DYNAMIC EFFECTS OF EXTERNAL DEBT ACCUMULATION ON PUBLIC CAPITAL FORMATION AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM NIGERIA

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ABSTRACT

This thesis investigates empirically the dynamic effects of external debt accumulation on public capital formation, and economic growth in Nigeria annually over the period 1970–2013. The study deploys three equations for debt, investment and growth, respectively, and is augmented with debt and policy variables to analyse external debt issues in Nigeria. Following the confirmation of the order of integration, the analysis is based on Johansen multivariate cointegration approach and Vector Error Correction Model (VECM). Two dummies are incorporated in both cointegration test and short run analysis to account for exchange rate devaluation after the 1986 economic reform and the 2005 debt relief. External debt composite index was constructed by the principal component method (PCM) to capture the overall effect of external debt on economic growth. The results from the debt equation suggest that oil price, domestic savings and fiscal deficits are significantly correlated with external debt. In addition, the dummy variables for exchange rate and debt relief incorporated to capture the government reform policy and the effects of debt relief are also significant. Therefore, all the variables contribute to external borrowing in Nigeria. The results from the investment equation reveal that the external debt, debt service payment, foreign direct investment and dummy for real exchange rate affect public investment negatively. Only dummy for debt relief influences public investment positively. In the growth equation, a significant and negative effect of external debt composite index, domestic credit and dummy for real exchange rate on growth was found while the human capital and dummy for debt relief showed a positive effect on growth. In spite of the fact that Nigeria had the least external debt ratios from 2006 onwards compared to the past decades when its debt ratios reached unsustainable levels, it has still affected investment and growth negatively. The results of this thesis are consistent with the economic theories that argue that external loans retard investment and economic growth in the developing countries.

Furthermore, the results also confirm that Nigeria is on the verge of returning to debt overhang status. Hence, appropriate measures have to be put in place to avoid future debt distress. This important finding that external debt has a negative impact on investment and growth suggests that relying on external debt to enhance economic growth is not a good policy. Hence, Nigeria should focus on its productive sectors, particularly the non-oil sectors that have been neglected, which could augment domestic resources through export earnings so that over dependence on oil and external loans can be reduced.

ABSTRAK

Tesis ini mengkaji secara empirik kesan dinamik pengumpulan hutang luar negeri keatas pembentukan modal awam, dan pertumbuhan ekonomi tahunan Nigeria sepanjang tempoh 1970-2013. Kajian ini menggunakan tiga persamaan untuk hutang, pelaburan dan pertumbuhan, masing-masing dan ditambah dengan pembolehubah hutang dan dasar untuk menganalisis isu-isu hutang luar negeri Nigeria. Berikutan pengesahan perintah integrasi, analisis adalah berdasarkan Johansen kointegrasi multivariat pendekatan dan Vector Error Correction Model (VECM). Dua dummi diperkenalkan di kedua-dua ujian kointegrasi dan analisis jangka pendek untuk mengambil kira penurunan nilai kadar pertukaran selepas 1986 pembaharuan ekonomi dan pelepasan hutang tahun 2005. Indeks hutang komposit Luar telah dibina dengan kaedah yang utama komponen (PCM) selepas itu untuk menangkap kesan keseluruhan hutang luar negeri kepada pertumbuhan ekonomi. Keputusan daripada persamaan hutang mencadangkan bahawa harga minyak, simpanan domestik dan defisit fiskal mempunyai hubungan yang signifikan dengan hutang luar negeri. Di samping itu, pemboleh ubah dummi untuk kadar pertukaran dan pelepasan hutang diperbadankan untuk menangkap dasar pembaharuan kerajaan dan kesan pelepasan hutang juga adalah penting. Semua pembolehubah menyumbang kepada pinjaman luar di Nigeria. Keputusan daripada persamaan pelaburan mendedahkan bahawa hutang luar negeri, bayaran khidmat hutang, pelaburan langsung asing dan dummy untuk kadar pertukaran sebenar menjejaskan pelaburan awam negatif. Hanya dummy untuk pengaruh pelepasan hutang pelaburan awam positif. Dalam persamaan pertumbuhan, kesan yang ketara dan negatif luaran indeks hutang komposit, kredit domestik dan dummy untuk kadar pertukaran sebenar kepada pertumbuhan ditemui manakala modal insan dan dummy untuk pelepasan hutang menunjukkan kesan positif kepada pertumbuhan. Walaupun fakta bahawa Nigerias mempunyai nisbah hutang luar kurangnya dari 2006 berbanding

beberapa dekad yang lalu apabila nisbah hutang mencapai tahap yang tidak mampan, masih menjejaskan pelaburan dan pertumbuhan negatif. Ini boleh menggalakkan keupayaan untuk mencapai pertumbuhan jangka panjangnya. Hasil tesis ini adalah selaras dengan teori-teori ekonomi yang berpendapat bahawa pinjaman luar melambatkan pelaburan dan pertumbuhan ekonomi di negara-negara membangun. Tambahan pula, keputusan juga mengesahkan bahawa Nigeria adalah pada kelompok kembali ke terjual hutang. Tetapi langkah yang sesuai perlu diambil untuk mengelakkan kesusahan hutang masa depan. Penemuan penting bahawa hutang luar negeri mempunyai kesan negatif ke atas pelaburan dan pertumbuhan menunjukkan bahawa pergantungan kepada hutang luar negeri untuk meningkatkan pertumbuhan ekonomi bukanlah satu dasar yang baik. Oleh itu, Nigeria perlu memberi fokus kepada sektor produktif, terutamanya sektor bukan minyak yang telah diabaikan, yang boleh menambah sumber dalam negeri melalui pendapatan eksport supaya tidak terlalu bergantung kepada pinjaman minyak dan luaran boleh dikurangkan.

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DEDICATION

To My Beloved Father

Alhaji Muhammad Adamu

And

To My Loving Mother

Hajiya Amina Usman

For their Boundless Prayers, Encouragement and Support.

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LIST OF ABBREVIATIONS

edy : External debt to GDP

olp : Oil price

dsx : Debt service to export

edx : External debt to export

gds : Gross domestic savings to GDP

def : Government fiscal deficit to GDP

ing : Public investment to GDP

ry : Real GDP

fdy : Foreign direct investment to GDP

dcy : Domestic credit to the private sector to GDP

eci : External debt composite index

DED-86 : Dummy exchange rate devaluation, 1986

DDR-05 : Dummy debt relief, 2005

KMO : Kaise-Mayer –Olkin

BTS : Bartletts Test of Sphericity

PCA : Principal Component Analysis

ADF : Augmented Dickey Fuller

PP : Phillips Perron

CUSUM : Cumulative sum

CUSUMSQ : Cumulative sum of squares

CHAPTER 1: GENERAL OVERVIEW

1.1 Background and Motivation of the Study

External borrowing has become one of the major resources for developing countries to cover deficits between national savings and domestic investment[1] so as to stimulate economic growth (Nurkse, 1963; Mckinnon, 1964; Mwaba, 2002). Besides external debt financing, many developing countries have benefited from other forms of foreign resources such as foreign aid, foreign investment, and gains from international trade (Lucas, 1990; Rasiah, 1995; Madsen, 2009; Juselius *et al*., 2011). This would increase the marginal product of capital in the productive sectors in developing countries and encourage new investment commitment until the capital-labour ratio, wages and capital are equalised, simultaneously (Kant, 1996). In a similar perspective, Todaro and Smith (1997) and Rioja (2003) pointed out that increasing external debt had been a common feature of developing countries at the initial phase of development, as it is necessary to engage external resources in financing the country's economic activity. The financial intermediation between the debtor countries and the export credit institutions such as the International Monetary Fund (IMF), World Bank and the African Development Bank (ADB), have improved the transfer of resources and is an efficient allocation for future economic growth. The most important role of external debt is that debtor nations can benefit from a higher economic return over the contracted cost of loans. These economic returns can be translated into financial returns that can also be used to boost domestic investment targeted at stimulating sustainable growth and development in the long run (Agenor, 2000). However, debt crisis arises when external debt servicing obligations increased beyond the country's income earning capacity (i.e. debt grows

[1] Schmidt-Hebbel *et al.*, (1994) argue that saving-investment relation plays a significant role in two ways: (i) are regarded as the basic key between saving-growth positive relations, and (ii) the accumulation of capital for domestic investment remain the wheel for accelerating economic growth. Therefore, saving-investment relation is important in evaluating the rate of economic growth particularly in countries with saving opportunity. Thus, an increase in saving means increase investment (I=S), and so does to growth (Devlin, 2010: p.129).

faster than output) causing a debt overhang (Krugman, 1988; Sachs, 1989),[2] which shall have negative implications on growth.

In poor developing countries, the stock of external debt continues to exhibit an increasing trend with no significant promise of providing the basis for economic growth when compared with debt indicators.[3] The odious debt has led to the 1982 debt crisis, in which developing countries, especially the Severely Indebted Poor Countries (SIPC's) such as Mexico, Brazil, Argentina and Venezuela, to mention a few, have witnessed a sudden decline in investments and output growth, which eventually made debt service difficult (Todaro and Smith, 1997). A vast body of studies relating high accumulated external debt to the reduction in investment and output growth in developing economies exists (see, for example, Pattillo *et al.,* 2003; Sen *et al*., 2007; Panizza, 2008). The unprecedented high external debt has turned into a factor driving poverty and income inequality, particularly in highly indebted poor countries such as Ethiopia, Niger, Bolivia, and Nicaragua (Loko *et al*., 2003).

Despite numerous efforts by the governments of developing countries to curtail the unprecedented expansion in external debt from a level of US$626 billion during the early period of the debt crisis in 1980 (see Table 1.1), the external debt stock increased to US$975 billion and US$1,965 billion in 1990 and 2000. By 2015, the external debt stood at US$2,338 billion, indicating high debt stock, which is detrimental to future growth and development of developing countries. In Sub-Saharan Africa,[4] the situation is worse judging by the debt indicators shown in Table 1.1. The size of Sub-Saharan

[2] Krugman (1988:225) defined debt overhang as condition when "*a country has a debt overhang problem when the expected present value of potential future resource transfers is less than its debt".*

[3] Debt indicators include those indices used to measure debt severity in an economy. For example, debt to GNI and debt to export ratio.

[4] During this period, there was an increase in commodity export prices higher than the international interest lending rate on loans. However, with a faster growth of export earnings, indebted countries can borrow and repay interest and principal amount at the same time benefitting from lower debt to export ratio (see Sachs, 1990, p.8).

Africa's external debt grew alarmingly from US$84 billion in 1980 to US$233 billion in 1995. It declined to US$222 billion in 2000 but rose again to US$229 in 2005.

Table 1.1: External Debt, Developing Countries and Sub-Saharan Africa (1980-2013).

Region	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**
Developing countries:						
External Debt ($bn)	626	686	975	1,237	1,965	2,338
Debt (% of GNI)	33	33	35	36	37	27
Debt service (% of export)	27	20	22	18	21	14
Sub-Saharan Africa:						
External Debt ($bn)	84	96	190	233	222	229
Debt (% of GNI)	30	55	71	74	63	18
Debt service (% of export)	22	21	24	19	12	14

Source: World Bank (2013); UNCTAD (2013).

The external debt of most of the developing countries has become a kind of inheritance that passed from generation to generation to provide a negative knock-on drag on these economies. Krueger (1987), Fosu (1996), Verdier (2008), and Dritsaki (2013) pointed out that the unprecedented debt burden had forced these regions to divert their domestic resources into debt service payment rather than investing in basic infrastructure development to ease the countries' growth processes. Also, these economies have encountered serious savings constraints and the fiscal gap in meeting their debt obligations. The majority have resorted to foreign borrowing to meet the debt service payments. The shock caused by the high debt accumulation has discouraged foreign investors from making new investment commitments because of the negative implication of future tax policies to meet their debt service obligations. Moreover, the economic rescue packages proposed by creditor countries to debtor nations are not implemented to match with developing countries aspirations. Rather, the overriding aim of such loans is to yield profitable returns to the creditors (Fosu, 1996; Greenidge *et al*., 2010; Forslund *et al.,* 2011).

1.1.1 Brief Overview of the Nigerian Economy

Nigeria is the most populated country in Africa. It declared independence in 1960 from British colonial rule and became a full republic in 1963. In the period from 1960 to 1970, agriculture was the main contributor to the Nigerian economy, contributing about 65-70% of total exports and about 3.2% of GDP growth annually. The development of the oil and gas sector from the late 1960s to 1970s made a historical shift from the agrarian economy to oil and gas based economy. During the oil boom era, from 1970 to 1978, the contribution of agriculture declined to about 40%, while oil exports dominated the nation's exports accounting for 87%, and aggregate income increased by 6.2% yearly. Nonetheless, the 1970s and 1980s' global oil glut, which resulted in the collapse in the oil prices coupled with the 1982 debt crisis had a negative implication on GDP growth rates (Fasipe, 1990). The 1988 and 2000 period marked economic reforms - structural adjustment and economic liberalisation, in which growth responded to economic reforms and increased at about 4-6% annually.

By 2006, the overall GDP growth approximated 7%. The non-oil sector's contribution averaged 8.6% from 2006 to 2013. Several macroeconomic indicators improved over the period. Human development indices have also been impressive. The rate of unemployment was recorded at 24% in 2011 compared to 21% in 2010. Youth unemployment was recorded at 38%, which positioned Nigeria among the severe youth unemployment incidence in Sub-Saharan African countries (CBN, 2013). With regard to inequality and poverty levels, the trends remained considerably high. According to the National Bureau of Statistics (2011), the Harmonised Nigerian Living Standard Survey (HNLSS) 2010 recorded a poverty incidence rate of 63% from a population of 170 million. This indicates that over 100 million of the total population are living in absolute poverty (surviving on less than US1 Dollar per day), and deprived of basic

human needs such as health, water, education and shelter (absolute poverty). The situation has matched with the responses of the macroeconomic policies being pursued over the years, which placed a significant challenge on the economy and reduced output growth and welfare. However, there was an improvement as the economy remained optimistic, particularly on the rate of growth, that was estimated at approximately 7% in 2013. Exchange rate, inflation and other economic indicators are expected to be consistent while the non-oil sector's growth remains strong. The positive economic outlook is predicated on sustained and effective macroeconomic policies, in addition to reform in government and other private institutions. This is important in overcoming problems inherent in the major human development indicators going forward.

1.1.2 Genesis and Development of Nigeria's External Debt

The problem of external borrowing cannot be limited to particular regions, as there are numerous countries facing an external debt crisis. Like other developing countries, Nigeria relies substantially on external loans for its developmental projects. The genesis of the external debt started in 1958 when the country contracted the first external loan of US$28 million for railway construction. During these periods, Nigeria had little external debt from foreign lenders (Adamu, 2012). The sign of external debt problems emerged in the late 1970s, which stemmed from the policies pursued during the first oil boom of the fiscal year 1973/1974, which had caused a severe shock to the oil price. Subsequent governments have put much priority on infrastructure development projects targeted at reforming import-substituting industries. Investment in development projects was financed from foreign exchange earnings, particularly from oil revenue, few internal finances, and modest foreign debt, mainly from bilateral and multilateral international financial institutions. The exchange rate was stable to accommodate the inflationary pressures. After a period, there was considerable appreciation in exchange rate

following the pressures on demand for nontradable goods. The exchange rate appreciation was a partial public investment for the projects that require a considerable amount of capital and depends on foreign input. On the other hand, the non-oil sectors, especially manufacturing and agriculture, suffered as the gain declined following poor competitiveness in the world market. Nevertheless, the economy has for a long period been characterised by a high degree of openness, with its major sectors depending on foreign resources for a broad range of consumption and investment goods (Nwoke, 1990).

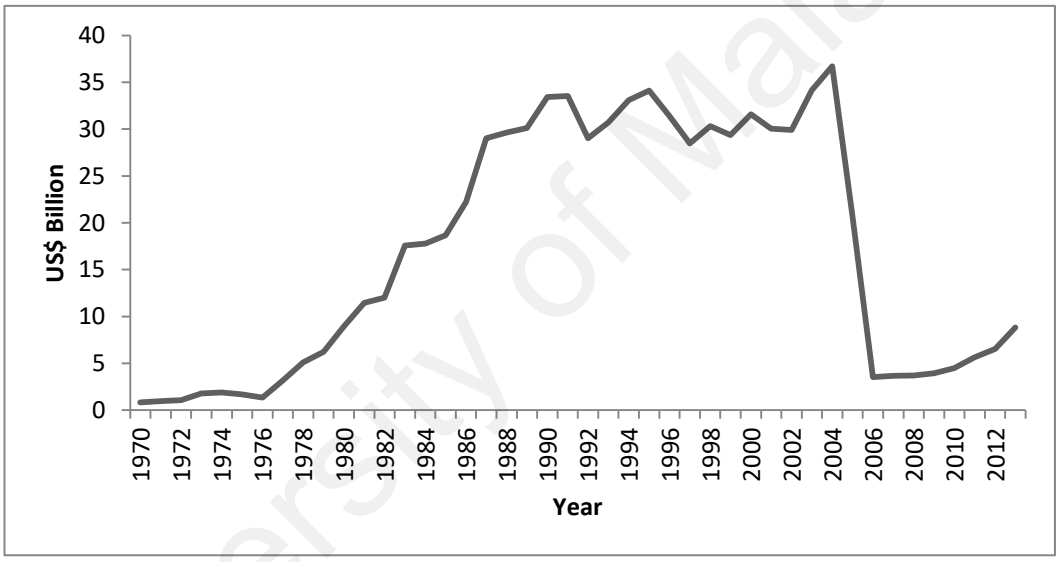
Figure 1.1 shows the trend in external debt from 1970 to 2013. For instance, the external debt was not volatile and contracted at concessional interest rates from bilateral and multilateral sources with long periods of repayment, which stood at US$0.8 billion. By 1978, owing to the global oil glut, which overstretched the government finances, it became inevitable to borrow to fill the declining oil revenues. This paved the way to Decree 30 of 1978, which permitted the government to borrow under the circumstances. In 1978, Nigeria contracted the first US$1 billion loan called "Jumbo loan" from the international export credit institutions. By 1980, the outstanding external debt had reached US$8.9 billion. Despite rescheduling in 1986, the principal amount and interest continued to mount, which further worsened the debt problem reaching a high of US$33.4 billion in 1990. Much increase in the debt stock during the latter period was attributed to the state of the economy as there was a depreciation of the Naira and collapse in the world commodity prices (especially oil). In addition, a sharp increase in the international interest lending rate and poor macroeconomic policy contributed to Nigeria's incapacity to meet the debt service obligations. These placed enormous pressure on the country's foreign exchange and constrained the import of other inputs

and capital goods for enhancing domestic production and eventually hampered investment and depressed economic growth (Ajayi, 1991; Ojo,1994).

However, the external debt stock stabilised to US$30 billion in 2000 due to the embargo imposed on new loans. The external debt further worsened reaching high to US$36.6 billion as at 2004. Several factors contributed to the sharp rise of Nigeria's external debt. Among the notable macroeconomic variables include the rapidly increased in government spending, especially on developing infrastructure, external loans from export credit institutions at non-concessional interest rates, the collapse in the oil prices and greater reliance on imports. These factors contributed to the increasing trade arrears (Iyoha, 1999). This development led to the debt service payments and worsened the debt stock. Moreover, a rise in the rate of interest affects the size and magnitude of the debt stock. This situation, no doubt, led to the country's frustration in meeting the debt service obligations that resulted in clamour in certain quarters for unilateral action against the creditor nations. However, the question remains as to whether Nigeria was qualified for debt relief? In a statement by Nigeria's Finance Minister on Nigeria's quest for external debt cancellation, Ngozi. O. Iweala claimed that "Nigeria deserves debt cancellation because Nigeria is a poor country contrary to what people think it has oil. Certainly, Nigeria has oil, but the revenues earned are spent on the sizeable population close to 180 million" (DMO, 2013).

Other arguments put forward include the government's anti-corruption crusade, as well as the transparency initiative. Also, the transition to democratic rule and its leadership role in restoring peace in SSA. Against this backdrop, on June 29, 2005, the Paris Club of creditors granted Nigeria a debt forgiveness or relief under the Highly Indebted Poor Countries (HIPC's) and Multilateral Debt Relief Initiatives (MDRI) (see Adamu, 2016).

The terms of the agreement were a payment of arrears amounting to US$6 billion based on the US$30 billion of the Paris Club debt, and a stock reduction in Naples terms and buyback of the reminder for an automatic way out from the Paris Club creditors (DMO, 2013). Consequently, Nigeria benefited from a debt write-off of US$18 billion. This considerably reduced the external debt from US$36.6 billion in 2004 to US$3.7 billion by 2006 as reported in Figure 1.1. Recently, there have been concerns about the rapid increase of external debt and its implications for the future growth and development, as the government resumes further borrowing reaching to about US$8.8 billion in 201



Source: World Bank, (2013), Debt Management Office (2013).

Figure 1.1: Trends in Total External Debt Stocks in constant 1995 in USD (1970-2013)

Table 1.2 shows the external debt as a percentage of GNI was very low in the early 1970s, from 7% to 15% between 1970 to 1980, and increased sharply to 120% in 1990 before dropping to 78.6% in 2000 and later reducing drastically to 21% in 2005. The external debt service to export was 56% in the 1970s rose to 227% by 1990 and declined steadily to about 9% in 2010, and later increased to 36% by 2005. The decline in the debt ratios was due to the debt relief earlier discussed.

The annual GDP per capita and real GDP growth in the early 1970s were growing at the rate of 22.2% and 25%. The increase could be due to huge foreign earnings mainly from oil and gas related export revenues, which coincided with the oil boom of the fiscal year 1973/1974. The decline in the oil price from the late 1970s constituted an adverse impact on Nigeria's economic growth, which remained weak as the proceeds from the oil revenue fell drastically following the collapse in the oil prices in the world market jointly with the 1982 debt crisis. This lowered the per capita GDP and real GDP growth to less than 10% (World Bank, 2013). Furthermore, public investment deteriorated, for example, from 22.9% in 1970, it dropped to 11.3% in 1985 and grew steadily, except for 1990 that recorded 16.8%, respectively (WMR, 2013).

