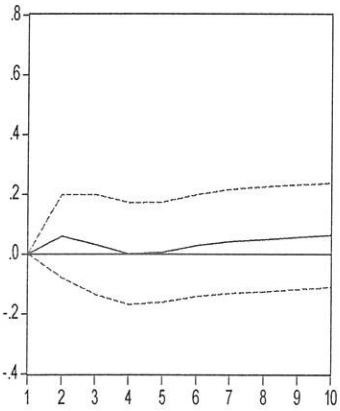
Response of LED to LPK



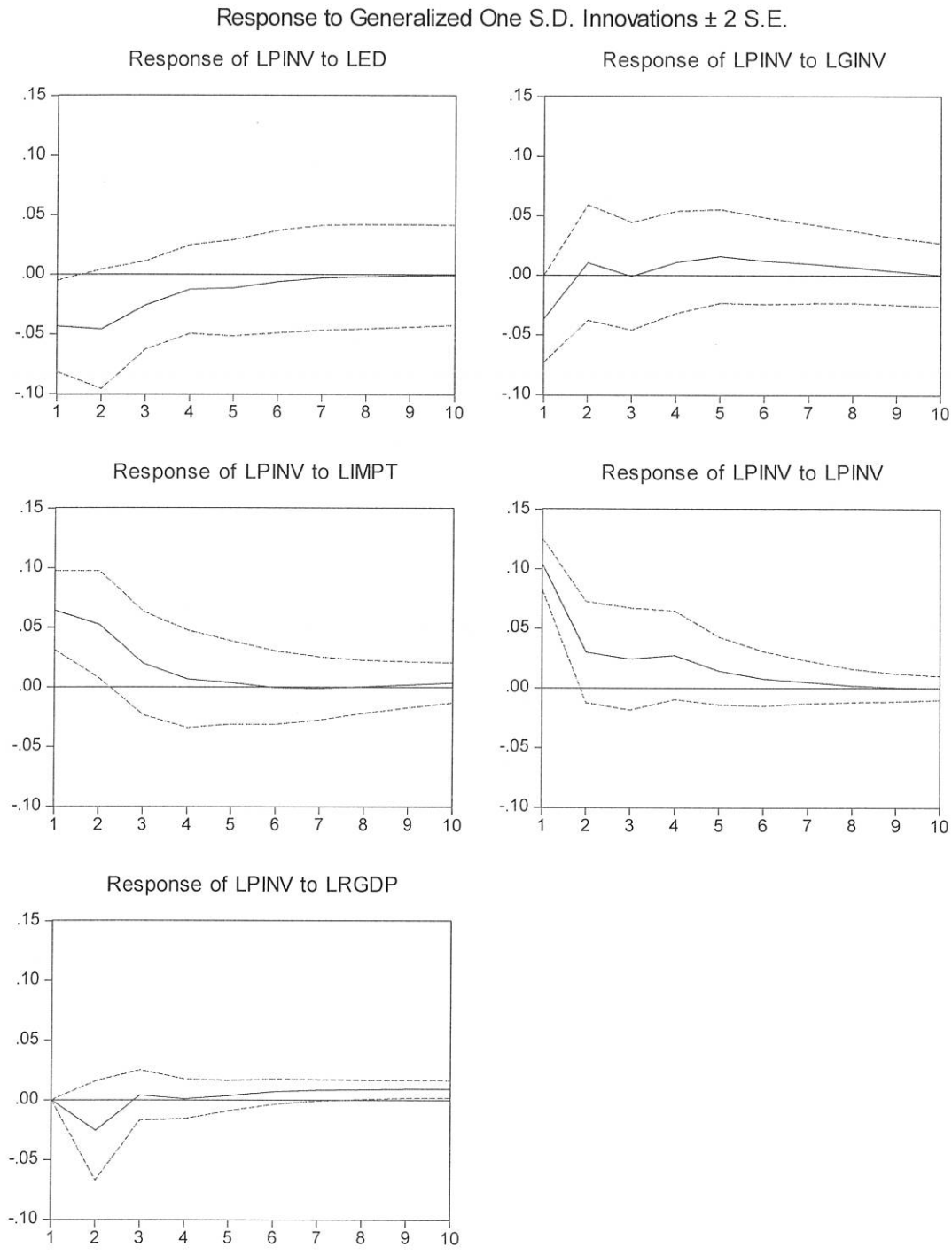
Response of LED to LTDS



Response of LED to LXM

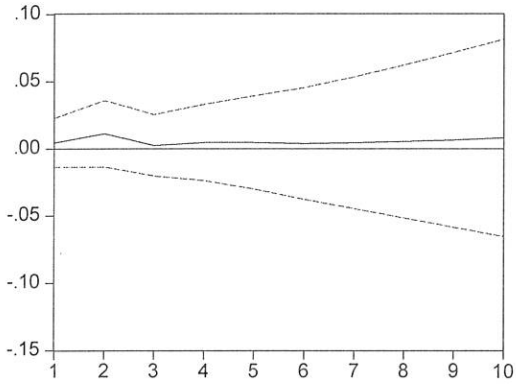


B. PRIVATE INVESTMENT MODEL

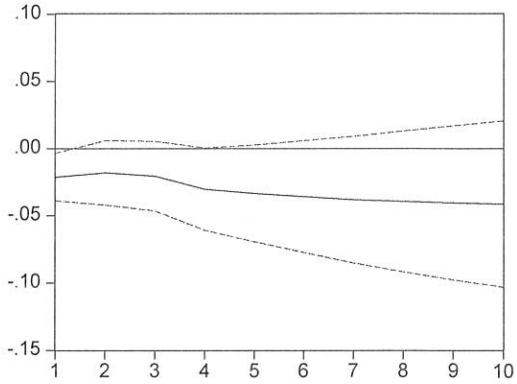


Response to Generalized One S.D. Innovations ± 2 S.E.

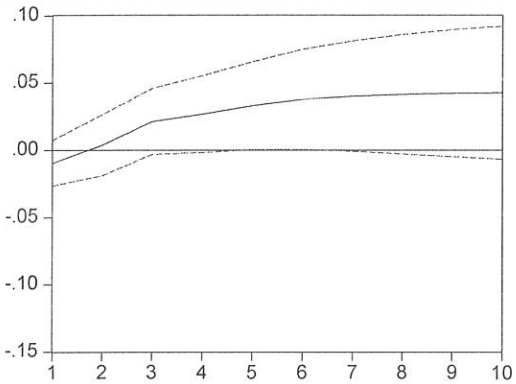