Table 1.2: Nigeria's External Debt and Economic Indicators, 1970-2013.

Indicator	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**
External Debt ($bn)	0.8	10.5	8.9	12.2	33.4	31.5	30.1	20.5
Debt (% of GNI)	7	6.2	15	68.1	120	131.7	78.5	21
Debt service (%)	56	7.2	32.1	138	227	274	149	35
Oil price	1.2	10.4	35.4	27	22.3	16.9	27.6	50.6
Invest. (% of GDP)	22.9	32.5	27.4	11.3	16.8	7	7.2	8.1
GDP per capita (%)	22.2	-7.8	1.3	5.6	9.9	-2.8	2.7	0.8
Real GDP growth	25	-5.2	4.2	9.7	8.2	2.5	5.4	7

Source: Debt Management Office, Nigeria (2013); OPEC (2013) and World Macroeconomic Research (2013).

As mentioned earlier, after the Nigeria-Paris club creditor's agreement in 2006, which resulted in a US$18 billion debt relief, the outstanding external debt stock remained at US$3.6 billion in 2006 and eventually rose to US$8.8 billion as at 2013 (see Figure 1.1). Table 1.3 presents the composition of Nigeria's external debt by creditors. The breakdown indicates that out of the current total debt stock of US$8.8 billion, US$6,275.20 million, representing 71.2% was borrowed from multilateral creditors. This was followed by debt owed to commercial creditors, representing 17.24%, while bilateral debt accounted for only US$1,025.70 million representing 11.63%, respectively.

Based on country policy and institutional assessment of debt sustainability analysis (DSA) for low-income countries published by the World Bank and the IMF, Nigeria is at a low risk of the external debt trap. Nigeria's outlook and her relation with global economies remain attractive since all the debt indicators remain within the country's specific threshold level with its debt to GDP of 2.6% much less than 40%, debt to export of 14% compared to 150%, and debt service to export of 0.4% against the 20% as shown in Table 1.4 (IMF, 2013). However, Nigeria should note that if appropriate policy and control measures are not put in place, particularly with regard to prolonged oil shock or worsening current account balance, it will reverse the recent achievements.

Table 1.3: Nigeria's External Debt Stock by Creditors, (US$ million) December, 2013.

Category	**Balance outstanding**	**Percentage**
MULTILATERAL		
World Bank Group		
IDA	5,329.50	
IFAD	92.20	
African Development Bank Group		
ADB	161.10	
ADF	571.40	
ABEDA	3.30	
ADF	103.20	
IDB	14.50	
Sub-total	**6,275.20**	**71.13**
BILATERAL		
EXIM Bank China	966.70	
AFD	59.00	
Sub-total	**1,025.70**	**11.63**
COMMERCIAL		
ZTE	11.80	
CMEC	9.20	
EUROBONDS	1,500.00	
Sub-total	**1,521.00**	**17.24**
Grand total	**8,821.90**	**100.00**

Source: Debt Management Office, Nigeria (2013).

Table 1.4: Nigeria's External Debt Sustainability Indicators, 2013

Debt Indicator (s)	Threshold	Current ratio
Solvency indicators:		
External debt to GDP	40	2.6
External debt to export	150	14
External debt to revenue	250	-
Liquidity indicators:		
External debt service to export	20	0.4
External debt service to revenue	20	-

Source: IMF (2013) and World Bank (2013)

Based on the discussion above, external debt issues in developing countries, in particular, Nigeria, require further in-depth analysis by considering the recent changes in the debt stock and its implications on the economy. Prior to debt relief in 2006, the debt had accumulated from US$.08 billion in 1970 to US$36.6 billion in 2004 (refer to Table 1.2 and Figure 1.1). This indicates that a huge transfer of domestic resources for debt service which could have been invested in productive sectors of the economy. As such, this had undermined investment and adjustment programs aimed at accelerating growth and development processes.

In any case, countries can only experience economic growth when they sustain the debt obligations through efficient debt management of debt stock and maintain domestic investment while on the contrary, debt may have an adverse effect on the country, especially on the welfare of the citizens. This sheds light on the external debt scenario in indebted poor countries like Nigeria within the period under study. The discussion covers developing countries, and Nigeria as the prime target of the study, where the external debt issues attracted the researcher's attention. The subsequent section will present a concise statement of the identified issues that motivated the study.

1.2 Problem Statement

Resource boom and its impact in raising the relative prices of non-tradeable to tradeable goods dominate a central role in explaining the genesis of Nigeria's external debt and poor economic performance (Sala-i-Martin and Subramanian, 2003). Nigeria had witnessed two resource export booms in the last five decades. The first was the agricultural export boom which pre-dated the country's independence and lasted until 1962.[5] The second was the two oil boom orchestrated by the OPEC, which dated between 1973-1974 and 1979-1980, which resulted in a substantial oil windfall for Nigeria and increased government spending considerably, particularly on capital projects and consumption expenditure in anticipation of increasing export revenue earnings. Similarly, Nigeria enjoyed the credit ratings in the international capital market as oil serves as collateral for external loans with zero anticipation for default. The oil boom led to the real exchange rate appreciation, in addition to dependence on the oil and gas (booming) sector at the expense of the non-oil (lagging) sector and the disproportionate development of the non-traded sector. The collapse in the oil price jointly with sudden increase in the international interest lending rates beginning from 1980 triggered macroeconomic problems of different magnitude such as dwindling revenue and domestic absorption surpassing the national income, increased fiscal deficit, higher import bills, and unfavourable terms of trade among others (Iyoha, 1999; Adamu, 2012). This necessitated government borrowing in an attempt to bridge the domestic financing gap.

[5] The agricultural boom cover thes 1950 to 1962 period when Nigeria was agriculturally self-sufficient in food production and remained the major source of foreign earnings. After the discovery of oil until the early 1970s, agriculture was neglected, and oil remained the dominant exchange commodity for the Nigerias economy.

The devastating effects of the accumulated debt and its associated causes had manifested in large-scale unemployment, capacity under-utilisation, consumption expenditure, growing interest payments on foreign debt, reduction in capital stock and a general fall in the living standards, which eventually exerted a negative effect on output growth. For instance, the GDP growth rate averaged 25% between 1970 and 1985, it averaged 2.2% between 1991 and 1997 and increased slightly to 2.3% between 1998 and 2002. It later increased the average from 2001 to 2013 to 5.9%respectively (CBN, 2013). The rate of investment dropped from 23% in 1970 through to 16.8% in 1990 and 8.1% in 2005. Later rose to 17.3% in 2010 before declining to 14.2% as of December 2013 respectively (see, Figure 1.2). The inherent problem in the structure of the Nigerian economy is indicated in the high reliance on imports for productive activities, and in the face of declining foreign exchange earnings and unfavourable trade. The debt service obligations are a claim on national income, savings and export income. Deterioration in external debt could worsen the debt service obligations, the situation could affect income and hamper long-run output growth.

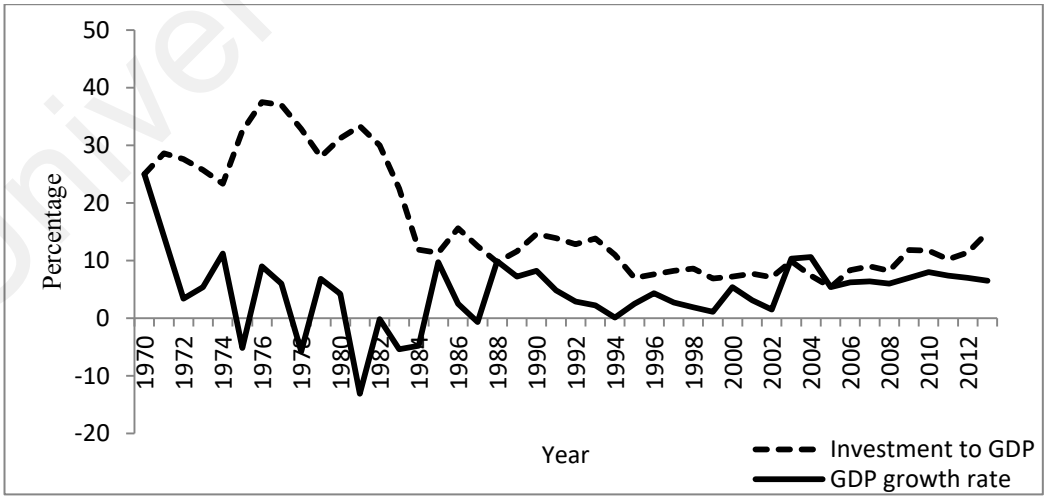


Figure. 1.2: Trend in Public Investments and GDP Growth Rate, 1970-2013.

The earnest attention to restoring the creditworthiness of the country, amidst declining foreign earnings and capital inflow, compelled Nigeria to introduce the Structural Adjustment Program (SAP) in 1986. The measures were adopted to overcome the continued increase of Nigeria's external debt consists of restrictions on fresh loans, directives to all tiers of governments to put embargoes on new loans, debt restructuring and concessional refinancing, etc. Experience has proved that these measures have failed and do not offer lasting solutions. Regardless of rescheduling, from 2001 to 2004, Nigeria's total debt service payments was very high, and they found it difficult to repay. Of the numerous rescheduling, there was increasing external debt due to interest payments and arrears, which led to high debt ratios. Thus, the nation's outstanding debt burden is not sustainable. A large percentage of the debt stock not eligible for rescheduling is rising fast, and the rescheduled debt will still require high debt repayment. This is a burden for Nigeria to meet the target for achieving the Millennium Development Goals (MDG) by the year 2020.

As stated earlier, the debt relief granted to Nigeria meant that more resources would be available, hence ability to increase savings and investment and to service the outstanding balance and sustain the debt ratios at the lowest level. This was not the case, and economic and social conditions continue to be an issue of concern. The country's human development index (HDI) and other development indices remained very low, and some indicators are static. For example, evidence indicates poor infrastructure development to support the growth and development process. Hence, life expectancy is very low, and less than 50% of the population have access to education and health facilities. Also, over 60% are living on less than one dollar per day indicating that the debt relief did not add value to the nation's development indices, as if whether such debt overhang still exists (UNDP, 2013). These assertions indicate that there are challenges

ahead of Nigeria on the impossibility of meeting the Sustainable Development Goals (SDGs) as agreed by the world leaders by the year 2030.

Having outlined the problem above, this study is inspired by the fact that a plethora of empirical studies have established the relationship between external debt and economic growth at a cross country and single country level, although the problem of external debt and its long-term implications on the Nigerian economy has not been addressed adequately in the previous literature. Therefore, it requires a broader understanding to form a proper policy guide for economic management.

1.3 Research Questions

The following three research questions are drawn from the statement of the problem outlined in this chapter (see section 1.2). This thesis intends to answer three key research questions in the field of international economics, more specifically on external debt issues in Nigeria. The three research questions are:

1) Does the oil price determine the behaviour of external debt in an oil-rich country Nigeria?
2) Does the external debt matter in financing public capital formation in Nigeria?
3) To what extent does the external debt affect economic growth in Nigeria?

1.4 Research Objectives

The main objective of this study is to examine the important issues concerning the effects of external debt on the economic growth of Nigeria. Thus, the following specific objectives were pursued.

1) To examine empirically the impact of the oil price in determining the behaviour of external debt in an oil-rich country Nigeria.

2) To examine empirically the impact of external debt on financing public capital formation in Nigeria.
3) To examine empirically the impact of external debt on the Nigeria economic performance.

1.5 Significance of the Study

This study provides an in-depth analysis of the factors governing the determination of the growing external debt and its impact on the Nigerian macroeconomic variables. Therefore, this study is intended to be significant in the following:

1) A guide for policy implementation to the government towards engaging both oil revenues and borrowed funds in the real sectors of the economy, especially in agriculture and manufacturing. Doing this would help the country in two-way. First, it will revive the lagging sectors and increase export performance, which can also increase foreign earnings after revenue from oil. Second, it will reduce high dependence on oil export and foreign borrowing.

2) A contribution to policy formulation towards appropriate external debt management through long-term investment in economically viable projects that would otherwise be embraced by both public and the private sector aim at strengthening the county's efforts in promoting growth. Besides, it would serve as a strategy for the government to keep negotiating with the export credit agencies, particularly the World Bank and the International Monetary Fund (IMF) for debt rescheduling or forgiveness focused on solving structural imbalances in the country, and the use of prudent fiscal policies that would establish fiscal discipline in government to curtail unnecessary expenditures, which have been the major factor behind external borrowing.

3) The study is expected to add value significantly to the existing body of literature, particularly on external debt and public capital investment relations, which are relatively short in the literature.

4) The findings from the study will provide a lesson and be of policy interest to other oil exporting countries and other developing countries with related fundamental problems.

1.6 Scope of the Study

This study is concerned with external debt related issues and their impacts on the Nigerian economy. It does not investigate domestic debt. The study employs annual time series spanning from 1970-2013. The years 2014 and 2015 are deliberately avoided as some data for the period at the time of undertaking the research were not available. Also, quarterly data of the candidate variables are hard to come by. Therefore, the study makes maximum use of the available data at hand.

1.7 Organisation of the Study

The thesis consists of seven chapters, including three analytical chapters representing the three research questions (chapters 4, 5, and 6) each with two unrestricted models to examine the issues of external debt and its contribution to the Nigerian economy. Chapter 2 presents a thorough review of the theoretical and empirical literature on the single country as well as multi-country case studies in an attempt to identify the research gap and provide a novel contribution to the frontier of knowledge. Chapter 3 is devoted to the methodology, which delineates the conceptual framework of the study, empirical models, data and construction of variables and the time series estimation techniques in an attempt to provide robust empirical results.

Chapter 4 reports the empirical results and discussion of the research question 1, which investigate the factors governing the behaviour or determination of external debt in Nigeria while chapter 5 documents the empirical results of the research question 2, which explores the effect of external debt financing on public investment. Chapter 6 provides a standard growth equation, which examines empirically the dynamic effects of external debt on growth as research question 3. Finally, chapter 7 provides a synthesis of the thesis as a whole by providing a summary, contribution of the study, policy implications, limitations of the study, and suggestions for further study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

For a broad understanding of the three testable objectives outlined in the previous chapter, this chapter reviews a bulk of related theoretical underpinnings within the scope of the study. The complexity of the issues of external debt and its implications on the public capital formation and economic growth of developing countries is cumbersome to analyse via a single theory. Nevertheless, economists have proposed various theories and models to justify the motives as well as contributions, and the adverse effects of external borrowing as part of alternative sources for augmenting public expenditure in order to increase output growth. Theoretically, there are divergent views among scholars in the field of international economics. This chapter presents a thorough review of the theoretical considerations that are appropriate to explain the issues of external debt in Nigeria.

In the review of the literature, the study systematically analyses empirical studies with the aim of identifying the potential research gaps to be filled and building a set of novel contributions of knowledge in the field of open economy macroeconomics, particularly concerning issues of external debt in Nigeria. Following the evaluation of the underlying theories to provide a set of rationales for a country's demand for foreign borrowing – external debts, the study also examines its impact on the public capital formation and economic growth. The review of the empirical literature is twofold. It first consists of single country specific studies, and the second are multi-country studies.[6] In a nutshell, the chapter is structured into three sections with each section review theoretical and empirical literature on a particular objective.

[6] Single country case studies are based on time series data, while on the other hand, multi country case studies comprises of cross section or panel data studies.

2.2 Dutch Disease and Gap Models

This section reviews theoretical and empirical insights of objective one. The theoretical underpinnings include the Dutch disease hypothesis and the gap models in an attempt to justify the motive behind external borrowing in developing countries, particularly resource-rich countries. It also reviews past empirical studies in an attempt to identify and contribute to the missing gaps in the literature.

2.2.1. Dutch Disease Theory

To date, there has been no specific economic theory for analysing the emergence of the resource boom and the accumulation of external debt in resource-rich countries. Ironically, the famous proposition for analysing the occurrence and the implications of a resource boom in the abundant resource countries is the "Dutch Disease hypothesis". It generates a weighty testable hypothesis regarding the interrelationship among resource boom, real exchange rate appreciation, and the overseas borrowing. This coincides with the thought of the famous structuralist economists Presbish (1950) and Singer (1950) who foresaw the worsening terms of trade in countries that are mainly exporters of primary commodities, would have an adverse effect on the countries' performance.

In 1977, 'The Economist' coined the phrase "Dutch disease". It demonstrates the total decline in output of the manufacturing sectors in the Netherlands as a result of the discovery of large deposits of natural gas in 1959. This led to the Dutch guilder booming at a steady rate, turning the Dutch exports of primary commodities (manufacturing and agriculture) to shrink and less competitive in the international market, causing sudden decline in the output of the lagging sectors, while the oil and gas sector due to the influx of foreign exchange earnings pay higher wages.

Furthermore, Corden and Neary (1982) and Corden (1984) advanced an economic hypothesis illustrating the "Dutch Disease". The economic hypothesis features a non-tradeable goods and tradeable goods sectors: the booming sectors (for instance, oil and gas, diamonds, gold) and the lagging sectors considered as manufacturing and agriculture. Corden and Neary (1982) explain further that the resource boom caused the transfer of capital and labour to the booming sector. Eventually, this raises the government expenditure following the resource windfall.[7] Corden and Neary (1982) also pointed out two causes leading to the emergence of Dutch disease and appreciation of real exchange rate in resource-rich economies. First, spending effect resulting from higher income caused by the booming of natural resources such as oil and natural gas and other non-renewable resources. This leads to increased expenditure of government. Higher demand for tradeable and nontradable would result in increased prices and output of the nontradable sector relative to the tradeable sector (real exchange rate appreciation). Consequently, wages increased while income from the lagging sectors declined. Second, resource movements effect occurs when a booming sector draw labour and capital from other non-resource tradable sectors of the economy leading to a decline in production in the nontradeable sector and causing an increase in the price of nontradable relative to the price of tradeable, which are set in the global market. The booming sector that leads to the appreciation of the real exchange rate, particularly in oil rich countries, facilitated higher imports and thereby compelling the governments of these economies into foreign borrowing to bridge the widening financing gap. Thus, the policy response to the appreciation of the real exchange rate cannot address the fundamental problems facing the economies. The appropriate economic policy should have been a reduction in government expenditures, a nominal devaluation of the currency, and a decrease in real wages to increase competitiveness in the tradable

[7] The increase in income due to higher commodity prices of the booming sector in the 1970s encouraged many of the resource rich economies to use resources as collateral for external borrowing to finance elephant projects and consumption. A decline in the prices in the early 1980s, left these economies with high deficits and external debt burden (Manzano and Rigobon, 2007).

(lagging) sector. The actual adjustment program resulted in the large current account balance and balance of payments deficits, compressed foreign exchange reserves jointly with an increase in the international interest lending rate, these have soared the stock of external debt. The spill-over of these had been external debt build up, which becomes detrimental to investment and growth prospects, especially in oil-rich countries like Venezuela, Nigeria, and Mexico, where increasing current account deficits and balance of payment are high resulting from mismanagement of oil revenues, which turned into a curse rather than a blessing.

Krugman (1987) described the resource boom as a disease in which a resource-abundant country could not revive the lagging sectors following the appreciation of real exchange rate, this lower the competitiveness of the tradable sector goods. Since resource exports have dominated the exports of commodities produced by the lagging sectors. Thus, in the long run, the country is at risk of de-industrialisation, which is a curse to the country since the lagging sectors are characterised by learning by doing.

2.2.2. Theory of Capital Accumulation (Gap Models)

The second theoretical review consists of several influential theories that have explained the factors that lead to a country's import of capital. Among the novel theories are Harrod (1939) and Domar;s (1946) model and the two and three gap model proposed by Mckinnon (1946), Chenery and Bruno (1962), Chenery and Strout (1966), Bacha (1990) and Taylor (1993).

Harrod (1939) and Domar's (1946) model originated from the post-Keynesian perception of public spending and en route the famous structuralist economics that regarded capital as a significant factor in stimulating the growth of output in developing

countries. Meanwhile, the major constraints to long-term growth in developing countries are the savings gap. Because the output growth of is induced by the savings and capital output ratio, yet, low-income countries identified with low investments due to poor savings, and have lower income. To overcome such obstacles, the low-income economies must import capital to augment national savings to boost investment and accelerate country's production capacity (Jones, 2013). If the imported capital is inappropriately used, it would make future investment less effective, and create an additional gap for capital and affect growth negatively. As investment increases at a steady rate, it can enhance aggregate demand for the currently added capacity (Nafziger, 1997). Meanwhile, the premise is that the sum of national income and the supply side can be equal if the capital formation (I_t) at any given time is commensurate with any adjustment in growth (y_t-y_{t-1}) augmented with the capital output ratio (k), for k represents the amount of capital required to produce a unit of output for a specific period. Second, for a self-sufficient economy, the equilibrium can be attained if the plan investment and plan savings are equal (I_t=S_t). Finally, introducing fresh capital at full production capacity instantly.

Domar (1946) pointed out that the rate at which investment increase should be at a constant proportion as $y = \frac{k}{v}$, where V refers to Incremental Capital Output Ratio (ICOR). The rate at which output growth depends on the level of investment (I), at the same time, maintaining the total expenditure and the rate of production proportionately (Harrod, 1939), though, the emphasis has been given on the growth path income. Domar (1946) suggested the increase in investment, thus, $\frac{\Delta yt}{y} = \frac{\Delta kt}{vy} = \frac{I}{vy} - \vartheta$, where $\Delta yt = \frac{\vartheta y}{\vartheta t} i.e$ a proportionate increase in output between the present and the future period, δ is the rate of depreciation, therefore, the current output growth depends on the

best value of the investment is given by $\frac{I}{Y} = V(y + \vartheta)$. However, the Harrod-Domar model was extended with an open economy model term as the two-gap model (Mckinnon, 1946; Chenery and Bruno, 1962; Chenery and Strout, 1966). The two-gap model observed that insufficient foreign exchange earnings after the domestic savings are a constraint to the growth of output. Import of capital in the form of loan or aid is necessary to augment domestic resources. Futhermore, Edelman (1983) observed that capital flow in the form of loans, aid and foreign direct investment to developing countries is a pre-condition for promoting investment and output growth. This argument was based on the presumption that the majority of resources (capital) and technological capabilities needed for long-term economic growth are not produced locally, must be imported from abroad. Inadequate domestic savings enable acquisition of sufficient foreign resources to utilise fully into the available investment as savings gap is assumed to exist. Similarly, insufficient foreign exchange to augment the existing domestic savings for investment has created the foreign exchange gap. When any one among these three gaps exists, it could discourage investment and output growth below the expected level (Colman and Nixson, 1978).

As explained above, the two-gap model demonstrates the relationship between savings and foreign exchange constraints in promoting the growth of output in developing countries (Bacha, 1990). After the "two-gap" model, Bacha (1990) and Taylor (1993) proposed the "three gaps" model. It is a financing framework adopted by the World Bank for ascertaining the minimum required growth rate from foreign exchange availability in developing countries. Besides foreign exchange and savings gap, developing countries suffer from a fiscal deficit due to wide disparities between the revenue and government spending, which deter the expected growth. This requires foreign resources, particularly external loans to finance the yearly increasing fiscal

deficit and it is considered as the best option for stimulating output growth, particularly in low-income economies (Agenor and Montiel, 1999). The two-gap framework emphasises that savings gap and foreign exchange constraint are the principle factors inhibiting output growth in developing countries. With the emergence of the debt crisis in the 1980s, the three gap model was introduced, which recognised a fiscal gap in addition to the savings and the foreign exchange constraint. Bacha (1990) and Taylor (1993) made a point that investment in developing countries is constrained by savings, fiscal and foreign exchange gap. Hence, foreign capital inflow could serve as a stimulant in augmenting domestic savings to accelerate growth.

2.2.3 Determinants of External Debt[8]

Since the global oil shocks of the early 1970s and the debt crisis of 1982, empirical studies on the factors governing the determination of external borrowing in developing countries have occupied a significant portion in scholarly research. This section focuses on the review of studies that investigated the factors determining external borrowing in developing countries, particularly the resource-rich countries. As earlier stated, there are two classes of literature – single and multi-country case studies.

Single Country Case Studies

Studies at the country level have produced mixed results despite a number of different methodologies, scope and period. For instance, Hercowitz (1986) used the simultaneous equation model to examine the determinants of external borrowing in Israel. He found net country transfers, public expenditure, low GDP growth and increasing debt are the major factors. Excessive loan transfers between both private and government also constitute a large portion of the total debt stock. Likewise, Babic and Primorac (1986)

[8] External debt, external borrowing, foreign borrowing and overseas borrowing are used intercheangebly through out the text.

used descriptive analysis and found the Yugoslavian policy on negative interest rates have increased investment and accelerated output growth. This, jointly with the policy pursued on overvalued Yugoslavian dinar have encouraged the importation of production inputs attractive, and the proportion of the total imports rises rapidly. These factors speed up inflation and aggravate inflationary and worsen external borrowing.

In a related study, Boamah (1988) employed descriptive analysis in Barbados over the 1972 to 1986 period. He found that low savings, low output growth and high debt servicing obligations remained the key factors determining the accumulation of external debt. He advocated for a policy that would increase both private and public sector savings and diversify exports to create a surplus in the current account balance. Similarly, in Korea, results revealed that monetary factors such as domestic asset, real interest rate are the most important determinant of external debt (Kwack and Leipziger, 1988). Using a simple macroeconomic model developed by Balassa (1980) and Solis and Zedillo (1985), Perasso (1989) found capital flight as the significant factor contributing to the external debt accumulation in Argentina. In the case of Canada, Spiro (1990) deployed a quantitative evaluation method for Canada from 1972 to 1988 and found appreciation in the real exchange rate is associated with the rise in the net capital flows.

In the context of Nigeria, Ajayi (1991) was among the early scholars who empirically examined the causes of external borrowing in Nigeria over the period 1970 through 1988. Using an economic model by incorporating variables such as terms of trade, international real interest rate, real exchange rate and the rate of income in industrialised nations while the ratio of external debt service as the dependent variable. The results indicated that poor domestic economic policies, worsening terms of trade, increasing real interest rate and a decline in the growth of industrialised countries are the

significant factors determining external debt in Nigeria. To take into account the impact of external shocks, Nyatepe-coo (1993) examined the determinant factors for the increasing external debt in Nigeria and Indonesian experienced over the period 1970 to 1989. The empirical finding indicates that a considerable portion of the accumulated external debt stock in both Nigeria and Indonesia was caused by capital flight. Conversely, shocks from external forces, large current account deficits, and poor macroeconomic framework are part of the cause in Nigeria. On the other hand, Indonesia was free from the adverse effect of debt crisis following its commitment to effectively adopt the flexible exchange rate system. Mbire and Atingi (1997) examined the determinants of Uganda's external debt. The empirical results indicated that external factors such as an increase in the international interest lending rate, the decline in terms of trade and real exchange rate had been the factors causing Uganda's debt problem.

Using descriptive analysis, Okoye (2000) analysed the causes of external debt in Nigeria and found that a poor productive base made the economy dependent on imports, had led to a considerable increase in import bills. The decline in foreign exchange earnings following the collapse in the oil prices in the early 1980s increased in the international interest lending rate, and huge expenditures on projects with zero economic viability have soared the Nigeria's external debt. In the same vein, Edo (2002) employed the ordinary least square method to investigate the rationale behind the external debt build up in Nigeria and Morocco over the period 1980 through 2001. The empirical results indicated that external factors such as interest rate, terms of trade and decline in the competitiveness of primary product have contributed to the accumulated external debt in both economies. In the same vein, institutional factors such as corruption and poor accountability, jointly with inflation, and terms of trade increased the stock of external debt in Nigeria.

Omotoye *et al.,* (2006) used a multivariate model to examine the debt crisis in Nigeria and Sub-Saharan African countries from 1970 and 2001. The empirical results uncovered several factors such as poor leadership and political uprising, unfavourable terms of trade and privatisation are the most important factors explaining the debt crisis in Nigeria. In Jordan, Bader and Magableh (2009) deployed annual data from 1980 through to 2005 to estimate the contributing factors of public debt. Their findings indicate that huge budget deficit, real exchange rate appreciation and savings gap are the leading factors causing debt build up, but the real exchange rate is the most effective among all factors. Ogunmuyiwa (2011) explored the causal linkages between fiscal deficit and the external debt in Nigeria from 1970 to 2007. The study found no causal relation between the variables due to structural changes inherent in both fiscal deficit and the stock of external debt. Benedict *et al.,* (2014) studied the determinants of external debt spanning from 1986 to 2010 and found the real exchange rate, increasing debt service payments, and low output growth is the main contributing factors leading to the debt build up in Nigeria. They advocated for effective and efficient utilisation of external loans in viable, productive investment.

Murwirapachena and Kapingura (2015) estimated a debt equation to determine the factors leading to the increase in South African external debt from 1980 to 2013. Using the VAR framework, they found that a decline in growth rate and increasing government expenditure on capital as the main factors causing external debt accumulation while Lau *et al.,* (2015) re-investigated the macroeconomic factors such as gross domestic product, quasi-money as a percentage of reserve, inflation and interest rate and their impact on the external debt accumulation in Malaysia from 1970 to 2013. They found causal linkages between external debt and macroeconomic indicators and concluded that beyond the period, the real interest rate would remain to be the most

exogenous factor determining external debt in Malaysia. In the case of Pakistan, Awan *et al.,* (2015) investigated the macroeconomic determinants of increasing the stock of external debt over the period 1976 through 2010. The study concluded that trade openness, nominal exchange rate and the increasing government fiscal deficit played an important role in the external debt accumulation in Pakistan. Also, the study found foreign aid and terms of trade are with the stock of external debt but statistically insignificant.

Multi-Country Case Studies

Similar to single country studies, there are empirical works on multiple countries trying to identify the determinant factors contributing to external debt. For example, using a panel data for 23 developing countries, Eichengreen and Portes (1986) assessed the degree of relationship of macroeconomic variables such as trade, fiscal deficit, debt service among others in determining external public debt over the 1930 to 1983 period. They concluded that there is no link between openness to trade and export instability and the increasing debt. While for the external factor, growth was statistically significant with debt. Hajivassiliou (1987) used panel data method for the 79 developing countries from 1970 through to 1982. He considered the net inflow of external borrowing, and the results indicated that the inflow for external debt was positively influenced by accumulated import bills, interest rate, debt service payments, and the ratio of external debt to export, and negatively by per capita GDP. This result coincided with both studies by Eichengreen and Eaton, who employed growth while contradicting the findings of Eichengreen and Portes (1986).

Pastor (1989) found inappropriate fiscal policies and exchange rate problem, terms of trade, low growth rate, oil shocks and abrupt rise in interest lending rates are the major factors leading to the accumulation of external debt in Latin American countries. In a similar study, Leiderman and Reihart (1993) investigated the major causes of capital transfers among 10 Latin American economies. They found that deflation of the foreign reserve and over-valuation of exchange rate account for 30% to 60% of the causes. Using structural decomposition analysis, Kim (2000) investigated the determinants of foreign capital inflow in 2 Asian and 2 Latin American countries, namely, Malaysia, Korea, Mexico and Chile found that external factors such as a decline in the international interest lending rate in the industrial nations, whereas internal factors include productivity and demand shocks, though there are relatively less significant in power. He suggested that developing countries need a sound financial regulation in managing exchange rate, foreign capital inflow and relevant macroeconomic variables against the future financial crisis in a globalised environment of increasing capital transfers among several countries.

Easterly (2001) studied growth implosions and debt explosions. He viewed that after the 1975 world economic recession, countries that are dependent on exports of primary products were affected by fiscal shocks, which deteriorated their foreign earnings and necessitated to borrow more. The affected economies were unable to improve the increasing fiscal deficit, which results in continued increases in debt ratios. Similarly, Easterly (2002) in his study entitled "How did heavily indebted poor countries become heavily indebted? Reviewing two decades of debt relief" analysed macroeconomic indices such as budget deficit and the current account deficit, and concluded that the indebted poor countries got trapped by high external debt resulting from reckless lending behaviour and inappropriate economic strategies forced by the creditors to

match with both economic and political environments of those countries. Using panel data approach, Tiruneh (2004) examined the determinants of the external borrowing in developing countries in the 1980s and 1990s. He concluded that external borrowing constitutes both internal and external causes such as capital flight, savings gap, low income, imports and debt servicing obligation and capital flight have been the main factors. Also, it is observed that divergence of colonial heritage among developing economies, and poor creditworthiness played a critical role in overseas borrowing in those countries. Also, Kraay and Vikeam (2004) employed probit regression to estimate the factors contributing to the debt accumulation in 93 developing countries. They found external shocks and quality of policies and institutions largely explained the debt distress.

In the same vein, Anorou *et al.,* (2006) used data for Sub-Saharan Africa and estimated a panel data regression model consisting of 29 indebted countries from 1984 to 2000. They concluded that real exchange rate contributes to the accumulated debt burden while interest payments and stability index have a negative effect on external debt. Using panel data from 39 African countries, Odedokun (2008) examined the causes restraining the African countries from meeting their debt obligations in the period of the debt crisis and thereafter. The results revealed that poor trade performance, low income, high interest rate and poor foreign reserve are among the factors militating the countries against repayment of debt obligations. Gorniewicz (2009) used descriptive analysis to identify the major factors leading to external debt accumulation in five North African countries, namely, Algeria, Egypt, Libya, Sudan, and Tunisia. The author identified trade openness to industrialised countries and expansion, unfavourable terms of trade, and protectionist policy on the market by developed countries determine the external debt in North African countries.

In Africa, Lekomola (2010) analysed the magnitude, causes and effects of accumulated external debt over the period 1997-2007. He identified budget deficits, poor economic management, oil shocks and rising interest lending rate are the factors causing the African indebtedness. Using panel data analysis for the Caribbean Community (CARICOM) spanning from 1987 to 2005, Greenidge *et al.,* (2010) found real exchange rate, decline in output, exports and disproportionate government expenditure and real interest rate have been the major factors leading to the accumulated external debt. At the same time, using panel data analyses comprising a sample of South American countries over the 1970 to 2007 period, Bittencourt (2013) found low output growth, hyper-inflationary and structural changes in the last three decades are the significant factors that made the accumulated debt stock. Similar results were found in a study carried out by Lau et al. (2013), for the 19 Asian countries over the period 1981 to 2010 by adapting government intertemporal budget constraint model in Hamilton and Flavin (1986). The empirical results revealed two major factors influencing the behaviour of debt ratios in the Asian countries. The majority of the debt ratios are affected by structural changes. The stationarity tests of ratios that failed to account for the structural breaks are probably stable, and the empirical results confirmed debt sustainability in the Asian countries. Table 2.1 provides a summary of the selected empirical studies, regarding the scope, methods of analysis and conclusion.

Table 2.1: Summary of Some Empirical Studies: Determinants of External Debt

Author (s)	Country (s) and Scope	Testing Method	Findings
Single Country Case Studies:			
Hercowitz (1986)	Israel (1965-1984)	OLS	Found that the unfavourable balance of payment and large unilateral transfers among public and private creditors explained the genesis of the debt build up.
Perasso (1989)	Argentina (1970-1985)	OLS	Besides poor domestic economic policies, capital flight had strongly played a significance role in foreign debt build up in Argentina.
Kwack and Leipziger (1988)	Korea (1972-1986)	OLS	Domestic assets, real interest rate are the prime cause of Koreas indebtedness
Boamah (1988)	Barbados (1972-1986)	Descriptive analysis	Low savings, low output growth and high debt servicing obligations remained the key factors.
Spiro (1990)	Canada (1972-1988)	OLS	Found appreciation in real exchange rate is associated with the rise in net capital flows.
Ajayi (1991)	Nigeria (1970-1988)	OLS Multiple regression	Found domestic economic policies, terms of trade, raising interest rates and a decline in growth of income in industrialized nations have been the major cause for external debt.
Nyatepe-coo (1993)	Indonesia and Nigeria (1970-1989)	Cointegration and VECM	Found capital flight, current account deficit, External shocks and poor domestic policy responses are the major determinants of stock of external debt.
Mbire and Atingi (1997)	(1970-1998) Uganda	VAR	Concluded that poor exchange rate management and deteriorating terms of trade rises the external debt stock in Uganda.
Okoye (2000)	Nigeria (1970-1997)	Descriptive analysis	Found poor productive base, raise in interest rate, the decline in foreign exchange earnings and expenditure on projects without return have been the causes of external borrowing.
Edo (2002)	Nigeria and Morocco (1980-1999)	OLS	Findings confirmed that interest rate, balance of payments difficulties, international interest rate and high fiscal expenditure govern the determination of debt accumulation in both countries.
Omotoye *et al.,* (2006)	Nigeria (1970-2001)	VAR and Granger causality	Revealed that inflation, term of trade and institutional factors are the prime factors leading to increase in external debt.
Bader and Magableh (2009)	Jordan, (1980-2005)	VECM	Government budget deficit, real exchange rate and savings gap, determine the external debt inflow. In the overall, real exchange rate is more effective.
Benedict *et al*., (2014)	Nigeria (1986-2010)	VECM	Found real exchange rate, low GDP and increasing debt service payments triggered the debt stock.
Lau *et al.,* (2015)	Malaysia (1970-2013)	Granger Causality	Found causal linkages between external debt and macroeconomic indicators, though, the interest rate remains to be the most exogenous factor.

Source: Author (2016)

Table 2.1: (Continued)

Author (s)	Country (s) and Scope	Testing Method	Findings
Murwirapachena and Kapingura (2015)	South Africa (1980-2013)	VAR	The authors found that sluggish economic growth and high levels of government expenditure on infrastructure cause an increase in external debt.
Awan *et al.,* (2015)	Pakistan (1976-2010)	ARDL approach	The study concluded that the nominal exchange rate, fiscal deficit and trade openness are the major causes of external borrowing.
Multi-Country Case Studies:			
Eichengreen and Portes (1986)	23 Developing ecoomies, (1930-1983)	OLS	Confirmed a positive but statistically insignificant relation between openness to trade and stock of debt. On the other hand, output growth was positive and significant in debt stock.
Hajivassiliou (1987)	Developing countries (1970-1982)	Panel data regression	High debt ratio, import bills, interest payment led to the debt accumulation.
Pastor (1989)	Latin America (1962-1986)	Panel data regression	Outlined factors such as interest rate, global oil shocks, deterioration of the terms of trade, poor fiscal policy and over valuation in the exchange rate are responsible for the accumulated external debt in Latin America.
Kim (2000)	Developing countries, (1970-1998)	OLS	Revealed poor productive base, external shocks decline in the international interest lending rate, are the cause of capital inflow.
Tiruneh, (2004)	Developing countries (1982-1998)	Panel data	Increasing savings gap and instability real GDP growth are found to the internal factors while the external factors include debt service payments and capital flight.
Anorou, Dimkpah and Ahmed (2006)	29 Sub-Saharan Africa, (1984-2000)	Panel data, OLS and GMM	Indicated that real exchange rate increases the growth of external debt while interest payments and stability index affect external debt negatively.
Gorniewicz (2009)	5 North African countries (1971-2007)	Descriptive analysis	Openness, unfavourable terms of trade and protectionist policy on market by developed countries led external debt in the region.
Lekomola (2010)	African Countries, (1997-2007)	Descriptive analysis	High budget deficit, interest rates on debt, global oil shocks and reckless lending behaviour by commercial Banks in the 1970s has been responsible for the African debt accumulation.
Greenidge *et al*., (2010)	CARICOM (1985-2005)	Panel data regression	Real exchange appreciation couple with the decline in output, export and disproportionate government expenditure are the major cause of external debt.
Bittencourt (2013)	9 Southern America (1970-2007)	Panel data approach	Found low output growth, hyper inflation and structural changes lead to growing external debt stock.
Lau *et al.*, (2013)	19 Asian countries (1981-2010)	Univariate and Panel data unit root test for structural breaks.	Though the external debt ratios are within the threshold level, but it is behaviour are determined by: (i) the majority of the debt ratios are affected by structural breaks. (ii) stationarity test that failed to account for the structural changes are probably stable.

As above

2.3 Golden Rule and Liquidity Constraint Theory

This section discusses and reviews theories and empirical studies on external debt and public investment relations. It covers a thorough review of the golden rule of the public sector and liquidity constraint theory in an attempt to underpin the empirical analysis of the second objective of the study.

2.3.1 Golden Rule of Public Sector Borrowing

The golden rule of public sector borrowing has been widely recognised as a conventional public finance theory that supports government deficits (Musgrave, 1939) (see Adamu, 2016). The golden rule of deficit financing allows public borrowing to fund public capital investment, especially in developing countries. To apply the idea of the golden rule, there is a need to separate investment expenditure from current expenditure. This would make the capital projects different from the tax payers enjoying from them, and abstain the probable loss in the case of tax fluctuation over a period. As such, uncertainty in respect of this rule may adversely affect capital expenditure (Buti *et al.,* 2003).

In another perspective, Kellerman (2007) and Truger (2015) pointed that golden rule is an intertemporal principle of pay-as-you-use assumptions in a situation where the current public expenditure may produce planned income for the economy in the future (see Adamu, 2016). It allows public spendings on infrastructure development projects through public borrowing (deficits), and promote inter-generational equity. The increase in public capital investment also translates into an increase in infrastructure development projects that are beneficial for the future formation. Nevertheless, the future generations would commit to funding the investments from the returns.

Logically, the future generations take over the government debt in transfer gain from a complementary capital investment. Government incapacitation to employ debt financing approach for the future generations amount to excessive debt burden for the current generation from the low expenditure or higher taxes, thus, constituting incentives for overcoming under investment to the disservice of the expected generations. The provided conventional stimulus could develop into in a period of fiscal consolidation when carving out government investment might sound politically manageable for curtailing government budget deficit.

However, the idea behind the golden rule is more credible and understandable though its operationalisation is difficult. The literature normally emphasises the future economic returns in terms of higher productivity. The question regarding to the potentiality of the viable public capital project remains a point of argument on whether it will provide the public social capital so that its rate of returns would be higher or equivalent to the costs in terms of interest payments and probably the aggregated costs. Preferably, if the returns from the invested capital are sufficient, then debt sustainability (i.e. debt ratios within or below the threshold level) would not be an issue and automatically induces investment and promote growth (IMF, 2013) (see Adamu, 2016).

The optimum approach to defining public capital investment that qualifies for deficit finance would then be to involve all government expenditure projects that will generate an adequate rate of returns for increasing productivity and growth in the future. Such a categorisation process would be highly costly and infeasible in reality. Moreover, the main challenge is about the macroeconomic level, whether a general form of government expenditure can be clearly known and related to an increasing growth and productivity (Truger, 2015). Certainly, such a realistic approach may likely risk the

process, involving all classes of government expenditure that should not be regarded as an investment as well as reducing classes of government expenditure that could be classified as an investment. Another reason for the golden rule is whether the public investment is productive, i.e. whether it increases productivity and growth through government deficit. However, the perception of the growth effects of traditional public investment, i.e. mainly traditional infrastructure investment as classified in the national accounts, as it has received the most attention in the literature. Although, Delors (2003) pointed out that the problem of golden rule of public sector borrowing gives much emphasis on physical capital as compared to human capital while allowing an increase in the government deficit. Furthermore, the interpretation of the term public investment is narrow considering the need for expansion in government to enhance investment in all aspects. It should be a broader term that would create opportunities for other forms of public expenditure.