Response of LRGDP to LED



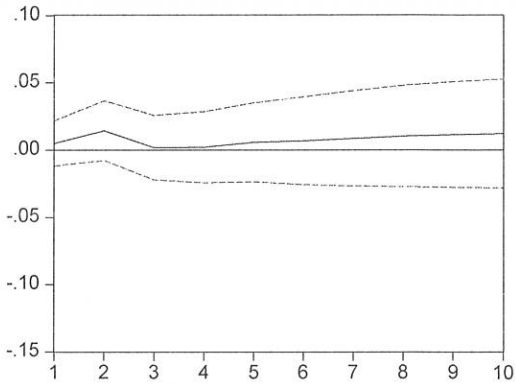
Response of LRGDP to LGINV



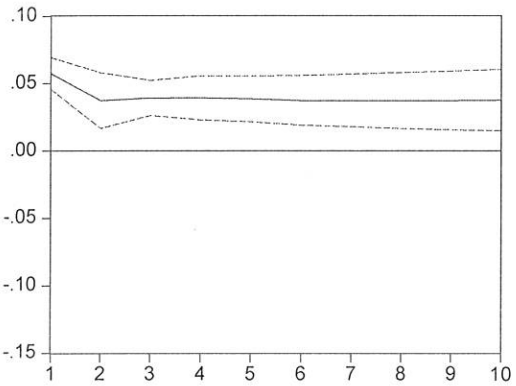
Response of LRGDP to LIMPT



Response of LRGDP to LPINV

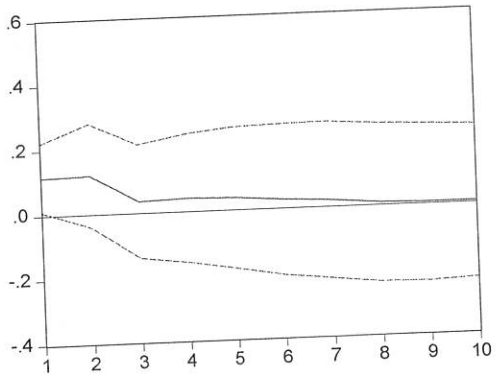


Response of LRGDP to LRGDP

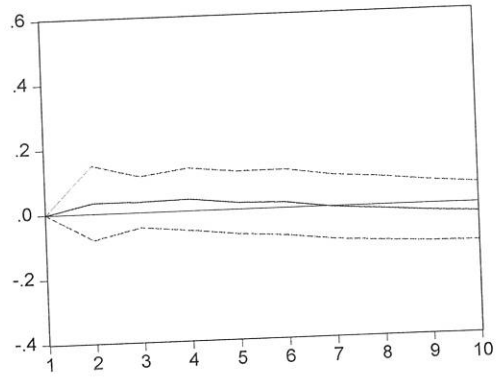


Response to Generalized One S.D. Innovations ± 2 S.E.