2.3.2 Liquidity Constraint Theory

The majority of the heavily indebted poor countries are not suffering from the inability to meet up the debt repayment obligations alone; they are also faced with liquidity constraints as well. A condition where an economy generates enough foreign exchange earnings, still encounter with large trade deficits and servicing a large debt stock, which undermines government expenditure due to liquidity constraints caused by the growing debt service (Taylor, 1993; Were, 2001). Given this, Corden (1988) and Callier (1989) proposed the liquidity constraints theory to justify the effect of debt service obligations on investment when a considerable portion of country's resources accrues to creditor institutions, which results to a disincentive to investment (see Adamu, 2016). An increase in debt means a portion of taxes that could be used for debt service and lower the nation's ability for investment.

Callier (1989) reported that access to export credit institutions allows the many of the developing countries in the late and early 1970s to access loans at different maturity. High accumulated debt implies an increase in debt service obligations and the debt turn against the expected contribution from the investment. Also, if an economy is unable to access the foreign loans, in other words, it is bounded by budget constrain, thus, consumption and government investment have to be independent. In such situation, the economy can finance productive investment up to a point where the Marginal Productivity of Capital (MPC) assumed indifferent with the rate of interest at which the loan was obtained. The crowding out effect caused by debt servicing, which carried away domestic resources for capital investment, remains a problem for the indebted poor economies. A reduction in the debt service payments is the important determinant for influencing investment that would provide the expected returns in the indebted countries (Cohen, 1993) (see Adamu, 2016). Although, Arslanalp and Henry (2006) argued to the contrary that debt relief may not provide the expected benefits since other binding constraints hamper the investment and growth process such as a poor macroeconomic policy framework in developing countries.

2.3.3 External Debt and Public Capital Formation[9]

In recent decades, many of the empirical studies on external debt issues are centred on economic growth. From the early 1990s, the contribution of overseas borrowing on public investment in the indebted developing countries has attracted significant attention, although, to date, little study has been done in the field (Adamu, 2016). Based on the available literature, there is two strands of studies. One side claims that the relationship between external debt and public capital investment is negative. The second

[9] Henceforward, public capital formation, public capital investment, public investment and public capital are used interchangeably throughout the text. This follows the studies by Munnell (1990); Garcia-mila *et al.,* (1996), Voss (2002), Clement *et al.,* (2003), Ang (2009), Cavallo and Daude (2011), Checherita-Westphal and Rother (2012) (see Adamu, 2016).

side believes that the relationship is positive. The majority concluded that external debt affects public investment negatively in developing countries, and relatively few studies found a positive relation.

Single Country Case Studies

Empirical studies on single country case studies are scarce and the majority centred on different countries other than Nigeria. For example, Borensztein (1990) investigated the impact of increasing external debt on domestic investment of Philippines spanning from 1970 to 1990. The study concluded that external debt reduces domestic investment. The author advocated for debt reduction to induce domestic investment. In the case of Turkey, Javed and Sahino (2005) examined the interlinkages among debt sustainability indicators, exports, growth and investment from 1983 to 2002 (see Adamu, 2016). They found that the accumulated debt stock affects investment negatively. They support the view that the setting of external debt by the authorities must be disciplined, which in some instances is possibly over ruled by the structural adjustment programmes, which can remove economic distortion, accelerate exports, growth and encourage external debt management.

For Nigeria, Akpan (2009) used annual time series data to examine the effect of the stock of government debt on the public investment from 1970 to 2005. The results indicated significant as well as positive correlations of private investment and lending rate on public investment, while inflation and export exert a negative effect while external debt service exerts negative, but insignificant effects on public capital investment in Nigeria. In contrast, Chaudhry *et al.,* (2009) used Pakistan's annual data to investigate the contribution of external debt on domestic savings and investment spanning from 1973 to 2006. They found partial evidence that foreign debt affects

investment expenditures and savings positively (see Adamu, 2016). Governance mechanism for efficient management of borrowed funds requires more commitment as it has a strong influence on savings and government investment. Ali *et al.,* (2014) examined the impact of foreign capital flows on public investment in Pakistan from 1972 to 2013. Following the confirmation of the cointegrating relation among the candidate variables, the result also indicated a unidirectional causality from external debt, remittances and domestic saving to public investment. A bidirectional causality between domestic investment and foreign direct investment is also observed, but no causality among domestic investment and inflation. All the estimated parameters are found stable. In their study, Akomolafe *et al., (*2015) used the VECM approach to examine the relationship between public debt and investment in Nigeria from 1980 through 2010. The result in both long run and error correction representation indicated that domestic debt contributes to domestic investment, whereas external debt found positively related to domestic investment in the long run. While a recent study by Abdullahi *et al*., (2016) investigated the effect of external debt on capital formation spanning from 1980 to 2013. Following a mixed order of integration, autoregressive distributed lag was employed, and a unique and stable long-run relationship was found. The empirical results indicated that external debt affects capital formation negatively and that unidirectional causality was found from external debt to capital formation, and bidirectional causality was observed between interest and capital formation.

Multi-Country Case Studies

Warner (1992) used 9 Latin American countries from 1982 through to 1989 to empirically estimate the contribution of debt indicators and macroeconomic factors on domestic investment. He found countries that went through changes in industrial production index, terms of trade, etc. have responded positively at conventional levels

indicating the contribution of debt on the domestic investment. Cohen (1993) conducted a study consisting of 81 developing countries using the ratio of investment to GDP as dependent variable while the control variables include debt ratios, GP per capita, population, school enrollment and inflation. The study revealed a negative, but not the significant impact on external debt on investment. He added that increasing the stock of debt probably may not depress public capital provided that the borrowed funds are efficiently infused into the real sectors of the economy.

Deshpande (1997) examined 13 severely indebted poor countries (SIPC's) between 1971 to 1991. He grouped the period into two-1971-1984, and 1984-1991, and found a positive effect of external debt on investment between 1971 to 1984 while turn to negative in the second period i.e. 1984 to 1991(see Adamu, 2016). This was caused by an unfavourable investment climate and macroeconomic imbalances. Using 30 Sub-Saharan African countries, Ndikumana (2000) investigated the factors responsible for promoting domestic investment. The author incorporates financial and non-financial factors in the investment model such as domestic credit, external debt, financial development index, real GDP among others. The results revealed that financial factors do promote domestic investment. Similarly, real GDP and trade are positive and significant, whereas external debt and government consumption expenditure affect investment negatively. Leipziger (2001) confirmed that an increase in debt service payments had been the reason behind the poor investment, which hampers economic growth and increases poverty in Latin America and the Caribbean. He concluded that debt service affects investment and growth negatively in those regions. Also, Clements *et al*., (2003) studied external debt, public investment and growth relation in low-income countries. They confirmed that burden of external debt discourages domestic

investment and impede output growth when debt service to export ratio obligation is above the threshold of 50% and 25% of debt to GNI ratio (see Adamu, 2016).

For Europe, a total of 10 member states was examined by Valila and Mehrotra (2005). The authors found real GDP growth, fiscal sustainability and budgetary policies are the determinants of public investment over the 1970 to 2003 period. For a group of low and middle-income countries, Udomkerdmongkol *et al*., (2007) investigated the relationship between external debt and domestic investment over 1995 to 2001b. They divided the time span into two regimes - the politically unstable regimes and stable regime. The result found that during the stability period, the economies recorded a negative impact of external debt on public investment. On the other hand, during the instability period, the contribution of foreign direct investment reduced below the public investment.

By employing unbalanced panel data consisting of 50 developing countries over the period 1985 to 2003, Lora and Olivera (2007) investigated the contribution of public debt stock in stimulating expenditure on social capital. They found higher debt ratios decrease social expenditure, though defaults may have an impact on social expenditure positively. Using part of the data and econometric method used by Lora and Olivera (2007), Lora (2007) estimated a panel regression of seven Latin American countries from 1987 through to 2001 and found a negative effect of the IMF adjustment loans on infrastructure expenditures. The study concluded that no evidence to show that debt default contributes to public investment. Using panel data analysis for 28 Highly Indebted Poor Countries (HIPCs) from 1991 to 2004, Cassimon and Van (2007) established that multilateral debt relief contributes to public investment negatively in the heavily indebted poor countries, but after 2 years, it turned positive and promoted public investment (see Adamu, 2016).

In an empirical study consisting of 22 transition countries, Mileva (2008) repoted that foreign debt and FDI flows promote public capital investment. Furthermore, the study found that countries with relatively underdeveloped financial markets and weak institution tend to depend on foreign direct investment compare to countries with the sizeable financial market and well-developed institutions. On one hand, Fosu (2010) employed a model of 5-year panel data consisting of 35 African countries from 1974 through 1994. Results revealed that debt service payments crowd-out public capital expenditure. Luca and Spatafora (2012) examined the factors influencing foreign capital and domestic investment in developing countries spanning from 2001 through to 2007. They employed both panel data and cross-sectional approach. They concluded that the high cost of internal borrowing had been regarded as most effective factors led to the increase in net foreign capital inflow in those countries. Also, the empirical results indicate that domestic credit and net foreign capital inflow exerted a positive effect on investment. As such, any influence on the world price of risk and interest on the domestic debt would raise the external debt through domestic credit and net foreign capital flow. They concluded that neither domestic credit nor institutional quality raises the foreign capital inflows to improve the public investment. Quattri and Fosu (2012) investigated debt service, external aid and public spending relation in Sub-Saharan African countries. The result showed that debt service reduces social sector, particularly spending on education, which is affected by crowd-out of resources as a result of high debt service obligations. On the other hand, multilateral aid promotes public investment. The summary of the selected empirical studies is reported in Table 2.2.

Table 2.2: Summary of Empirical Studies: External Debt and Public Capital Formation

Author (s)	Country (s) and Scope	Testing Method	Findings
Single Country Case Studies:			
Javed and Sahino (2005)	Turkish (1983-2002)	OLS	Found a negative correlation between external debt and investment.
Akpan (2009)	Nigeria (1970-2005)	OLS multiple regression	Concluded that external debt affects public investment positively, but statistically insignificant.
Chaudhry *et al.,* (2009)	Pakistan (1973-2006)	OLS multiple regression	The study revealed a positive impact of external debt and domestic savings on investment.
Ali *et al*., (2014)	Pakistan (1972-2013)	VECM	Found positive effect of external debt, FDI and workers remittances on public capital while the causality test result indicated a unidirectional causality running from all the variables to investment.
Akomolafe *et al.,* (2015)	Nigeria (1980-2010)	VECM	External debt affects domestic investment negatively in the long run.
Abdullahi *et al.,* (2016)	Nigeria (1980-2013)	ARDL approach	Found a negative effect of external debt on capital formation as well as unidirectional causality from external debt to capital formation.
Multi-Country Case Studies:			
Warner, (1992)	9 Latin American Countries (1982-1989)	Panel data approach	Found a positive effect of growth on public investment.
Cohen (1993)	81Developing countries (1975-1985)	Panel data regression	The study concluded that external debt stocks affect investment negatively.
Ndikumana (2000)	30 Sub-Saharan African countries (1970-1995)	Panel data approach	Found financial development leads to higher future levels of investment, implying a potent long-run effect of financial development and non financial development indicators on domestic investment.
Clements *et al.,* (2003)	Low Income Countries (1970-1999)	Panel data	Found a strong negative effect of debt service payments on public investment as the debt service crowd out a considerable share of output.
Valila and Mehrotra (2005).	10 EU member state (1970-2003)	Panel data approach	Results show that real GDP, effective budgetary policy and fiscal sustainability are the major determinant of public investment while foreign direct investment was insignificant.
Deshpande (2007)	Developing countries (1971-2005)	Panel data, approach	The study indicated a negative effect of external debt on domestic investment and other economic variables.
Udomkerdmongkol *et al*. (2007)	Middle income countries (1995-2001)	Panel data approach	Concluded that during the two periods both external debt and private investment could not promote domestic investment.
Quattri and Fosu (2012)	Sub Saharan Africa (1995-2009)	Panel data GMM method	Debt servicing requirements affect public investment negatively. The effects are more severe in the education sector.
Luca and Spatafora (2012)	Developing countries (2001-2007)	Panel data approach	Found institutional quality and domestic credit are the major factors rising external debt and retard public investment.

Source: Author (2016)

Table 2.2: (Continued)

Author (s)	Country (s) and Scope	Testing Method	Findings
Leipziger (2001)	Latin America and Caribbean	Panel data Approach	Found large debt servicing obligations crowd out investment leading slow growth
Cassimon and Van (2007)	24 HIPCs in Africa (1991-2004)	Panel data approach	Found that debt relief affect government investment negatively, but after some time, it becomes positive.
Lora and Olivera (2007)	50 developing countries (1985-2003)	Panel data approach	High debt ratios do reduce public expenditure on social services.
Lora (2007)	7 Latin American (1987-2001)	Panel data Approach	Reported an adverse effect of IMF adjustment loans on public investment.
Fosu (2010)	35 African countries (1975-1994)	Panel data approach	Found debt servicing obligations adversely affect a social sector, especially education and health as well as public investment in general.

As above

2.4 Debt Overhang Theory and Debt Laffer Curve

The previous two sections undertook a thorough review of the literature regarding the determinants of external borrowing and its role in stimulating public investment. This section explores the theoretical underpinning, as well as past empirical investigations that have evaluated external debt and economic growth relations.

2.4.1 Debt Overhang Theory

The theory of "debt overhang" stems from the 1982 debt crisis, in which the majority of the developing countries experienced a detrimental impact on foreign borrowing on investment and output growth. This result from their inability to settle the debt obligations to export credit institutions (for example, Mexico, Argentina and Brazil). Numerous scholars have attempted a theoretical examination of the macroeconomic implications of high levels of debt. Among the pioneering studies include Krugman (1988) and Sachs (1989) who used Myers (1977) corporate "debt overhang theory" and applied to the government of highly indebted countries. In his seminar paper "Financing vs. Forgiving a debt overhang", Krugman (1988) discussed on whether debt financing or debt reduction could be an alternative for indebted countries. Krugman described debt overhang as an inherited debt burden that the creditors are uncertain for its repayment in full value". Krugman (1988) declared an indebted country as:

> *"A debtor country is something like a debtor firm, although the parallel is not exact. At any given time, the creditors of a firm view that firm as having a probability distribution over streams of future earnings, out of which debt service can be paid. If the present value of the stream of earnings is expected to be less than the firm's debt, then the creditors will not expect to be fully repaid – although they may prefer to wait and see rather than force the firm immediately into bankruptcy proceedings"* (Krugman, 1988 p. 254).

Krugman (1988) and Sachs (1989) described developing countries as a private firm having vast opportunities for investment in anticipation of benefit in the future. It is probable for the future benefit to repay back the contracted loans due to macroeconomic instability and poor debt management that may undermine the expected gain (Balma and Ncube, 2015). Over a long period, the majority of the economies in developing countries have witnessed several political and economic downturns ranging from leadership problem, macroeconomic and structural instability, especially from the wake of the debt crisis of 1982. For example, Brazil, Mexico, Bolivia, Argentina, Congo, Côte d'Ivoire, to mention a few, their debt to GDP ratio were above the countries threshold level. The acute effects of the debt crisis were much critical in the middle and low in income economies compared to higher income countries (Sachs, 2002; Pattillo et al., 2002; Presbitero, 2008).

Reinhart and Rogoff (2010) pointed out that economies characterised by high debt burden have the high tendency for increasing economic stagnation due to negative effects of the accumulated debt. Moreover, once a debt rises beyond the countries payment capability crowd out domestic capital through debt service payments. In light of this, numerous empirical studies have found that enormous stock of external debt can promote investment and economic growth to a certain level, but after the threshold, its effect will be negative (see, for example, Kaminsky and Pereira, 1996; Were, 2001; Pattillo *et al.,* 2002; Pattillo *et al.,* 2011). They argued that a country's ability for debt repayment rely on the government fiscal effectiveness to absorb the burden of expenditures. If the source of income (tax base) is insufficient to repay the debt, then the ability for debt repayment is bounded.

Large stock of external debt also signifies an increase in domestic debt as many countries service their outstanding debt by borrowing domestically. This led to potentially hyperinflation, and unnecessary adjournment of investment in infrastructure development projects. Dornbusch (1984) argued that at an early stage, countries suffer from high debt burden due to increasing budget deficit in their quest for investment opportunities. In such situation, a rationale for such debt burden was justified by the debt overhang hypothesis via debt relief strategy under multilateral debt relief initiative. Through this strategy, highly indebted countries can lower their accumulated external debt. This strategy was mapped out during the 1989 and 1990 Brady Plan, as an alternative option for the indebted countries to prevail over the global debt crisis of the 1980s.

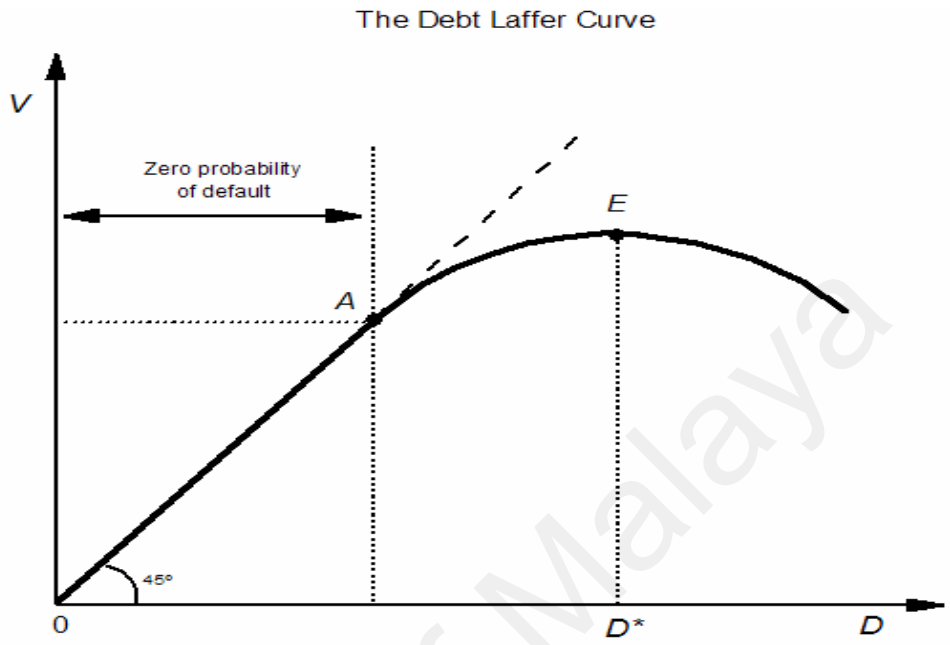
Hjertholm (2003) classified the potential effects of large external debt burden into two groups: First, the traditional view (narrow), which emphasises on tax incentives, whereby future debt service obligation of a debtor country may discourage a country's future economic growth, in which a large portion of income will be paid to creditors in the form of higher taxes. Higher taxes reduce returns from investment and discourage investors from making a new commitment and undermine output growth. As a result, experts suggested debt reductions since it will enhance investment, and adjust incentives to output growth and poverty reduction. Second, the macroeconomic instability view (broad), is being considered as another problem for private investment. Macroeconomic stability is a situation characterised by low and predictable inflation rates, stable exchange rates and low government fiscal deficits could be a signal for the better enabling environment for private investor's commitment. Instability of macroeconomic variables, more importantly, inflation and exchange rates may cause fiscal distress on the government side to influence fiscal issues. Such a situation may discourage

investors confidence in the future macroeconomic plan and reduces the ability to invest, which affects growth negatively.

2.4.2 Debt Laffer Curve

Sachs (1989) proposed the Debt Laffer curve through the conception of the debt overhang hypothesis a condition where the burden of external debt could lead to efficiency losses. While Sachs and Huizinga (1987) posited it as a situation where the greater number of the indebted countries outstanding debt exceeded the current value of expected net debt service payments (see Claessens, 1990). To analyse the relationship between a country's outstanding debt and the expected repayment, Sachs (1989) and Krugman (1989) used the graphical approach to demonstrate the relationship. Figure 2.1 illustrates the relationship between debt and countries expected repayment obligations. The horizontal axis depicts the country's nominal value of debt (D), while the vertical axis captures the expected repayments (V). As can be seen from the graph, at a lower level of debt, both principal and interest may be expected to be fully repaid. Therefore, the results may lie between 45^0. Conversely, at a higher level of debt, there is the tendency of default, as the expected debt service obligations trace out a curve that continuously declines below 45^0 line. At a point "A", the expected debt service payment to nominal debt can be measured from the slope of origin, this is by making the risk and transaction costs to remain constant, this could be considered by approximating the secondary market price of the debt. Accordingly, if the level of accumulated debt is between point "A" and "E", the country is placed at the "right" side of the Debt Laffer curve. This implies that the country can repay debt servicing obligations without serious effects on the economy, and debt reduction cannot lead to an increase in the market value. On the other hand, if a country is placed at the "right" side of the vertical line (E

and D), it is said to be the wrong side of the Laffer curve. This suggests that the country suffers from the accumulated debt burden – debt overhang.



Source: Sachs (1989) and Krugman (1989a)
Figure 2.1. Debt Laffer Curve

Pattillo *et al., (*2002) demonstrated the Debt Laffer curve's negative and positive effects of external debt on economic growth. According to them, from the upward sloping of the curve, indicate an increase in the face value of debt is related to an increase in the expected debt repayment, whereas rises in debt reduce expected debt repayment on the downward sloping of the curve. They also examine crowding out effects of resources through debt service payments rather being used for investment to enhance long-run economic growth. By assumption, Claessens (1990) suggested that indebted developing countries can apply Debt Laffer curve to contend for debt forgiveness, this could decrease the face value of the debt and may stimulate output growth. However, may also result in an increase in the market value of a country's debt since debt forgiveness gives the beneficiary chance to pursue new loans corresponding to the value of the debt forgiven until they become trapped (Easterly, 2002; Tiruneh, 2004).

2.4.3 External Debt and Economic Growth

After the global debt crisis of 1982, there have been conflicting views among scholars in the field of international economics, who extensively examined the external debt and economic growth relations in a number of countries and using different econometric methodologies, although their findings lack consensus, and sometimes inconclusive, which rendered the results a source of debate among scholars and policy makers. Numerous findings confirmed that high external debt depresses investment and growth. This section reviews empirical studies on external debt and economic growth relations, which has been a field of heated debate in developing countries.

Single Country Case Studies

We begin with the empirical studies on Nigeria. Ashinze and Onwioduokit (1996) used annual data from 1979 to 1994, to estimate the relationship between the external debt and output growth in Nigeria. They concluded that external debt, stimulated economic growth between 1988 to 1992 when the borrowed funds were efficiently utilised. However, in the periods between 1979 to 1987, and 1993 to 1994, external debt adversely affects growth. They added that debt crisis of the early 1980s, poor macroeconomic policies and lack of commitment from the government, political instability are the major problems inhibiting growth. Ramakrishna (2000) re-examined external debt and economic growth relation over the 1981 to 2012 period. The empirical results indicated that output of agriculture and service sectors had played a significant role in promoting growth in Ethiopia. While the coefficient of external debt appeared is contrary to the previous results. It was found to be positive but statistically insignificant to influence growth. This might be the effect of debt relief which reduces the acute effect of external debt on growth. Were (2001) investigated the impact external debt in

Kenya's economic growth as well as on private investment. Although, the findings indicated that foreign capital is beneficial to Kenya as it reduces the savings gap and increases investment. It is only when the debt accumulated beyond the countries' repayment capability that it affects growth negatively. He suggested debt forgiveness as the alternative for enhancing growth in Uganda. Mwaba (2002) studied the size and magnitude of Uganda's external debt and the impact of the 1990s debt relief in stimulating investment and output growth. The study confirmed a U-shape relation between debt and growth. Moreover, despite the debt relief, still, Uganda remained at the negative side of Debt Laffer curve. Likewise in Srilanka, Wijeweera, Dollery, and Pathberiya (2005) explored debt service and growth relation from 1952 through to 2002. The empirical results indicated debt service do not hamper growth. Ezirim, Anoruo, and Muoghalu (2006) examined the causality relation among growth, FDI and external debt in Nigeria from the 1970 to 2001 period. The study found a bidirectional causal relation among FDI and external debt. On the hand, foreign reserve and interest payments exert an adverse effect on growth. Amin and Audu (2006) used annual time series data and confirmed that external debt influences economic growth in Nigeria while debt service payments crowd out investment and growth.

Frimpong and Oteng-Abayie (2006) used the VECM approach from 1979 to 1999 in Ghana. The study revealed a positive and significant correlation between external debt and economic growth. This suggests that external debt influenced output growth following the country's ability to utilise the available resources for poverty reduction and investment in basic infrastructure development projects. Correspondingly, Baker and Hassan (2008) also analysed the relationship between external debt and growth in Malaysia. Using the vector autoregression (VAR) method over the 1970 to 2005 period,

they found external debt had a statistically and significant positive relation with growth. The study concluded that Malaysia no longer experiences debt overhang.

On the other hand, Ayadi and Ayadi (2008) employed ordinary least square and generalised least square estimators to investigate the association between external debt and growth for Nigeria and South Africa, respectively. They found a significant negative effect of external debt on growth in Nigeria while for South Africa was positive but statistically insignificant. While Hameed, Ashraf, and Chaudhary (2008) used yearly data for Pakistan spanning from 1970 through to 2003 to search for the relationship among debt servicing obligations, policy variables on economic growth. The empirical findings indicated an adverse effect of debt service on the growth of output. This weakened the Pakistan ability to repay its outstanding debt in the long run. Using OLS estimator, Udoka and Anyingang (2010) examined the contribution of Nigeria's external debt management policies in promoting economic growth over the 1970 to 2006 period using OLS estimator. Their empirical results show that external debt and government fiscal deficit undermine growth. In a related empirical studies, Loganathan, Sukemi, and Sanusi (2010) used the vector error correction model to examine the relationship between external debt, investment, savings and economic growth for Malaysia from 1988 to 2008. The empirical findings confirmed the sustainability of external debt with Malaysian macroeconomic performance. As part of the policy implications of the study, Malaysia should take appropriate policy measures to ensure low levels of debt servicing obligations and promote trade performance. Ezeabasili *et al.,* (2011) also revealed an adverse consequence of high foreign debt and its servicing obligations on the Nigerian economy from 1975 to 2006 using OLS approach.

Moreover, using the ARDL approach, Akram (2011) estimated a dynamic effect of external debt and growth for Pakistan from 1972 to 2009. The results indicated that the most common debt ratios (debt to GDP and debt service to export) affect growth negatively. Using data for the US over the 2003 to 2008 period, Changyong et al. (2012) investigated the interaction among foreign debt, economic growth and economic crisis. Their analysis is based on Ramsey (1928), Cass (1965), and Koopmans (1965), otherwise called the Ramsey-Cass-Koopmans model. The results show that economic growth is depressed when there is an increase in debt ratios jointly with low debt transformation, such condition may trigger an economic crisis.

Mohamed (2013) explored the role of external debt in promoting the economic growth of Tunisia over the 1970 to 2010 period. Using ARDL bound testing approach, the estimated error correction model and the long run coefficients indicated that external debt affects per capita GDP negatively. Contrary to the above findings, Ajao and Ogiemudia (2013) reported a positive impact of external debt on growth while debt service crowd out investment. In Malawi, Tchereni *et al.,* (2013) used time series data from 1975 to 2003 to investigate the contribution of foreign debt on economic growth. The results reveal an insignificant negative effect of foreign debt on economic growth in Malawi. They concluded that the government should encourage domestic manufacturers through incentives than depending on external debt. Using ARDL bound test, Daud *et al*., (2013) investigated the role played by external debt on the Malaysia's economic growth using quarterly data from 1991(q1) to 1999(q4). Following the unique cointegration relation among the variables, the empirical results indicated that external debt had contributed to Malaysia's economic growth to a certain level, after that an increase of external indebtedness above the threshold level affect the Malaysian economy negatively. Similarly, Kasidi and Said (2013) investigated the relationship

between external debt and growth of Tanzania from 1990 through to 2010, revealed a positive impact of external debt as well as the negative effect of debt service on economic growth.

In Cameroon, Forgha *et al*., (2014) examined the relationship among external debt, domestic investment and economic growth over the 1980 to 2013 period. Using 2-Stage Least Square (TSLS) method, the result indicated that domestic investment affects growth positively, but external debt depresses growth in Cameroon. They advocate for more effort on external debt management through investment in productive sectors of the economy. A study by Ramzan and Ahmad (2014) examined the external debt and growth in Pakistan using ARDL bound testing to cointegrating approach over the period 1970 to 2009. The finding reveals a unique and cointegration relation. Meanwhile, the study found external debt has impacted on economic growth negatively. Ramzan, Ahmad, Abdelhafidh (2014) used the ARDL approach and found a negative effect of external debt on growth both in the long and short run in Tunisia over the 1970 to 2010 period.

Multi-Country Case Studies

Following the empirical literature on single country case studies, a number of empirical literature on multi-countries have employed different methods and study periods to examine external debt and growth relations. The early studies include Elbadawi, Ndulu, and Ndungu (1997) used cross-sectional data to study the nexus among debt indicators, investment and growth in 99 developing countries. They observed a U-shaped relation between debt and growth. Furthermore, the high external debt crowd out investment due to increasing debt service payments. A rise in debt to GDP ratio of about 97% had been the prime factor leading to a decline in investment in public capital expenditure. Hence,

the unprecedented debt burden affects investment and growth negatively. This deteriorated countries' economic condition and continued to inflict economic problems of which the majority of the African and Latin American countries could not reverse the trend. For Sub-Saharan Africa, Iyoha (1999) assessed the impact of external debt on economic growth spanning from 1970 to 1995. He applied the simulation approach and a set of macroeconomic models comprising policy and debt variables. The results confirmed the existence of debt overhang, which crowds out investment through debt service payments and affects growth negatively. For a group of 18 Latin American countries, Weeks (2000) studied the relationship between external debt on economic growth from 1970 to 1994 found that a one unit change in debt service decreases economic growth approximately by 0.02% through the crowd out effect on investment.

Furthermore, Saddiqui and Malik (2002) found a nonlinearity relation between debt and growth in three South Asian countries, namely, Pakistan, Sri Lanka and India from 1975 to 1998. Using a three-year moving average, Pattillo, Poirson, and Ricci (2002) employed data sets for 93 developing countries from 1969 through to 1998 and examined the impact of external debt on growth. The results supported the nonlinear relation between external debt and growth. Most developing countries at an initial stage of development have the inadequate capital for investment and are forced to import capital, and may contribute to growth positively, but after some time, when the debt ratios surpass the threshold level, consequently, it depressed investment and growth. Schclarek (2004) investigated the nexus between external debt and growth of output in 59 developing countries, and 24 industrialised nations over the 1970 to 2002 period using dynamic system GMM panel estimator developed by Arellano and Bond (1991). The empirical results show that for developing countries, the lower stock of external debt was associated with an increase in growth rates. On the other hand, the adverse

consequences were induced by an increasing public external debt stock over the private external debt stock. Considering the channels through which an increasing external debt affects growth, they found that the growth in output were influenced by the increase in capital accumulation. There are few evidences on the external debt and total factor productivity growth relation. In the case of private savings rates, there exist an inconclusive results that are contrary to non-linear relation between external debt and output growth. For industrial countries, the relationship between gross government debt and economic growth was insignificant Schclarek (2004). This coincided with the findings of Elbadawi *et al*., *(*1997) and Presbitero (2008).

Using a dynamic generalised least square approach, Baharumshah and Thanoon (2006) estimated the impact of foreign capital on the East Asian economies. The findings indicated that both the long and short run external debt did not influence output growth. However, among the explanatory variables foreign direct investment has significant influence over domestic savings, suggesting that foreign direct investment plays an important role in stimulating economic growth in Asian countries compared to public investment. Likewise, Sen *et al.,* (2007) employed a panel data to examine the debt overhang hypothesis in Asian and Latin American borrowers from 1982 to 2002. Their results concluded with the existence of debt overhang, which undermined growth severely in Latin America while moderately for Asian countries. Nabli and Veganzones-Varoudakis (2007) constructed a range of economic reform index using principal component analysis for 44 developing economies from 1970 to 1999. It includes the external stability index to examine the linkages among economic reforms and economic growth. The authors found that macroeconomic and external stability index are the major factors for the reform process and the economic growth prospects of the developing countries.

Contrary to Elbadawi and Pattillo, Presbitero (2008) examined the external debt and economic growth relation for 114 indebted developing countries. The results indicate no support for the Debt Laffer curve once institutional quality is incorporated. Furthermore, debt overhang significantly affects countries with good institutions and irrelevant in countries with weak institutions. In another empirical study, Jayaraman and Lau (2009) employed a balanced panel consisting of 6 Pacific Island countries to investigates the relationship between external debt and growth. They found a positive and statistically significant correlation of external debt on growth. A 1% rise in external debt was associated with growth by 0.3%. In the case of export to GDP ratio, a positive relation was observed in all the countries, except for Solomon Islands which appeared positive, but statistically insignificant. They suggested that those countries with serious external debt problem should map out policy measures to curtail the situation against future accumulation.

Similarly, Pattillo *et al.,* (2011) re-examined the nonlinear relation between external debt and economic growth for 93 developing countries from 1979 to 1998. The findings support the U-shape relation between external debt and growth as confirmed by Pattillo *et al*., (2002). While Greenidge *et al.,* (2012) studied the threshold impact of sovereign debt in 12 Caribbean Community (CARICOM) from 1990 to 2010. The study found that every one unit rise in public spending would raise the external debt by approximately 0.3%. Thus, a unit increase in the real exchange rate is associated with an increase in debt, which change the initial positive impact to negative on growth. Wamboye (2012) analysed the relationship between external debt, trade and economic performance for the 40 less developed countries from 1975 to 2010. The result indicates increasing external debt reduces the potentials for growth, inconsiderate of the nature of the debt. The low power of the negative effects on growth results from the debt relief

initiatives, whereas trade and FDI influence economic growth in the LDCs. Ejigayehu and Persson (2013) employed panel data regression for eight heavily indebted poor countries in Africa to estimate the impact of external debt and growth spanning 1991 to 2010. The empirical result of the estimated panel data regression reveals an insignificant negative effect of external debt on the economic performance of those countries. For ASEAN-4 countries, which includes Indonesia, Malaysia, Philippines, and Thailand, Daud (2014) found that external debt responds positively to the economic growth of ASEAN-4 countries up to an optimum level. However, beyond the threshold level, the external debt affects Indonesia and Thailand negatively. Table 2.3 provides a summary of some selected empirical studies. Similar to the above findings, Megersa (2014) tried to establish the existence of Laffer curve by investigating the nonlinear relationship between debt and growth using panel data for 22 low-income countries of Sub-Saharan Africa from 1990 to 2011. The empirical results confirmed the existence of a U-shaped relation between public debt and economic growth. This buttresses the hypothesis of the positive impact of external debt on growth up to a certain level, and beyond that level, it depresses economic growth.

2.5 Summary

This chapter reviewed a set of relevant theories and empirical studies on the issues arising from external debt, as well as its impact on public investment and economic growth. Among the theories discussed, Dutch disease and capital accumulation theory (Domar, 1939; Harrod, 1946; Mckinnon, 1946; Chenery and Bruno, 1962; Chenery and Strout, 1966; Coden and Neary,1982; Corden, 1984; Krugman, 1987; Bacha, 1990; Taylor, 1993) justify the rationale for foreign borrowing in resource abundant countries, while the golden rule of public sector and liquidity constraint theory support the role of external borrowing in financing public investment (Musgrave, 1939; Corden, 1988; Callier, 1989; Trueger, Kellerman, 2007; Trueger, 2015). Other theories, such as debt overhang and the Debt Laffer curve were employed to support the association between external debt and economic growth (Krugman, 1988; Sachs, 1989).

On the empirical part, three groups of empirical studies based on the three research questions (see chapter 1) have been reviewed within the scope of the study. Firstly, we explored the factors governing the determination of foreign borrowing in developing countries. Secondly, the study delved into the role played by external debt in influencing public capital investment, and finally, the effect of external debt and its sustainability on long term output growth of the debtor countries.

Based on the results of the empirical studies, this study found that numerous factors have been declared as the contributing factors leading to the determination of external debt in developing countries. External factors include oil price, real exchange rate, external shocks, debt service obligations and terms of trade are considered to be the most contributing factors in the oil exporting countries. Internal factors consist of macroeconomic variables such as savings, government fiscal deficits, low output

growth, interest rate, institutional factors and poor domestic policies (Pastor, 1989; Ajayi, 1991; Mbire and Atingi, 1997; Lekomola, 2010). This study differs from the existing literature in Nigeria by integrating oil prices, which has not been considered in the existing studies on Nigeria. Also, two dummy variables for exchange rate devaluation and debt relief have been incorporated, which has not been the case in the previous studies. This would contribute to the body of empirical literature that suggests changes in oil prices might account for the changes in the stock of external debt in the oil exporting countries (see, Dornbusch, 1984; Krueger, 1987).

Regarding the external debt, investment and growth relations, this study deduced two perceptions among the scholars. The first school of thought (the majority) believed that external debt, particularly in developing countries crowd out investment and affects their economic performance negatively. The second school of thought (the minority) is the view that external debt contributes to the growth of output positively. However, considering the vast empirical studies, the majority of the studies concluded a negative relation between debt, public investment and growth due to liquidity constraint and debt overhang. These include Claessen (1990), Scott (1994), Iyoha (1999), Pattillo *et al.,* (2002), Ayadi and Ayadi (2008), Hameed *et al.,* (2008), Jayaraman and Lau (2009), Kumar and Woo (2010), Pattillo *et al*., (2011), Ramzan and Ahmad (2014) and others. From these empirical studies, relatively few studies confirmed a positive link between external debt and investment (Cohen, 1993; Ashinze and Onwioduokit, 1996; Frimpong, 2006; Baker and Hassan, 2008; Loganathan *et al*., 2010).

Having conducted a thorough review of numerous empirical studies, and understanding their methodologies and findings, this study sheds additional light on the gaps in the literature for further investigation to advance the frontier of knowledge.

First, relatively few studies have examined the issue of the resource boom, specifically the effect of oil price and real exchange rate. The majority of authors focused on conventional macroeconomic variables such as savings and government deficit (Boamah, 1988; Edo, 2002). From this literature survey, little attention has been given to the role played by oil price and real exchange rate in explaining the behaviour of external debt in Nigeria.

Second, based on the literature survey, comparatively there are few studies on external debt and public capital relation as opposed to the total investment (public and private) in Nigeria. Although Akpan (2009) studied external debt service and public investment in Nigeria and found a positive effect on public investment, this study differs from the previous studies in two ways. First, it is important to conduct an in-depth analysis by integrating two debt ratios (debt to GNI and debt service to export) to gauge their effect on public capital investment in promoting sustainable economic growth and development in Nigeria. Second, foreign direct investment is included since it aids in the transfer of human (skilled manpower) and physical capital through the interlinkages with the host country and the foreign investors, which promotes public investment.

Third, except for Nabli and Veganzones-Varoudakis's study (2007), it is difficult to find an empirical study that has constructed an external debt composite index using principal component method (PCM) to capture the effects of the overall external debt indicators on growth. This would fill the gap uncovered in many of the empirical studies that employed a single indicator (see, for example, Abdelhafidh, 2014; Udoka and Anyingang, 2010; Frimpong and Oteng-Abayie, 2001).

Fourth, the empirical studies should be viewed with scepticism. A number of time series data studies have applied various econometric techniques, for example, ordinary least square method, but they failed to consider the non-stationary property of the data as well as the cointegrating relation prior to estimations (Ajayi, 1991; Nyatepe-coo, 1993; Edo, 2002; Ayadi and Ayadi, 2008). This could result in inappropriate inference and "spurious regression".[10] The stationarity test is important because only variables that satisfy the stationarity process and having attained the long run relation can explain the cointegration and stationarity of the error correction (Engle and Granger, 1987). Hence, it is uncertain on whether or not the cointegration is supported by the data. Similarly, OLS and TSLS methods are inappropriate because of their shortcomings to simultaneously estimate long-run coefficients and error correction of the time series data (Sachs, 1989). Hence, in this study, the integration and cointegration of the time series data have been examined. The vector error correction model was also employed to analyse the dynamic relationship among the variables under study.

Of the above-discussed research gaps, this study pursued an in-depth analysis by incorporating the relevant variables, and a unique time series data set that covers the period when Nigeria enjoyed the debt relief from the Paris Club creditors. Equally, a set of parsimonious econometric methodologies will be employed to provide a reliable result that would fill the prevailing gaps in external debt-economic growth relation in Nigeria.

[10] For more detail on spurious regression (see Granger and Newbold, 1974)

Table 2.3: Summary of Some Empirical Studies: External Debt and Economic Growth

Author (s)	Country (s) and Scope	Methods of testing	Findings
Single Country Case Studies:			
Ashinze and Onwioduokit (1996)	Nigeria (1979-1994)	Multiple regression	Found a negative association between external debt and growth. They conclude that poor macroeconomic policy, political instability, and lack of commitment from the leaders are considered to be the problems militating against output growth.
Frimpong and Oteng-Abayie (2001)	Ghana (1970-1999)	VECM	Found a positive effect of external debt on economic growth, on the other hand debt service exerts a negative sign on growth.
Clement *et al.*, (2003)	55 low income countries (1970-1999)	DGLS	The overall results show that external debt more related to lower rates of investment and growth due high debt service payment in those countries.
Adegbite *et al.*, (2008)	Nigeria (1970-2006)	Multiple Regression (OLS and GLS)	Observed that both external debt and debt service obligations retarded economic growth. They advocate for debt forgiveness in order to enhance growth.
Ayadi and Ayadi (2008)	Nigeria and South Africa (1970-2007)	OLS	Found a negative effect external debt and debt service on growth.
Presbitero (2008)	114 Developing Countries (1980-2002)	Panel data approach	Revealed debt forgiveness and increase in domestic debt were correlated, and thwart the possibility to lower the debt service obligations.
Udoka and Anyingang (2010)	Nigeria (1970-2006)	OLS	The result indicated a negative effect of external debt on growth
Loganathan, *et al.*, (2010)	Malaysia (1988-2008)	VECM Approach	A sustainable external debt, but the government should realign its macroeconomic policies to reduce debt servicing.
Osinubi *et al.*, (2010)	Nigeria (1970-2003)	OLS	They found external debt and budget deficit, have depressed growth negatively.
Ezebesile *et al.*, (2011)	Nigeria (1975-2006)	VECM	External debt and debt service payments affect growth and investment negatively.
Daud (2012)	Malaysia (1991q1-2009q4)	ARDL approach	Found external debt contributed to economic growth in Malaysia up to an optimum level, while further increased in external debt affect growth negatively.
Ajao and Ogiemudia (2013)	Nigeria (1979-2009)	VECM approach	There is a positive correlation between external debt and growth while debt service appears to be negative.
Tchereni *et al.*, (2013)	Malawi (1975-2003)	OLS	Found negative, but insignificant relation between the debt stock and output growth.
Forghat *et al.,* (2014)	Cameroon (1980-2013)	TSLS	Found a negative effect of external debt on growth, while domestic investment shows a positive impact on growth.
Abdelhafidh (2014)	Tunisia (1970-2010)	ARDL	Found that external debt affect growth negatively both in the long run and short run.
Kasidi (2013)	Tanzania (1990-2010)	OLS	Found external debt stimulate growth while debt service payments retard growth.
Ramakrishna (2015)	Ethiopia (1981-2012)	ARDL approach	Both agricultural sector and services sector promotes growth while external debt remained insignificant.