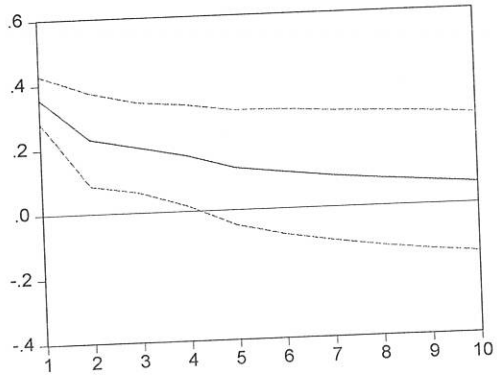
Response of LED to LGINV



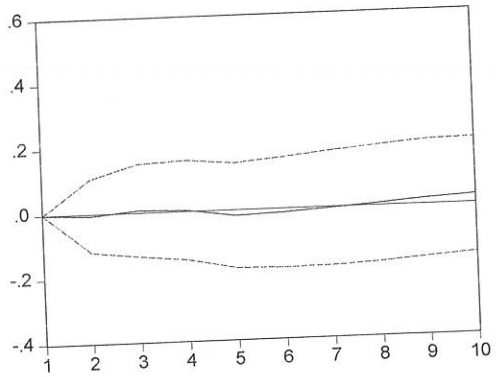
Response of LED to LRGDP



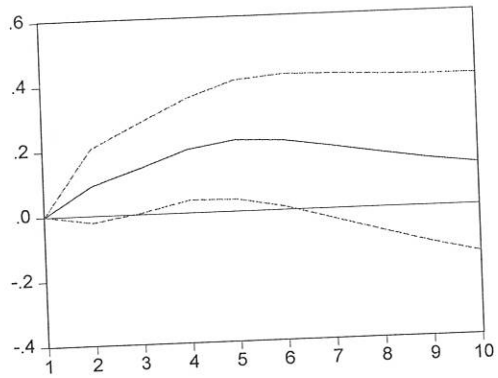
Response of LED to LED



Response of LED to PINV

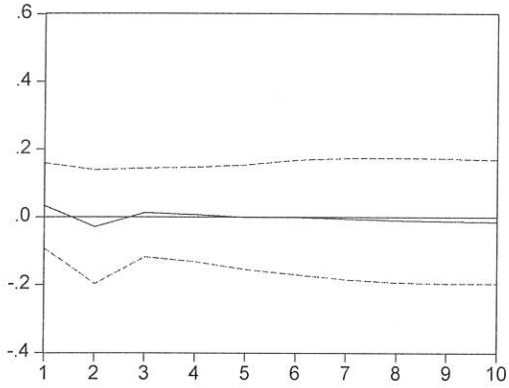


Response of LED to LIMPT

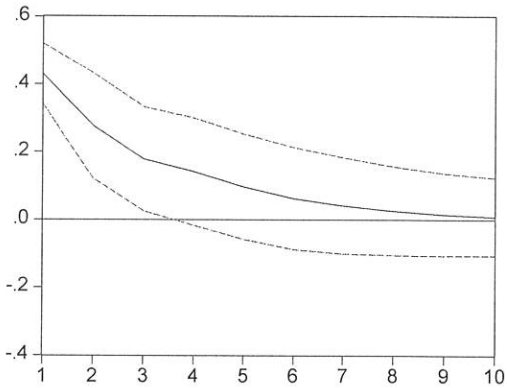


Response to Generalized One S.D. Innovations ± 2 S.E.