Source: Author (2016)

Table 2.3: (Continued)

Author (s)	Country (s) and Scope	Methods of testing	Findings
Multi Countries Case Studies:			
Iyoha (1999)	Sub-Saharan Africa (1970-1994)	Simulation approach	External debt depresses growth and investment in SSA, thus, confirming the debt overhang and crowding out effect.
Weeks (2000)	18Latin American countries (1970-1994)	GMM approach	Both external debt and debt servicing obligations, reduces economic growth
Siddiqui and Malik (2001)	3 South Asia (1975-1998)	Panel data approach	Found negative and nonlinear relation between external debt and growth
Pattillo *et al.,* (2002)	93developing countries (1969-1998)	Panel data approach	Found a negative effect of external debt on per capita GDP.
Schclarek (2004)	59 developing and 24 developed countries (1970-2002)	Dynamic GMM system estimator	The results show a negative and significant relationship between total external debt and economic growth, i.e. lower total external debt levels are associated with higher growth rates. Furthermore, the results show no threshold effects of external debt on growth.
Baharumshah and Thanoon (2006)	8 East Asian countries (1982-2001)	DGLS	Both short and long term external debt affects growth negatively.
Nabli and Veganzones-varoudakis (2007)	44developing countries (1970-1999)	Panel data approach	Found that external debt stability index and macroeconomic promote economic reform process.
Sen *et al*., (2007)	Latin America and Asian region (1982-2002)	Panel data approach	Found a severe effect of debt overhang in Latin America and a moderate in Asian countries.
Jayaraman and Lau (2009)	6Pacific Island countries (1988-2004)	Panel data approach	The results reveal a positive effect of external debt on economic growth.
Greenidge *et al*., (2010)	12CARICOM countries (1980-2010)	Panel data approach	The study found that debt contributes to growth below 30 percent threshold level, but becomes negative beyond 55 percent of GDP
Pattillo et al., (2011)	93 developing countries (1969-1998)	Panel data approach	The results supported the U-shape relationship between external debt and economic growth as the impact of debt becomes negative at about 160-170 percent of exports or 35-40 percent of GDP and marginal take half of the value.
Abutalab and Hamid (2012)	Egypt (1985-2008)	Stochastic control approach	The results show that the external debt exceeded the threshold level before 1997, but was converge to the optimum level, which could promote growth in Egypt.
Ejigayehu and Persson (2013)	8 Developing countries (1991-2010)	Panel data approach	A negative, but insignificant impact of external debt on growth.
Daud (2014)	ASEAN-4 (1981-2009)	Panel data approach	The external debt contributes in improving the output growth of the ASEAN-4, beyond a certain threshold, it affects Indonesia and Thailand negatively.

As above

CHAPTER 3: METHODOLOGY

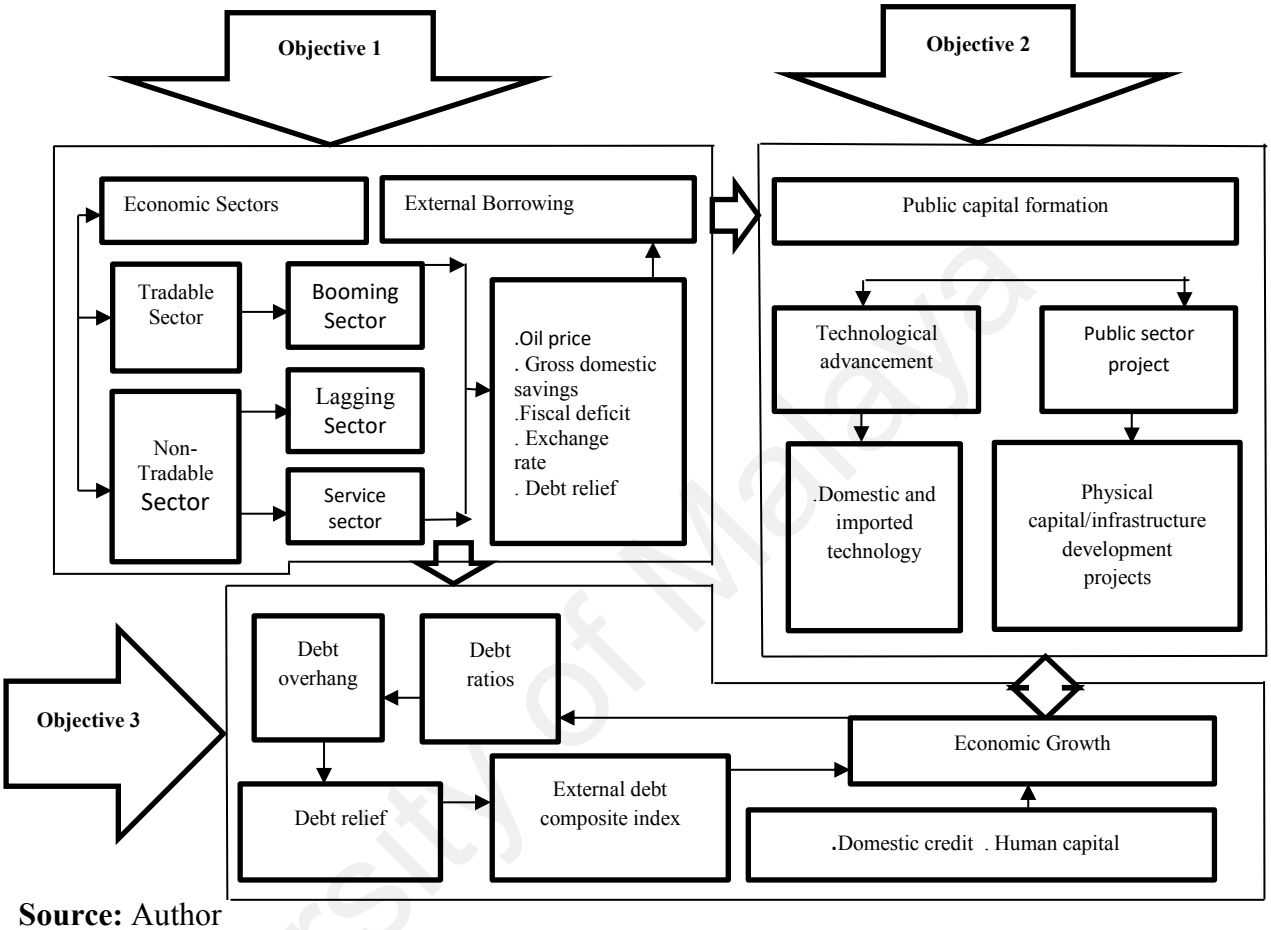
3.1 Introduction

In the previous chapter, a set of theories and empirical studies were reviewed in the light of the three research objectives of this thesis. As such, in the literature, different characteristics of variables and their expected signs, methodology and scope were reviewed and documented. This chapter aims at discussing the appropriate methodology to be used to generate robust findings in chapters 4, 5 and 6. Firstly, the chapter outlines the conceptual framework of this study, and model specifications in order to examine the cause and effects of external debt on the public investment and economic growth in Nigeria. It was followed by a discussion on the data sources, and the construction of an *external debt composite index* using principal component method (PCM).

3.2 Conceptual Framework

This section presents the conceptual framework that underlies the three research objectives of the study in accordance with the theoretical and empirical literature presented in Chapter 2. Figure 3.1 presented the conceptual framework comprising of three parts with each representing the three specific objectives, respectively. It outlined a combination of closely candidate variables, which are considered essential to the underlying issues of external debt in Nigeria. The bold lines and arrows, depict the linkages and directions between the three objectives and their explanatory variables. Objective 1 allow the empirical investigation on the determinants of external debt and debt build up in Nigeria. The second objective corresponds to the role played by external debt in promoting public investment since the majority of the debts contracted by developing countries are mainly for investment in the development projects such as infrastructural development.

In the third objective, the study provides an understanding between external debt and economic growth, particularly the changes that might affect growth after the debt relief in 2006. The details of the empirical models are specified in the subsequent section.



Source: Author

Figure 3.1 Conceptual Framework: Interactions between external debt, public capital investment, and economic growth.

3.3 Model Specification

Granger and Newbold (1986) made a point that the purpose of time series data analysis is to construct an empirical model that gives the same properties of the observed time series by allowing the researcher to draw conclusion in view of the behaviour of the series. This section presents the model specifications based on the research objectives, which are augmented with a set of debt and policy variables documented in the literature, and considered to provide an adequate explanation of the Nigerian economy. Take note of that, two *step* dummies are incorporated in the long run models. First,

dummy for an exchange rate devaluation to capture the effects of government reform policy, i.e. Structural Adjustment Programm (SAP) introduced in 1986. Second, dummy for debt relief to account for the impact of 2005 debt relief. They take the value of 0 before the introduction or intervention period and 1 afterwards.

3.3.1 Determinants of External Debt (Objective 1)

The determinants of external debt in developing countries are directly related to many factors, some are internal while others are external. Among the internal factors (within the country control) include gross domestic savings and fiscal deficit. The external factors are beyond the country's control, these include oil price and real exchange rate, and so on (Guttentag and Harving, 1985). Following from the review of the literature, the model framework to estimate the factors governing the determination of external debt in Nigeria is a replica of the model proposed by Greenidge *et al.*, (2010) $(edy_t = \delta_t + x_t\psi + \mu_t)$ in which external debt as a percentage of GDP (dependent variable), δ as the constant term of the model while x is a vector of explanatory variables. Nonetheless, ψ stand for the vector of the respective elasticities while t and μ are time period and the stochastic error term to take care of unobserved variables in the model.

In the light of the past studies by Tiruneh (2004), Kevin *et al.,* (2010), and Greenidge *et al*., (2012), the following debt function was employed to examine the Nigerian experience.

$$edy_t = f(\overset{(-/+)}{olp_t}, \overset{(-)}{gds_t}, \overset{(+)}{def_t}\ \overset{(-)}{DED\_86_t}, \overset{(+)}{DDR\_05_t}) \qquad (3.1)$$

where *edy* is the external debt to GDP ratio (dependent variable), olp_t is the oil price, gds_t is the gross domestic savings to GDP, def_t is the government fiscal deficit to GDP,

DED_86 and *DDR_05* are the dummy variables. Now, equation (3.1) gives the following log-log regression equation for responding to research question 1:

$$\ln edy_t = \alpha_0 + \alpha_1 \ln olp_t + \alpha_2 \ln gds_t + \alpha_3 \ln def_t + \alpha_4 DED\_86 + \alpha_5 DDR\_05 + \mu_t \qquad (3.2)$$

All of the above variables are expected to have their behavioural role, according to economic theory as depicted in equation (3.1). Note that α is the parameters to be estimated while t and μ are time period and the stochastic error term to take care of unobserved variables in the model.

3.3.2 External Debt and Public Investment (Objective 2)

According to Eshaq (1983) foreign borrowing by the developing countries is based on the reason that it will serve as a capital by filling the gap between domestic savings and desired investment in the host countries (see Adamu, 2016). Among the fundamental feature of the foreign debt is widely sourced from bilateral and multilateral financial institutions, in which they plan and guide the investments in the host countries for a greater economic performance. It is assumed that if the borrowed funds are fully utilized, would support public investment and stimulate growth. However, to examine the impact of external debt financing of public investment in Nigeria, the study employs an investment model proposed by Gourinchas and Jeanne (2013) that an open economy can issue foreign debt in the form of capital flows. Thus, the country's aggregate resource constraints is specified as:

$$C_t + I_T + R^* D_t = Y_t + D_{t+1,} \qquad (3.3)$$

$$I_t = K_{t-1} - (1-\delta)K_{t,}$$

where I_t, δ, R^* and D_t represents the investment, depreciation rate, interest rate, and country's external debt, respectively. And, K_t is the capital owned by residents. The

country service its external debt as default is not anticipated. The external debt inflow in particular period *t,* $D_{t+1} - D_{t,}$ is equal to public investment, I_t, minus domestic savings, $Y_t - (R^* - 1)D_t - C_{t,}$ with both terms playing a significant role in the analysis. This study follows Fosu (2010), and Quattri and Fosu (2012) by incorporating both external debt and debt service into the investment function (*ing*) in order to test the second objective.

$$ing_t = f(\overset{(-)}{edy_t}, \overset{(-)}{dsx_t} + \overset{(-/+)}{fdy_t}\ \overset{(-)}{DED} - 86_t, \overset{(+)}{DDR} - 05_t) \tag{3.4}$$

where ing_t is the public investment to GDP ratio, *edy* is the external debt to GDP ratio, dsx_t is the debt service to exports ratio and *fdy* is the foreign direct investment to GDP ratio. Based on the theoretical and empirical discussion in Chapter 2, the following investment function as above (3.4) with external debt as the primary variable of interest is specified as log-log regression equation (3.5):

$$\ln ing_t = \beta_0 + \beta_1 \ln edy_t + \beta_2 \ln dsx_t + \beta_3 \ln fdy_t + \beta_4 DED\_86 + \beta_5 DDR\_05 + \mu_t \tag{3.5}$$

3.3.3 External Debt and Economic Growth (Objective 3)

Existing empirical studies on the relationship between external debt and economic growth have largely been underpinned on some famous studies (see, for examples Pattillo *et al.,* 2002; 2003; 2011; Checherita-Westphal and Rother, 2012). However, the present study adopted their framework by specifying the following growth model:

$$y_t = \alpha_t + \beta Debt_t + \gamma X_t + \mu_t \tag{3.6}$$

where X_t is the vector of the policy variables. Equation (3.6) can be rewritten as the growth function:

$$ry_t = f(\overset{(-/+)}{eci_t}, \overset{(-)}{dcy_t}, \overset{(+)}{hcp_t}\ \overset{(-)}{DED\_86_t}, \overset{(+)}{DDR\_05_t}) \tag{3.7}$$

where *edy* is defined earlier, ry_t is the real GDP, *eci* is the external debt composite index, *dcy* is the domestic credit to the private sector as a share of GDP, and *hcp* is the human capital proxy for secondary school enrolment. An empirical equation (3.8) is specified from the growth function as:

$$\ln ry_t = \delta_0 + \delta_1 \ln eci_t + \delta_2 \ln dcy_t + \delta_3 \ln hcp_t + \delta_4 DED\_86_t + \delta_5 DDR\_05_t + \mu_t \qquad (3.8)$$

All the variables included in the model are derived from the neoclassical growth models, theoretical and empirical literature, commonly from studies related in indebted developing countries in particular, - Nigeria.

3.4 Data and Variable Construction

Having outlined the three empirical models (i.e. equations 3.2, 3.5, and 3.7) serving the three study objectives, this sub-section provides the description of the variables and the construction of composite index by the mean of principal component method (PCM).

3.4.1 Data

This study employed annual data spanning from 1970 through 2013. Table 3.1 provides a list of variables in their symbols, description and their respective sources. They were sorted by the three objectives for convenience. Meanwhile, the macroeconomic variables are typically trending over time, thus, transforming the data into natural logarithm is essential as long as the variables are strictly positive or not too close to zero. Also, the log transformation reduces inconsistency in trend data, and often easier to be interpreted in elasticities (see, Luktepohl, 2004, Juselius *et al*., 2011, p.5).

Table 3.1: List of Variables Symbol, Definitions, and Sources: 1970-2013.

Variable Symbol	Variable Description and Measurement	Data Source
Determinant of External Debt (Objective 1)		
ln*edy* (Dependent variable)	Log of external debt stock as a percentage of GDP at constant 2005 US dollars	WDI, WB
ln*olp*	Log of oil price, at yearly Brent crude oil spot price, U.S$ per barrel	OPEC
ln*gds*	Log of domestic savings as percentage of GDP at constant 205 US dollars	CBN
ln*def*	Log of fiscal deficit as a percentage of GDP	CBN
DED_86	Zero-One dummy variable proxying exchange rate devaluation to account for government economic reform - Structural Adjustment Programm introduced in 1986 i.e. 0 before the refor and 1 afterward.	Author construction
DDR_05	Zero-One dummy variable for proxy of 2005 debt relief granted to Nigeria by the Paris club creditors. i.e. 0 before the debt relief and 1 afterward.	Author construction
External Debt and Public Capital Formation (Objective 2)		
ln*ing* (Dependent variable)	Log of gross fixed capital formation as a percentage of GDP at constant 2005 US dollars	WMR, WDI, WB
ln*edy*	As above as in the first panel	As above
ln*dsx*	Log of debt service as a percentage of export at constant 2005 US dollars.	CBN; DMO
ln*fdy*	Log of Foreign Direct Investment as percentage of GDP	WDI, WB
DED_86	As above	As above
DDR_05	As above	As above
External Debt and Economic Growth (Objective Three)		
Ln*ry* (Dependent variable)	Log of real GDP, which captures level of output at constant US dollars.	WDI, WB
ln*eci*	Log of *external debt composite index* is the first principal component analysis of debt to GNI, Debt service to export and debt to export ratio.	Author construction
ln*dcy*	Log of domestic credit to the private sector as percentage of GDP at constant US dollars	WDI, WB
ln*hcp*	Log of human capital proxy for secondary school enrolment in percentage.	CBN
DED_86	As above	As above
DDR_05	As above	As above

Notes: WDI, WB; WMR; OPEC; DMO; CBN are World Development Indicators, World Bank database; World Macroeconomic Research; Organization Petroleum Exporting Countries; Debt Management Office, Nigeria; Central Bank of Nigeria.

3.4.2 Variable Construction: *External Debt Composite Index*

In order to measure the overall impact of the external debt indicators, rather than depending on one or two indicators as used in the previous studies (see, for example, Amin and Audu, 2006; Ayadi and Ayadi, 2008; Mohamamed, 2013; Ramzan and Ahmad, 2014), this study construct an index, namely *"external debt composite index (eci)"* using principal component analysis (PCA) method.[11] To the best of literature search, researchers and policy makers have no unanimous debt indicator to appropriately measure the external debt on economic growth, in particular for Nigeria.

The principal component analysis is a method of condensing data from its original value into a reduced form in order to capture as much of the information from the observed variables as possible (Rao, 1964; Leech *et al*., 2005). More precisely, this method is aimed at capturing the variance from source series using the following equation:

$$PC = \alpha_1(x_{11}) + \alpha_2(x_{12}) + ... + \alpha_{np}(x_p) \tag{3.9}$$

where PC is the principal component, α_{np} is the regression coefficients of the component variable corresponding to eigenvector of the covariance matrix between the variables and x_p is the value of the component variable. The PCA method has the following advantages. First, it reduces the outlier problems related to skewed distributions. Second, it captures the underlying latent information on variables in a block (Rao, 1964; Leamer, 1973; Lee *et al*., 2005).

The empirical literature provided a broad of studies on investigating the impact of external debt on economic growth, particularly using either cross-wise countries or

[11] This method has been widely applied in numerous economic studies (see for example, Ang, 2009; Jalil *et al*., 2010; Ang, 2010 Rehman and Shahbaz, 2014; Tinico-Zermeno *et al*., 2014).

single country case. They used one or more external debt ratio to capture their effect on economic growth, alternatively. The literature survey such as, Nabli and Veganzones-Varoudakis (2007)[12] is the only study on this topic. No study has been made to construct a composite index for external debt indicators to capture their impact on economic growth. This study followed closely the Nabli and Veganzones-varoudakis's work (2007) in selecting the relevant debt indicators, which are widely used, namely, external debt to GDP (*edy*), external debt service to export (*dsx*) and external debt stock to export (*edx*), respectively.

Before conducting the principal component, the variables under consideration have to be examined for their factorability by using Bartlett (1950) test of sphericity and the Kaiser-Meyer-Olkin (KMO) (1974) measure of sampling adequacy. The Barlett's test converts the computed determinant matrix to a χ^2 statistics, which then tested for significance (Tinoco-Zermeno *et al*., 2014). Panel A of Table 3.2 reports the results of factorability tests (KMO and Bartlett's test of Sphericity (BTS) for sample adequacy).[13] The test statistics are KMO = 0.773 and BTS = 145.048 at the 1% significance level. This implies that the variables under consideration are appropriate for conducting principal component analysis[3]. Panel B of Table 3.2 presented the estimates of the *external debt composite index* obtained from the principal component analysis. The first components have an eigenvalue, which is greater than one, that account for 97% of the standardizes variance. The second component account for 2%, while the third explained about 1% of the standardized variance. This suggests that the first component is the most appropriate principal component. Similarly, Panel B of Table 3.2 shows the eigenvalues, which indicate the variance explained by each principal component scores.

[12] The authors used external debt to GNI, external debt to exports and current account balance to exports to construct an external stability index. In this paper, we used debt stock to export ratio in place of current account balance since our objective is to capture the stability of external debt in Nigeria. Because these indicators measures the country's "solvency" and "liquidity" position and consider the debt stock in relation to the country's capability to generate income for repayment.

[13] The rule of thumb is that the lowest acceptable KMO is 0.50 and the values between 0.50 and 0.60 are mediocre values, and value from 0.70 and above are regarded as appropriate for PCA (Kaiser, 1974).

The first PCA score is 97% of the standardized variance. On the other hand, at the lower segment of Table 3.2 (see, panel B), the eigenvectors show the weight (or influence) of each individual variable on the standardized variance of the first principal, which are 81%, 44% and 38%, respectively. Hence, these eigenvectors are used as a basis for constructing the external debt composite index (*eci*) to serve the overall information of the three debt indicators mentioned earlier.

Table 3.2: Factorability Tests and Principal Component Analysis

Panel A: KMO and Bartletts test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.773	
Bartlett test of Sphericity Approx. Chi-square		145.048 (0.000)***	
Panel B: External debt composite index			
	PC 1	PC 2	PC 3
Eigenvalues	2.8975	0.0693	0.0331
Variance (%)	0.9658	0.0231	0.0110
Cumulative (%)	0.9658	0.9890	1.0000
Eigenvectors (Loading)			
Variables	Vector 1	Vector 2	Vector 3
edy	0.580	-0.039	-0.812
edx	0.575	-0.685	0.444
dsx	0.575	0.726	0.375
Ordinary correlations			
edy	1.000	-	-
edx	0.941	1.000	-
dsx	0.961	0.929	1.000

Notes: *** indicate significance at the 1% level. *edy* = debt to GNI ratio, *dsx* = debt service to export ratio, and *edx* = debt to ratio.

3.4.3 Expected Influence of the Variables

This section explained the expected role or influence of the candidate variables included in the models specified (see section 3.3) as referred to the respective theoretical and empirical findings.

External Debt to GDP Ratio (edy) - External debt to GNI/GDP ratio refers to the use of domestic income to pay for the outstanding external debt. The higher the value, the higher the external debt and difficult for a country to manage (see, Ojo, 1994). This ratio serves as the dependent variable in the debt equation, but as an independent variable in the investment equation, respectively. It is expected to stimulate public investment in the host countries. The primary purpose of external borrowing is to bridge the financing gap and stimulate domestic income required for investment and in turn promote long term economic growth (Chenery and Bruno, 1962; Chenery and Strout, 1966). The transfer of foreign resources could support the infrastructure development projects, and promote aggregate income. As earlier mentioned, the inclusion of this variable in the investment equation is to validate the hypotheses of the study. That is to measure the debt overhang hypothesis, which increase the likelihood of tax burden which can discourage domestic and foreign investments.

Debt Service to Export Ratio (dsx) - The debt service ratio is related to total external debt service payments to the exports of goods and services. It is a common indicator used for measuring the debt burden and debt capacity. It indicates the percentage of a country's export earnings used for servicing external debt (Ojo, 1994). The inclusion of the debt service ratio in the investment equations is that an increasing debt service payment also increases the burden of external debt through accumulated interest payment on the principal amount. In fact, it encourage liquidity constraint, which narrow the composition of government expenditure by reducing the budgetary allocation for infrastructure investment, and affect growth negatively (see, Clement *et al.*, 2003).

Public Capital Formation to GDP (ing) **–** Public capital formation/investment to GDP[14] proxy for gross capital formation has been considered as a key source of growth. It promotes output growth, and in turn support the economic development process (Aschauer 1989a). Also, it is viewed as the wheel of the nation's economic activity or if not an engine for economic growth. Theoretical propositions and empirical studies, both affirmed the contribution of public capital on output growth (see, for example, Arrow and Kurz 1970; Aschauer 1989a b; Munnell 1990; Koeda 2006,).

Oil Price (olp) - It is generally refers to the yearly Brent crude oil spot price of a barrel of benchmark usually in US$ (OPEC, 2013). It is included in the debt equation to test the effect of falling or rising oil prices on the behaviour of external debt stock. The resource rich countries, particularly oil exporting economies such as Nigeria, Venezuela, Iran and Indonesia to mention a few. These countries are the major beneficiaries of the oil boom (higher oil prices/revenue), and they are more vulnerable to "Dutch disease". As the majority of these countries spent their revenues on imports, which directly increased the prices of imported goods (Corden and Neary, 1982). A rise in foreign exchange earnings from the oil export revenues have two major implications on the oil exporting countries. Firstly, a hike in the oil revenues increased the tendency for oil producing countries to increase their expenditure dramatically (mostly on consumption) in anticipation of continued higher oil export earnings. Secondly, based on the increasing oil revenues, oil exporting countries enjoyed the credit ratings in the international capital market by having access to unlimited borrowing at concessional interest rates with zero expectation of default, this had been the cause of increasing

[14] A proxy for "Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation (World Bank, 2013)."

their external debt stock. Consequently, the fall in the oil prices in the mid 1980s left the oil exporting countries with no alternative, but to further borrowing due to increasing government expenditure leading to an accumulated fiscal deficit (Krueger, 1987).

Gross Domestic Savings to GDP (gds) - The gross domestic savings to GDP is considered in the debt equation as the level of domestic savings in developing countries could not take into account the vast investment opportunities. To get rid of this, Chenery and Bruno (1964), Chenery and Strout (1966), and Bacha (1990) suggested foreign capital transfer as the alternative way to narrow the savings gap and increase investment opportunities for long term economic growth (Solow, 1956). In Nigeria, for example, inadequate domestic savings, increases the tendencies for external borrowing to meet the financing gap.

Fiscal Deficit to GDP (def) - The government deficit to GDP is added in the debt equation to justify its effect on external debt, given external borrowing is a function of high government fiscal deficit, which is exogenous to the government of developing countries. This rises the stock of external debt provided that the fiscal deficit is financed by external borrowing (Dornbusch, 1984). Similarly, an increasing deficit creates a shortfall of saving and consequently provide an avenue for further borrowing to finance this shortfall. Consequently, the past deficits result in higher debt that will have to be paid in the later period. If debt servicing obligations on external debt surpassed the expected income of the country, the debt is set up dynamically. So, the debt to GDP ratio deteriorates. It could become unsustainable and require corrective measures (Barro *et al*., 1995).

Foreign Direct Investment to GDP (fdy) - Foreign direct investment as percentage of GDP, consists of multinational investment. It is an enterprise resident in one particular country earn a minimum interest of 10% from a enterprise resident in another country (UNCTAD, 2010). FDI might support physical capital via inter-linkages with trade and technological capabilities (Rasiah, 1995). On the contrary, FDI may not promote domestic capital since most of the foreign investment are capital intensive in which the host countries have no comparative advantage. As a result, the foreign investors control the market share and benefit from the extra gains created by the unhighly protected market (Kohpaiboon, 2003). In addition, Rasiah *et al*., (2010) pointed out that due to political risk, inflation and transaction cost foreign investments are likely provide the expected benefits, particularly in oil rich countries such as Nigeria while Singer (1950) viewed that the majority of the gains from foreign direct investment do not benefit the host country rather being transfered to the investors countries.

Real GDP (ry) - Real GDP is the output (growth) equation. Clark (1917) pointed out that an increase in investment depends on expected changes in economic growth. Theoretically, any transitory change in GDP growth could affect investment expenditure (Barro, 1991). Oshikoya (1994) hypothesized that investment has been directly determined by income. Countries with reasonable income could devote more resources to national savings, which in turn used for investment (Greene and Villanueva, 1991).

External Debt Composite Index (eci) - External debt composite index (eci_t), proxies of three external debt indicators – external debt to GDP, debt service to export and external debt to exports ratio (see, Table 3.2). This single index was constructed by using the principal component method. It is incorporated in the model in order to assess the overall impact of the debt indicators in stimulating economic growth. Because during

the period under study over 80% of the Nigerian total external debt stock owed to Paris Club creditors was cancelled under the Highly Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiative (MDRI). This enables us to understand the changes in debt stock that might have affected economic growth (Adamu and Rajah, 2016).

Domestic Credit to the Private Sector to GDP (dcy) - In a small open economy, financial sector serves as a conduit for liquidity to the private sector, which represents the majority of the total capital. Domestic credit to the private sector as a share of GDP is considered in the growth equation to capture the degree of effectiveness of financial intermediation. Expanding liquid securities, credit and cash to the private sector, establish a claim for repayment increase private sector efficiency and productivity, then stimulate growth. The higher interest rate of access to capital may result to higher loan default and eventually lower growth (World Bank, 2013).

Human Capital proxy for secondary school enrolment (hcp) – Human capital (proxy for secondary school enrolment) has been broadly established in the growth theories as it serves not only as a productive input alongside labour and capital but also as an engine of economic growth (Romer, 1986; Lucas, 1988). Similarly, Levine and Renelt (1992) have demonstrated that human capital, measured by the secondary enrolment rate, is a prime indicator of economic growth in growth models. A plethora of growth studies have also confirmed the robustness of education as the measure of human capital (see, for example, Barro 1991; Barro and Sala-i-Martin 1995; Mankiw et al., 1992). Although, Prichett (2001) disagree with the notion that human capital has a positive impact on economic growth rate. He contended that increased in education has not transformed into rapid economic growth in low income countries, more especially in African countries.

Dummy for Real Exchange Rate Devaluation (DED_86) - The real exchange rate refers to the value of domestic currency to foreign currency rate, usually dollar rate and measures the relative consumer prices between the USA and the domestic currency. A change in the real exchange rate implies appreciation or depreciation of the domestic currency (Juselius *et al.,* 2013). The discovery of a natural resources could lead to real exchange rate appreciation due to a decline in the competitiveness of the primary exports products (Corden and Neary, 1982). Similarly, an increase in real exchange rate suggests an appreciation of the foreign currency leading to a loss of price competitiveness, thus, the Dutch disease effect (Greasley and Madsen, 2010; Juselius *et al.,* 2013). On the other hand, government policy can lead to devaluation of domestic currency. For example, the Structural Adjustment Programm introduced in 1986 had led to exchange rate devaluation. The implication is that foreign debts are denominated in foreign currency, hence a depreciation of real exchange rate means devaluation of domestic currency and implies higher payments over debt denominated in foreign currency. This behaviour increases the external debt burden and reduce foreign exchange earnings and create a current account deficit (Dornbusch, 1984; Asonuma, 2016). Accordingly, Rodrick (2007) contends that ineffectively managed exchange rates can be deplorable for investment and output growth. The decision for an appropriate management of an exchange rate is a basic aspect of determining prudent economic management and safeguard against macroeconomic instability. Nevertheless, exchange rate policy plays an important role in economic performance, and considered among the most controversial issues in macroeconomic policy.

Dummy for debt relief (DDR_86) - According to economic theory, debt forgiveness or debt relief may lead to change in investment and economic growth through a reduction in debt service obligations or a reduction in the total outstanding debt (Dijkstra, 2013).

A reduction in debt service payments may provide additional resources for the country's investment in both economic and social services investment, which thusly may prompt to changes in the welfare of the populace and lead to an increase in income (Arslanalp and Henry, 2006; Dijkstra, 2013).

3.5 Econometric Methodology

This section discusses the time series econometric methods employed in responding the three research questions (objectives) outlined in Chapter 1. More formally, it covers unit root tests, cointegration, and vector error correction to estimate the empirical models specified in Section 3.3.

3.5.1 Unit Root Test

Testing the order of integration $I(d)$ in time series data studies become an essential practice in economic research. Following the seminal paper by Dickey and Fuller (1979), there have been development aimed at overcoming the problem of spurious regression inherent in macroeconomic time series data (Carrion-i-Silvestre and Sanso 2006). Consequently, failure to identify the order of integration of a time series variable could lead to spurious conclusion of the OLS estimator. This problem also had been traced in the seminal work of Nelson and Ploser (1982), in which numerous theoretical and empirical works have been investigated on non-stationarity of data. They found that the null hypothesis of a unit root (or non- stationary) was not rejected for many financial and economic time series data. Sometimes one or more variables of interest are nonstationary in level, given the standard asymptotic distribution theory does not apply to the econometric system involving these variables. Nonetheless, prior to the estimation of the empirical models, the properties of the series have to be examined to ascertain the orders of integration $I(d)$ of the series. This is aimed at overcoming the

problem of high *R*-squared, low Durbin Watson statistics, and resulting high standard errors or the common term of "(spurious regression)" see, (Engle and Granger, 1987 p.261).

A time series variable is said to be stationary in levels, or integrated of order zero, i.e. *I*(0) if the null hypothesis of a unit root was rejected for the variable without first differenced exercise. Likewise, if a time series is differenced once to achieve its stationarity, it is said to be stationary at first difference, i.e. *I*(1). If a time series is differenced *d* times in order to achieve stationarity, the variable is labelled as *I*(*d*) i.e. *I*(2) if the variable differenced twice in rejecting the null hypothesis of a unit root. A level stationary time series does not have roots on or within the unit circle, while for *I*(1) or more than one order of integration of time series *I*(1) contain roots on or within the unit circle. Wang (2003) pointed out that testing for stationarity is the same as testing for the existence of a unit root in a time series. In order to examine the stationarity of a time series, this study used two conventional unit root tests, namely, Augmented Dickey Fuller (ADF) (Dickey and Fuller, 1979, 1981) and Phillips and Perron (PP) tests (Phillips and Perron, 1988).

3.5.1.1 Augmented Dickey-Fuller (ADF) Test

The ADF test is a parametric test with higher order correlation by assuming that a data series follows AR (*k*) process with disturbance term. Majority of macroeconomic time series data has complicated structure when captured by an AR (1) model. Said and Dickey (1984) added that the autoregressive unit root test can be adjusted with the ARMA (*p, q*) models that have no orders. Thus, ADF test is computed using the following model:

$$\Delta y_t = \upsilon + (\phi - 1)\ y_{t-1} + \mu_t = \upsilon + \gamma y_{t-1} + \mu_t \tag{3.10}$$

$H_0 : \gamma=0,$ that is there is a unit root *in* y_t against $H_1: \gamma < 0$, that there is stationary in y_t. The Dickey-Fuller (1979, 1981) test was proposed because the null hypothesis under the conventional *t*-distribution is not applicable. Equation (3.10) is a condition, where the residual is a stochastic error term. The presence of autocorrelation in the residual, and Δy_t is written in the form of autoregressive process:

$$\Delta y_t = \upsilon + \gamma y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \mu_t \tag{3.11}$$

Of equation (3.11), the Dickey Fuller (DF) test could be alternatively is extended into a so-called Augmented Dickey Fuller (ADF) test by adding an augmented term, $\sum_{i=1}^{k} \delta_i \Delta y_{t-i}$. In addition, a deterministic trend is included to capture trend stationary.

3.5.1.2 Phillips-Perron (PP) Test

Considering the low power of the ADF test (Phillips and Perron 1988), this study employed the Phillips-Perron (1988) unit root test commonly known as PP test. The PP test differs entirely with the ADF unit root test, particularly in dealing with heteroskedasticity in the stochastic error term. The ADF is a parametric autoregression while PP test is non-parametric (i.e. it disregards serial correlation) and it is power, in the case of weakly autocorrelation (μ_t). Meanwhile, the PP tests are formulated because of the same asymptotic distributions as in relation to Dickey-Fuller tests. The PP test has more property as illustrated in Monte Carlo tests by Phillips and Perron (1988). One of the disadvantages of PP unit root test, it causes distortion when the sample size of a test varies significantly from the sample size suggested by asymptotic theory. Such

variation could result to approximation in the asymptotic theory. The PP model can be specified as:

$$\Delta y_t = \beta_0 + \beta_t (t - T/2) + \gamma_0 \, y_{t-1} + \mu_t \tag{3.12}$$

where μ_t denotes $I(0)$ and can be heteroskedastic. The PP test takes care of any autocorrelation and heteroscedasticity issues in the stochastic term ε_t of the test regression by adjusting the test statistics $t_{\gamma=0}$ and T_{γ}.

3.5.2 Cointegration Test

Cointegration test in economic studies was first introduced by Granger (1981) and popularized by Engle and Granger (1987). The cointegration test is based on the notion that macroeconomic variables are nonstationary, a proper linear combination between trending variables could clear away the common trend component. However, the majority of the studies in economics on cointegration test are centred on the three common cointegration tests, namely:

(i) The Engle and Granger (1987) is a single equation based on the testing a cointegrating relation of the variables using ordinary least squares (OLS) on the levels. It has some disadvantages. First, in a case of more than two series in the model, there can be more than one cointegration vector. Hence, it is possible for up to (n - 1) linearly independent cointegration vectors to exist in a system with n series. Only when n = 2 indicate that the cointegration vector is unique. Second, in case of 1 cointegrating relation, thus, estimating a single equation is potentially inefficient as it leads to loss of information resulting from the failure of the model to consider all variables as potentially endogenous. Since the number of cointegration vectors in the model is unexplained, and given the need to allow all variables to be potentially

endogenous, therefore, in such situation the Engle and Granger (1987) cointegration approach can result to misleading results.

(ii) Johansen (1988, 1991) and Johansen and Juselius (1990, 1995) multivariate maximum likelihood approach to cointegration is a conceivable approach in estimating variables long run relationships in empirical economic studies (Ahking, 2002). It is regarded as superior and found to be the best alternative testing method because of the following advantages: First, the Johansen test provides an asymptotically fully efficient, maximum likelihood based systems technique for determining the number of cointegrating vectors (which is not possible in both Engle and Granger (1987) and Pesaran *et al.*, (2001) in a multivariate cointegration test that allows more than one cointegration vector in a single estimated model, and loss of efficiency. Second, the Johansen maximum likelihood provides a more unified framework for estimating and testing long run relationship in the context of error correction models (Kumar *et al.,* 2012). Third, the Johansen cointegration approach perform better than the other cointegration tests, even when the errors are normally distributed, or the dynamics of the vector error correction model (VECM) are unknown, and additional lags are incorporated (Gonzalo, 1994). Fourth, Johansen approach treats either all or a set of variables in the model as jointly determined. Macroeconomic time series can exert influence on certain explanatory variables. If not tackled, such reverse feedback could cause biased and inefficient coefficient estimates in the model (Khonder *et al*., 2012).

(iii) Pesaran *et al*., (2001) developed an efficient single equation technique for testing cointegrating relationships among variables in a finite sample. The method is applied regardless of whether the variables are exclusively *I*(0), *I*(0) or jointly cointegrated. But the ARDL single equation approach is unable to handle several cointegration relations simultaneously, therefore, a simple cointegration test approach is needed to overcome this shortcoming in such complex multivariate model.

The Johansen multivariate test (Johansen, 1988; Johansen and Juselius, 1990; Johansen, 1991) for cointegration is a generalization of the augmented Dickey-Fuller method of Engle and Granger's. The generalization is the determination of linear combinations of variables for unit roots. The Johansen multivariate cointegration test is based on the computation of maximum likelihood statistics of making it possible to examine all the cointegrating vectors in a condition of more than two variables up to *N* number of cointegrating vectors. As such, the Dickey-Fuller test, it implies that standard asymptotic distributions do not apply. If there are *n* number of variables and there will be *r* number of cointegrating vectors, then the variables do not have unit roots.

According to Johansen and Juselius (1990), the cointegration test begins with the vector autoregression (VAR) of order *P* specified as:

$$\mathbf{y}_t = \boldsymbol{\mu} + \mathbf{A}_1 \mathbf{y}_{t-1} + \ldots + \mathbf{A}_p \mathbf{y}_{t-p} + \varepsilon_t \tag{3.13}$$

where $\mathbf{y}_{t}$, is the *n*x**1** vector of variables that are integrated of order one, denoted by *I*(1), and ε_t is the *n*x**1**vector of innovations. Thus, VAR can be re-specified as:

$$\Delta \mathbf{y}_t = \boldsymbol{\mu} + \boldsymbol{\Pi} \mathbf{y}_{t-1} + \sum_{i-1}^{p-1} \Gamma_i y_{t-i} + \varepsilon_t \quad \text{, where} \tag{3.14}$$

$$\boldsymbol{\Pi} = \sum_{i=1}^{p} A_i - I \quad \text{and} \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j \tag{3.15}$$

Now, if the coefficient matrix **Π** has reduced rank $r < n$, then there exist n x r matrices α and β each with rank r such that **Π** = **αβ** and $\boldsymbol{\beta}\mathbf{y}_t$ is stationary. r is the number of cointegrating relationships, the elements of **α** is known as the adjustment parameters in the vector error correction model and each column of **β** is a cointegrating vector. It can be shown for a given r, the maximum likelihood estimator of **β** explain the combination of y_{t-1} that yields the r largest canonical correlations of $\Delta\mathbf{y}_t$ with $\mathbf{y}_{t-1}$ after correcting for lagged differences and deterministic variables when present.

Johansen and Juselius (1990) and Johansen (1991) proposes two types of likelihood ratio tests of the significance of these canonical correlations. The reduced rank of the **Π** matrix, namely - the *trace* test (λ_{trace}) and *maximum eigenvalue* test (λ_{max}),[15] shown below:

$$\lambda trace = -T\sum_{i=r+1}^{n}\ln(1-\lambda_i) \tag{3.16}$$

$$\lambda \max = -T\ln(1-\lambda_{r+1}) \tag{3.17}$$

where T is defined as the sample size and i λ is the ith largest canonical correlation. The *trace* test is used in testing the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $r + 1$ cointegrating vectors. Neither of these test statistics follows a chi square distribution in general. The asymptotic critical values can be found in Johansen and Juselius (1990). Since the critical values used for the *maximum eigenvalue* and *trace* test statistics are based on a pure unit-root assumption, they will no longer be reliable when the variables in the system are near-unit-root processes. A question is how

[15] The cointegration test is sensitive to lag length selection – Akaike Information Criteria (AIC), Final Prediction Error (FPE), Hannan-Quinn Information Criteria (HQ) or Schwarz Bayesian Criteria (SC), respectively. For this study, the lag selection is based on the two most commonly used criterias - AIC and SC. This does not mean they are inferior to other criterias, but they provide minimum value of the information criteria, which is better in selecting a true model (Gutierrez *et al.,* 2007).

sensitive Johansen's procedures deviate from the pure-unit root assumption. Johansen's methodology is typically used in a setting that all variables in the VAR system are $I(1)$, having stationary variables in the system is typically not an issue. Johansen (1991) stated that there is little need to pre-test the variables in the system to establish their order of integration. If a single variable is $I(0)$ instead of $I(1)$, this will reveal itself through a cointegrating vector whose space is spanned by the only stationary variable in the model. For example, Equation (3.13) describe a model in which $\mathbf{y}_t = (y_{1,t}\ y_{2,t})$ where $y_{1,t}$ is $I(1)$ and $y_{2,t}$ is $I(0)$, one should expect to find that there is one cointegrating vector in the system which is given by $\boldsymbol{\beta} = (0\ 1)$. In the case where $\boldsymbol{\Pi}$ has full rank, all n variables in the system are stationary.