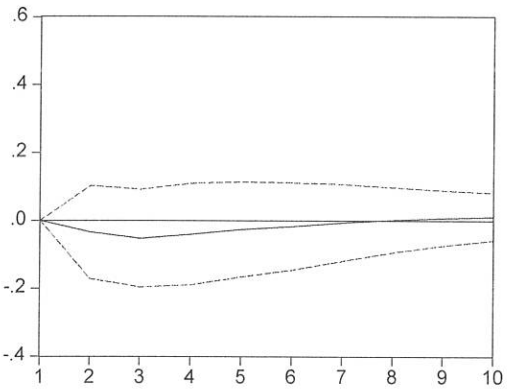
Response of LGINV to LED



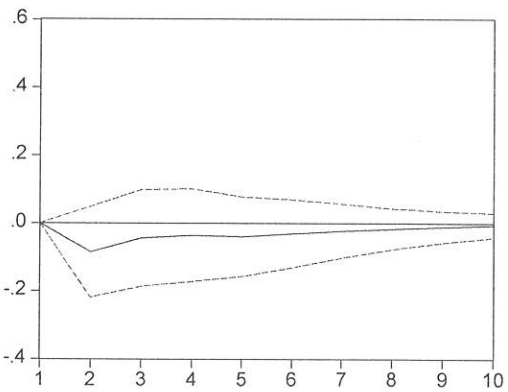
Response of LGINV to LGINV



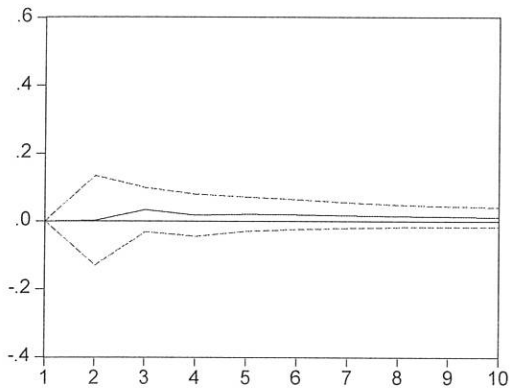
Response of LGINV to LIMPT



Response of LGINV to LPINV



Response of LGINV to LRGDP



APPENDIX H: VARIANCE DECOMPOSITION OF VARIABLES

A. GROWTH MODEL

Table A.1: Variance Decomposition of LRGDP

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.086558	94.37243	0.279510	0.005287	0.083219	3.411506	0.208269	1.639778
3	0.102613	89.56882	0.474620	0.018019	0.691197	4.172133	3.880554	1.194650
4	0.120776	83.37153	1.248607	0.319149	2.269582	4.963828	6.912829	0.914472
5	0.137731	78.86633	2.230246	0.909931	3.557395	5.277244	8.313964	0.844893
6	0.153892	75.98074	3.288074	1.466640	4.269286	5.358607	8.590974	1.045674
7	0.168826	74.23386	4.200364	1.817778	4.584308	5.314768	8.473286	1.375633
8	0.182643	73.19620	4.943429	2.035485	4.710503	5.165419	8.282027	1.666936
9	0.195618	72.53376	5.562251	2.212674	4.761753	4.952567	8.111699	1.865294
10	0.208115	72.04132	6.120916	2.390075	4.791277	4.706792	7.968287	1.981328

Table A.2: Variance Decomposition of LHCD

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	0.579655	0.219889	99.20046	0.000000	0.000000	0.000000	0.000000
2	0.086558	0.486359	3.559464	93.28755	0.100801	0.031717	0.000397	2.533708
3	0.102613	5.142310	7.759079	77.01588	0.095145	0.629454	0.004643	9.353492
4	0.120776	11.24844	8.689048	64.02015	0.472155	1.368767	0.110935	14.09051
5	0.137731	17.14136	8.098587	55.57553	1.184997	1.703883	0.412539	15.88311
6	0.153892	22.03460	7.328694	50.07946	2.033455	1.795507	0.929461	15.79882
7	0.168826	26.23376	6.664882	45.84460	2.949384	1.821670	1.590722	14.89499
8	0.182643	30.06894	6.112160	42.04569	3.881782	1.882692	2.259348	13.74939
9	0.195618	33.66403	5.710080	38.42647	4.744619	2.010568	2.833597	12.61064
10	0.208115	36.99489	5.468287	35.03002	5.451360	2.180830	3.285766	11.58885

Table A.3 Variance Decomposition of LLAB

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	21.64250	2.853810	0.003692	75.50000	0.000000	0.000000	0.000000
2	0.086558	14.86316	11.35829	0.460118	72.72638	0.345791	0.224090	0.022175
3	0.102613	13.81829	12.55885	1.059288	71.46053	0.792173	0.199713	0.111159
4	0.120776	15.06934	12.20943	1.385366	70.17284	0.731712	0.172778	0.258540
5	0.137731	17.27240	11.47077	1.394659	68.66556	0.682236	0.157885	0.356490
6	0.153892	19.79262	10.76878	1.321391	66.85153	0.739465	0.149561	0.376645
7	0.168826	22.12133	10.28652	1.258511	64.95677	0.842642	0.160858	0.373373
8	0.182643	24.13711	10.06865	1.210320	63.08439	0.931799	0.203449	0.364272
9	0.195618	25.85091	10.11229	1.177650	61.24433	0.989089	0.273276	0.352458
10	0.208115	27.32233	10.38349	1.170054	59.40627	1.015778	0.359594	0.342483

Table A.4: Variance Decomposition of LPK

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	1.245933	7.073940	0.000120	0.002187	91.67782	0.000000	0.000000
2	0.086558	0.927291	9.727340	0.919244	0.595671	87.71188	0.004666	0.113906
3	0.102613	0.787560	9.627711	0.711411	2.859213	81.95528	0.004941	4.053890
4	0.120776	2.213524	9.956691	0.682520	5.328590	74.92351	0.241915	6.653247
5	0.137731	3.739568	10.90871	0.596603	6.673193	69.42052	0.679302	7.982114
6	0.153892	5.440454	12.66217	0.529161	7.124975	64.48431	1.077012	8.681914
7	0.168826	6.968529	14.88258	0.513757	6.986039	60.18223	1.380160	9.086697
8	0.182643	8.163520	17.41825	0.507090	6.528627	56.46605	1.591303	9.325155
9	0.195618	9.058146	20.18734	0.481331	5.966323	53.18995	1.729052	9.387858
10	0.208115	9.724625	23.07215	0.442820	5.420484	50.24698	1.808734	9.284205

Table A.5: Variance Decomposition of LED

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	1.291027	98.70897	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.086558	2.429704	96.50826	0.028143	0.077436	0.286860	5.27E-05	0.669543
3	0.102613	2.237591	91.41841	0.047095	1.815646	2.562765	1.319467	0.599022
4	0.120776	1.820264	84.91169	0.076146	4.640344	5.408973	2.668476	0.474111
5	0.137731	1.519603	79.95910	0.081301	6.559672	8.182563	3.247500	0.450261
6	0.153892	1.341248	76.66132	0.096452	7.273644	10.65556	3.395364	0.576417
7	0.168826	1.262709	74.34624	0.130204	7.263697	12.80085	3.399196	0.797110
8	0.182643	1.293973	72.60095	0.169190	6.934323	14.59453	3.370176	1.036856
9	0.195618	1.445272	71.18437	0.195701	6.509977	16.05546	3.342552	1.266665
10	0.208115	1.709397	69.95088	0.206084	6.088196	17.23641	3.320697	1.488336

Table A.6: Variance Decomposition of LTDS

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	0.961399	6.975299	2.896205	0.018766	0.010088	89.13824	0.000000
2	0.086558	1.560583	5.203347	3.235044	2.364666	1.092788	85.84478	0.698787
3	0.102613	2.950894	5.312820	3.603371	5.472541	3.046966	78.60098	1.012427
4	0.120776	3.559313	6.873178	3.936936	6.843676	4.257839	73.58493	0.944131
5	0.137731	3.679369	8.649404	4.196581	7.179629	5.309119	70.08086	0.905037
6	0.153892	3.608196	10.14599	4.340980	7.180690	6.233489	67.61749	0.873159
7	0.168826	3.509665	11.29357	4.339528	7.088213	7.103269	65.81605	0.849702
8	0.182643	3.423531	12.14171	4.271681	6.966413	7.937150	64.41346	0.846056
9	0.195618	3.358015	12.78062	4.191469	6.837563	8.726023	63.22169	0.884613
10	0.208115	3.313087	13.31682	4.113301	6.709407	9.445795	62.12741	0.974178

Table A.7: Variance Decomposition of LXM

Period	S.E.	LRGDP	LED	LHCD	LLAB	LPK	LTDS	LXM
1	0.068085	2.378407	6.310875	16.93474	1.675674	1.407695	2.867642	68.42496
2	0.086558	7.220523	5.992433	17.04647	4.118845	2.135679	6.800080	56.68597
3	0.102613	6.742835	5.298204	20.40676	6.191051	3.128863	6.213396	52.01889
4	0.120776	6.429774	5.805987	21.82166	6.855720	3.732229	5.979139	49.37549
5	0.137731	6.160241	6.782323	21.78630	7.427059	3.963938	5.994733	47.88540
6	0.153892	6.039598	7.912816	21.32159	8.234976	3.923564	5.891983	46.67548
7	0.168826	6.032229	8.910591	20.80279	9.179698	3.826711	5.744175	45.50381
8	0.182643	6.117084	9.600389	20.34890	10.03867	3.758159	5.627876	44.50893
9	0.195618	6.271463	9.982386	20.00043	10.67995	3.758392	5.553603	43.75378
10	0.208115	6.473041	10.15018	19.74669	11.08869	3.830407	5.509768	43.20123

B. PRIVATE INVESTMENT MODEL

Table A.8: Variance Decomposition of LPINV

Period	S.E.	LEDTGDP	LGINV	LIMTGDP	LPINV	LRGDP
1	0.401918	10.30037	7.293022	22.80432	59.60229	0.000000
2	0.536530	16.03605	5.833045	27.94769	47.54578	2.637432
3	0.654149	17.52322	5.464006	27.69792	46.77976	2.535106
4	0.753339	17.39235	5.695229	26.77501	47.69812	2.439288
5	0.838589	17.45682	6.489544	26.23384	47.38661	2.433193
6	0.914006	17.39791	6.960638	25.96122	47.10541	2.574815
7	0.979963	17.30370	7.255290	25.78492	46.86474	2.791346
8	1.037807	17.23541	7.392359	25.66876	46.66699	3.036475
9	1.088643	17.17898	7.408681	25.59391	46.50677	3.311657
10	1.133309	17.12174	7.384449	25.55674	46.34871	3.588356

Table A.9: Variance Decomposition of LRGDP

Period	S.E.	LEDTGDP	LGINV	LIMTGDP	LPINV	LRGDP
1	0.401918	0.483211	11.68869	2.432460	0.633009	84.76263
2	0.536530	2.357895	13.16483	1.829321	3.889967	78.75799
3	0.654149	1.743359	14.40211	6.724183	2.802044	74.32831
4	0.753339	1.439718	18.36479	11.01908	2.062122	67.11429
5	0.838589	1.221579	21.18487	15.46859	1.767892	60.35706
6	0.914006	1.033393	23.24647	19.46633	1.628033	54.62577
7	0.979963	0.914034	24.90229	22.48438	1.623226	50.07606
8	1.037807	0.858020	26.16291	24.72434	1.720823	46.53391
9	1.088643	0.853380	27.14037	26.37140	1.850915	43.78393
10	1.133309	0.901182	27.94888	27.53800	1.985003	41.62693

Table A.10: Variance Decomposition of LED

Period	S.E.	LEDTGDP	LGINV	LIMTGDP	LPINV	LRGDP
1	0.401918	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.536530	97.83780	0.356044	1.153689	0.631088	0.021381
3	0.654149	94.74426	2.619141	1.887483	0.692374	0.056741
4	0.753339	91.99733	5.023489	2.200946	0.732879	0.045360
5	0.838589	89.25370	7.671660	2.241312	0.794839	0.038493
6	0.914006	86.68496	10.29745	2.176895	0.808279	0.032417
7	0.979963	84.43836	12.67394	2.064399	0.792612	0.030686
8	1.037807	82.49991	14.75286	1.947388	0.764057	0.035789
9	1.088643	80.86198	16.51660	1.844320	0.728846	0.048253
10	1.133309	79.50500	17.97243	1.761087	0.693035	0.068447

Table A.11: Variance Decomposition of LGINV

Period	S.E.	LEDTGDP	LGINV	LIMTGDP	LPINV	LRGDP
1	0.401918	0.580051	99.41995	0.000000	0.000000	0.000000
2	0.536530	0.708505	96.18844	0.436418	2.665301	0.001333
3	0.654149	0.672690	94.71300	1.283610	2.968493	0.362206
4	0.753339	0.640351	94.09547	1.682497	3.154052	0.427628
5	0.838589	0.618142	93.51012	1.826927	3.509129	0.535677
6	0.914006	0.608946	93.13706	1.887132	3.730410	0.636455
7	0.979963	0.614018	92.93086	1.885634	3.856271	0.713218
8	1.037807	0.638986	92.77862	1.879723	3.929761	0.772910
9	1.088643	0.679956	92.64648	1.891460	3.959709	0.822399
10	1.133309	0.733853	92.51361	1.924270	3.965681	0.862589

DECLARATION

I, the undersigned, declare that this thesis is my original work and has never been presented in any other university. All sources of materials used for this thesis have been duly acknowledged. The examiners' comments have been dully incorporated.

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