The above specification tests of the cointegrating vector suggest a way of making inference more robust in the potential presence of near-unit-root variables. For instance, considering the bivariate case, explicitly testing whether $\boldsymbol{\beta} = (0\ 1)$ will help to rule out spurious relationships that are not rejected by the initial maximum eigenvalue or trace test. Although, we argue that such specification tests should be performed in almost every kind of application, they are likely to be extra useful in cases where the variables are likely to have near-unit-roots and the initial test of cointegration rank is biased.

3.5.3 Parsimonious Error Correction Model (PECM)

Once the variables are incorporated into the VAR model, and are found to be cointegrated, then error correction model can be estimated using a Johansen approach to estimate the dynamic relationship of the prepared model. The connection between the cointegration approach and the error correction model is formalized in the Granger and Weiss (1983) and Engle and Granger (1987) representation. Consider the following VAR specification with lags p.

$$y_t = V + \mathrm{A}_1 y_{t-1} + ... + \mathrm{A}_p y_{t-p} + \varepsilon_\mathrm{t} \tag{3.18}$$

Where y_t denotes K x 1 vector variables, V represents K x 1 vector of parameters, A_1 – A_P are the K x K matrices of parameters, and ε_t is a K x 1 vector of disturbances. ε_t has mean 0, has covariance matrix $\sum$, and is i.i.d. normal over time. Any VAR(p) can be re-written as a VECM in the following form.

$$\Delta y_t = V + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \varepsilon_t \tag{3.19}$$

Where $\mathbf{\Pi} = \sum_{j=1}^{j=p} \mathrm{A}_j - \mathbf{I}_\mathrm{i}$ and $\mathbf{\Gamma}_i = -\sum_{j=i+1}^{j=p} \mathrm{A}_j$. According to Engle and Granger (1987) if the variables yt are $I(1)$ the matrix $\mathbf{\Pi}$ in equation (3.19) has rank $0 \leq r < K$, where r is the number of linearly independent cointegrating vectors. If the variables cointegrate, $0 \leq r < K$ and equation (3.19) indicates that a VAR in the first difference is misspecified since it withhold the lagged level term $\mathbf{\Pi y}_{\mathrm{t-1}}$.

Consider that $\mathbf{\Pi}$ has reduced rank $0 < r < K$ so that it can be expressed as $\mathbf{\Pi} = \boldsymbol{\alpha\beta}$, where α and β are both r x K matrices of rank r. Without further restrictions, the cointegrating vectors are not identified: the parameters (α, β) are identical from the parameters $(\alpha\Psi, \beta\Psi^{-1})$ for any r x r nonsingular matrix Ψ . On account that only the rank of $\mathbf{\Pi}$ is identified, the VECM is said to establish the rank of the cointegrating space, or corresponding with the number of cointegrating vectors. The estimation of the parameters of a Vector Error Correction Model (VECM) requires at least r^2 identification restrictions. Additionally, the VECM specification in equation (3.19) also has two issues. If the variables in y_t are $I(1)$ but not cointegrated, $\mathbf{\Pi}$ is a matrix of zeros and thus has rank 0. Second, if all the variables are $I(0)$, $\mathbf{\Pi}$ has full rank K.

3.6 Summary

This chapter presents the research methodology, which will guide in accomplishing the analysis of the 3 research objectives outlined in Chapter 1. Starting with the conceptual framework, which describes the interrelationship among the variables constituting the 3 objectives of the study. Objective 1 investigates the determinants of external debt and debt build up in Nigeria while objective 2 examines empirically the role of the debt in promoting public investment. Objective 3 provides an empirical analysis on the effect of the overall external debt ratios on growth by constructing a single index referred to *external debt composite index*. Empirical models of the respective research objectives were specified using variables that are justified and documented in both theoretical and economic literature. The chapter also discusses the estimation techniques starting from the stationarity process whereby Augmented Dickey Fuller (ADF) and Phillips and Perron (PP) unit root test was adopted for the stationarity of the variables. A conventional and widelys used method - Johansen multivariate cointegration approach has been employed across the 3 research questions to estimate the long run cointegrating relations because of multivariate framework in natural. Finally, a Vector Error Correction Model (VECM) was specified to measure the short run dynamic relation and the speed of adjustment toward a long run relationship.

CHAPTER 4: DETERMINANTS OF EXTERNAL DEBT IN NIGERIA: AN EMPIRICAL INVESTIGATION

4.1 Introduction

This chapter deals with the objective 1 empirically examine the key factors those in determining the accumulation of external debt in a developing country, Nigeria. The increasing external debt of Nigeria is generally considered as the major challenge against the country's economic development in recent decades. In spite of the fact that Nigeria was among the highly indebted poor countries that benefited from a debt relief in 2005. As of late, there are remarkable concerns from the academic researchers and policy makers on the rapidly increasing external debt. Theoretically, external debt helps countries (such as Nigeria) with financing constraints to fund capital projects for stimulating long run economic growth. Nonetheless, a bulk of empirical studies were reviewed (see Chapter 2), and have documented a wide range of inter-connected factors that justify the external indebtedness in Nigeria.

The rest of the chapter is structured as follows. Section 4.2 presents the empirical results and discussion of key findings, in particular Johansen cointegration test, and the estimated parsimonious error-correction model. The last section 4.3, summarizes and conclude the chapter.

4.2 Empirical Results and Discussion

This section presents the results of debt equation as to achieve Objective 1, which empirically examine the factors determining the accumulation of external debt in Nigeria. Also, discussions of the key findings were carried out in the respective sub-section.

4.2.1 Unit Root Tests

The unit root tests for the stationarity of the underlying variables are conducted on both levels and the first difference using Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. Two different models with varying deterministic component are employed while conducting the tests. First, the model with the constant, which assumes no linear trends in the levels of the variable, such that the first differenced series have a zero mean i.e. model with an intercept. Second, a model with a constant and a trend, which take account of unknown exogenous growth. Table 4.1 reports the results of the unit root tests of the 4 candidate variables of the debt equation specified in section 3.3.1 equation 3.2. As can be seen from the Table, log of external debt to GDP ratio (ln*edy*), log of oil price (ln*olp*), log of gross domestic saving to GDP (lng*ds*) are not stationary at level, but becomes stationary after the first difference. Log of fiscal deficit to GDP (ln*def*) appear to be non stationary in the level except in PP test, which is stationary at level. Going by the results, three out of the four candidate variables (ln*edy,* ln*olp and* lng*ds*) indicate stationarity at first difference in both tests only ln*def* is stationary at level base on PP test,[16] therefore, it is concluded that all the variables follow the *I*(1) process.

[16] In spite of the fact that Johansen methodology is basically employed where all the variables are *I*(1), however, if a single variable is *I*(0) instead of *I*(1) not an issue (see Johansen, 1995; Hjalmarsson and Osterholm, 2007).

Table 4.1: Unit root tests

Variable	ADF H_0: ρ has a unit root		PP H_0: ρ has a unit root	
	Constant	Constant and Trend	Constant	Constant and Trend
ln*edy*	-0.708 [0]	-0.949 [0]	-0.761 [3]	-0.714 [7]
	(0.404)	(0.940)	(0.819)	(0.965)
Δln*edy*	-5.791 [0]	-5.014 [1]	-5.767 [6]	-6.533 [13]
	(0.000)***	(0.001)***	(0.000)***	(0.000)***
I(*d*)	*I* (1)	*I* (1)	*I* (1)	*I* (1)
ln*olp*	-2.242[0]	-2.718 [0]	-2.232 [3]	-2.718 [0]
	(0.194)	(0.234)	(0.198)	(0.234)
Δln*olp*	-8.654 [0]	-8.645 [0]	-8.718 [2]	-8.664 [1]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I(*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)
ln*gds*	-0.051[0]	-2.481[3]	0.521[32]	0.597 [15]
	(0.659)	(0.335)	(0.824)	(0.841)
Δln*gds*	-8.142[0]	-8.115 [0]	-13.504[28]	-17.369 [21]
	(0.000)***	(0.000)*	(0.000)***	(0.000)***
I(*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)
ln*def*	-0.903 [3]	-2.345 [3]	-1.026 [2]	-1.658 [3]
	(0.327)	(0.401)	(0.269)	(0.000)***
Δln*def*	-6.538 [2]	-6.846 [2]	14.611 [20]	19.200 [17]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I(*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)

Note: ***, ** and * indicate 1%, 10% and 1% significance level. The optimum lag [.] is suggested by Akaike Information Criterion (AIC) with maximum lags of 3 due to limited annual observations, while the Newey and West Bartlett kernel are used for PP test.

4.2.2. Lag Selection Criteria

Following the confirmation of the order of integration, the next is to determine the cointegration relation. Prior to that, an appropriate lag structure has to be identified since the Johansen cointegration approach is sensitive to lag selection. This selection of lag order is conducted from a number of lag length criterion, namely, sequential modified test statistic of likelihood ratio (Log L), Likelihood ratio test (LR), Final prediction error (FPE), Akaike Information Criteria (AIC), Schwarz information criteria (SC) and Hannan-Quinn information criteria (HR). Table 4.2 reports the lag order selection with numerous criteria weights from which the model with minimum value is to be chosen as the optimum lag length for the VAR model that would influence an appropriate cointegration result. Except sequential modified test statistics of the

likelihood ratio, all the criteria selected lag order 1, and out of them final prediction error is chosen based on the minimum value of the test statistics for the external debt model. Meanwhile, to ensure that the lag with significant information is included in the VAR model, VAR lag exclusion wald tests are also conducted for serial correlation LM test (see Panel A of Table 4.3). The wald statistics suggest that lag order 1 is jointly significant in the VAR system, therefore, it is estimated using lag 1, respectively.

Table 4.2: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Lag	Sequential modified LR test statistic (Log L)	Likelihood ratio test (LR)	Final prediction error (FPE)	Akaike information criterion (AIC)	Schwarz information criterion (SC)	Hannan-Quinn information criterion (HQ)
0	-129.805	NA	0.008	6.527	6.694	6.587
1	-48.497	142.784*	0.000*	3.341*	4.177*	3.645*
2	-36.880	18.134	0.000	3.555	5.059	4.103
3	-27.454	12.873	0.000	3.875	6.049	4.667

Note: * indicates lag order selected by the criterion. Each test at 5% level.

Table 4.3: VAR Lag Exclusion Wald Tests

No. of Lag	ln*edy*	ln*olp*	ln*gds*	ln*def*	Joint
1	37.695	14.153	13.304	37.058	60.340
	(1.290)	(0.006)***	(0.009)***	(1.751)	(0.002)***
2	2.561	11.262	1.834	3.802	25.101
	(0.633)	(0.023)*	(0.766)	(0.433)	(0.268)
df	4	4	4	4	16

Notes: Figures in bracket are probability values. df indicate degrees of freedom.

4.2.3 Johansen Multivariate Cointegration Test

Having identified the lag order, the Johansen cointegration test is conducted based on the maximum likelihood ratio using the 5 cointegration test specifications[17] using the lag selected (Johansen, 1988 and Johansen and Juselius,1992; 1995). This is to select an appropriate normalized cointegrating vector based on economic relation, and in accordance with the theoretical literature. Also, it provides the error correction term (*ect*) for the vector error correction model (VECM). Recall that two zero-one *step* dummies are incorporated as the exogenous variables in the Johansen cointegration test in order to pick up the expected structural break. First, the exchange rate devaluation dummy (*DED_86*) that captures the impact of Nigerian economic reform policy tagged Structural Adjustment Program introduced in 1986. Second, the debt relief dummy (*DDR_05*) that account for the Highly Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiative (MDRI) granted to Nigeria in 2005 by the Paris club creditors.

However, the Johansen cointegration test is based on 2 test statistics for estimating the cointegrating equations (i.e. rank of Π) – the trace test (Tr) and the maximum eigenvalue (L-max) test. Both trace and eigenvalue cointegration are based on r number of cointegration vectors with H_0: $r = \alpha$; against H_1: $r \geq \alpha + 1$, α is set from 0 to 3, consecutively. Table 4.4 presents the test results of the Johansen multivariate cointegration test based on the trace and maximum eigenvalue statistics. First, the results indicate contegrating vectors at most 3 in trace test and 1 in maximum eigenvalue statistics in all the specifications. This confirmed the existence of at least 1 cointegrating relationships among the 4 candidate variables in the model. Of the suggested 5 cointegrating equations (CEs), only ln*edy*(.) relation i.e. lnedy_t -lnolp_t - lngds_t -lndef_t being considered for answering the research question 1, while the other 4

[17] These are No intercept or trend in CE or test VAR, intercept (no trend) in CE- no intercept in VAR, intercept (no trend) in CE and test VAR, intercept and trend in CE-no intercept in VAR and intercept and trend in CE-intercept in VAR

CEs are mainly the ln*olp*(.), lng*ds*(.), and ln*def*(.) relations those are not the main focus of this study. For example, the domestic national savings relation, lngds_t(.) is influenced positively by the governing savings rate (lndef_t), but negatively by external debt (lnedy_t). Second, out of the 5 cointegrating equations for lnedy_t -lnolp_t -lngds_t -lndef_t, specification 2 (with intercept and no time trend) as of VAR (1) has been preferred for the analysis because of their reasonable estimates (i.e. size and sign) as suggested by the theories or *a priori*. While the other normalized equations - 1, 3, 4 and 5 (see Table 4.4) are less appropriate because they do not fulfill the necessary requirements as mentioned above that their estimated coefficients was either absolutely high or statistically insignificant (at least 0.10 levels) as *a priori* expectations. Table 4.5 reports the normalized cointegration relation coefficients of the external debt equation. All of the estimated coefficients have their expected signs and statistically significant at least at the 10% level as shown by the *t*-statistics in square bracket. The estimated coefficient of oil price (ln*olp*) is ambiguous, it appears to be in negative sign at the 1% level, -1.319. A 1% increase in the oil price is associated with the response of external debt approximately by 1.32% lower. This implies that the collapse of the oil prices beginning from the early 1980s had created a huge government budget deficit. Consequently, the unhealthy financial condition compelled oil exporting countries like Nigeria into foreign borrowing at different maturities to fill-in the financing gap between desired government spending and country's available resources. Because about 90% of the Nigerias foreign exchange earning is fundamentally depends on revenue from oil export, which serve as a major source for funding government expenditure and there was no effective contingency plans for savings to bail the financial difficulties in the case of oil prices fall. This flung the country into debt crisis.

Table 4.4: Johansen Multivariate Cointegration Test, VAR=Lag (1)

Specification 1: No intercept or trend in CE or test in VAR		
Hypothesis No. of CE (s)	Trace test statistics	Max-eigen value statistics
None	48.676 (0.005)***	28.263 (0.006)***
At most 1	20.412 (0.143)	15.717 (0.119)
At most 2	5.244 (0.533)	3.599 (0.692)
At most 3	1.645 (0.234)	1.645 (0.234)
Cointegrating vectors	1	1
Long run normalized equation: ln*edy* =	1.799ln*olp* -3.308ln*gds* +0.987ln*def*	
	(0.355) (0.562) (0.143)	
	[5.067]*** [-5.886]*** [6.902]***	
Specification 2: Intercept (No trend) in CE – no intercept in VAR		
None	66.073 (0.003)***	28.274 (0.054)**
At most 1	37.798 (0.025)**	19.880 (0.105)
At most 2	17.918 (0.101)	15.155 (0.064)
At most 3	2.262 (0.626)	2.762 (0.626)
Cointegrating vectors	2	1
Long run normalized equation: ln*edy* =	-1.319ln*olp* -2.355ln*gds* + 0.831ln*def* -0.395	
	(0.265) (0.538) (0.123) (1.128)	
	[-4.977]*** [-4.377]*** [6.756]*** [-0.350]	
Specification 3: Intercept (no trend) in CE and test VAR		
None	60.931 (0.001)***	28.122 (0.042)**
At most 1	32.809 (0.021)**	18.783 (0.103)
At most 2	14.025 (0.082)*	11.778 (0.119)
At most 3	2.246 (0.133)	2.246 (0.133)
Cointegrating vectors	3	1
Long run normalized equation:ln*edy* =	-1.665ln*olp* -3.108ln*gds* + 0.941ln*def*	
	(0.339) (0.688) (0.157)	
	[-4.911]*** [-4.517]*** [5.993]***	
Specification 4: Intercept and trend in CE-no intercept in VAR		
None	68.382 (0.019)**	30.350 (0.080)*
At most 1	38.032 (0.141)	19.046 (0.302)
At most 2	18.985 (0.281)	11.782 (0.435)
At most 3	7.203 (0.323)	7.203 (0.323)
Cointegrating vectors	1	1
Long run normalized equation: ln*edy* =	0.928*olp* -2.408ln*gds* +0.790ln*def* + 0.035trend	
	(0.232) (0.554) (0.102) (0.022)	
	[4.000]*** [-4.346]*** [7.745]*** [1.590]	
Specification 5: Intercept and trend in CE-intercept in VAR		
None	60.076 (0.017)**	30.289 (0.057)**
At most 1	29.787 (0.162)	19.044 (0.210)
At most 2	10.743 (0.411)	7.766 (0.682)
At most 3	2.977 (0.084)*	2.977 (0.084)*
Cointegrating vectors	1	1
Long run normalized equation: ln*edy* =	-0.968ln*olp* -2.493ln*gds* +0.809ln*def*	
	(0.244) (0.584) (0.108)	
	[-3.967]*** [-4.268]*** [7.490]***	

Note: ***, ** and * indicates 1%, 5% and 10% significance level. Two zero-one variables (*DED_1986* and *DDR_2005*) have been incorporated as the exorgenous variables in the estimation.

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Table 4.5: Normalized Cointegration Equation (CE) of External Debt (Specification 2)

ln*edy* =	-1.319ln*olp*	-2.355ln*gds*	0.831ln*def*	-0.395
	(0.265)	(0.538)	(0.123)	(1.128)
	[-4.977]***	[-4.377]***	[6.756]***	[-0.350]

Note: *** and ** indicates 1% and 5% significance level. Figures in bracket and square bracket are standard errors and t-statistics.

However, during the oil boom in 1973-1974, Nigeria enjoyed oil windfalls and global credit rating in the international capital market for unlimited borrowing with zero expectation of default. Unfortunately, Nigeria failed to manage the resources in the productive sectors, so as to improve economic and social conditions for the future. In addition, low competitiveness of the nontradeable sectors of the economy had increased the external debt stock. The empirical results coincided with the earlier findings by Pastor (1989) in Latin America, Lekomola (2010) in Africa, and the views of Manzano and Rigbon (2007) and Krueger, (1987). Similarly, the findings are in accordance with the Dutch Disease hypothesis (Corden and Neary, 1982 and Corden, 1984).

The estimated coefficient of gross domestic savings is -2.355 statistically significant at the 1% significance level. A 1% increase gross domestic savings rate, will result to a higher rate of external debt approximately by 2.36%. This suggests that inadequate savings is a financial phenomenon in Nigeria, since savings has been considered as a tool for macroeconomic stability and promote development. The inadequate domestic savings rates and over ambition of government to augment domestic savings had forced the nation to borrow more, which eventually, aggravates the stock of external debt. This finding is in line with the other studies such as Boamah (1988) and Okoye (2000). Also, it is conform to a *priori* expectation of the theoretical analysis of the capital accumulation theory championed by Domar (1939); Harrod (1946), Chenery and McKinnon, (1964), Strout, (1966); Harberger (1985) among others. They suggested that foreign borrowing can supplement domestic savings and thus investment, as well as

promote long term growth in developing countries. The results also reflect what was advocated earlier in the context of capital mobility in developing countries by Colman and Nixson (1978), Calvo *et al*., (1996), and Reinhart and Rogoff (2010).

The estimated coefficient of the government fiscal deficit (ln*def*) is 0.831, and statistically significant at the 1% level. A 1% increase in the fiscal deficit worsens (increase) the Nigerian external debt position by 0.83%. The increase in the fiscal deficit could be due to many factors. For example, Nigerias extra budgetary activities in which the government expenditure outweigh the expected revenue, and in most cases not appropriately utilized. Added to that, the decline in global oil prices in the global market is also part of the factors. As a result, government resort to borrowing in order to finance the unprecedented deficit, which directly increase the debt stock. This finding is in agreement with three gap model that an increase in external debt is associated with a high government fiscal deficit (Bacha, 1990; Tailor, 1993). It is supported by other studies by Sachs *et al*., (1981), Dornbusch (1984), Bader and Magableh (2009), Awan *et al*., (2015) and among others.

4.2.4 Parsimonious Error Correction Model

The existence of a long run cointegrating relationship implies a dynamic short run model (error-correction model), which can be estimated and analyse the response of change of each variable on the external debt. The lagged residual, ect_{t-1} derived from the cointegrating vectors – the second CE (see Table 4.5) is incorporated into vector error correction models. One of the vector error correction model for objective 1 is specified as follows:

$$\Delta \ln edy_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta \ln edy_t + \sum_{i=0}^{p} \alpha_2 \Delta \ln olp_t + \sum_{i=0}^{p} \alpha_3 \Delta \ln gds_t + \sum_{i=0}^{p} \alpha_4 \Delta \ln def_t$$

$$+ \alpha_5 DED\_86_t + \alpha_6 DDR\_05_t + \lambda_1 ect_{t-1} + \mu_t \quad (4.1)$$

where Δ is the first difference operator, p is the lag length and α_i are the coefficients of the variables in the short run dynamics of the parsimonious error correction model, and ect_{t-1} denotes the lagged error correction term generated from the *preferred* cointegrating vector. t and μ are time dynamic and the Gaussian error term to capture unobserved variables in the model. Unlike in the long run equation, *DED_86* and *DDR_05* are the two *impulse* dummies incorporated in the short run to account for exchange rate devaluation following the government economic reform introduced in 1986, and the HIPCs and MDRI debt relief in 2005, respectively.

To estimate the parsimonious error correction model, the famous technique by Hendry (1986, 1987, 1995) general to specific approach has been applied to estimate the dynamic model. This is by eliminating statistically insignificant variables (lags) one by one in order to arrive at most appropriate parsimonious error correction results. A maximum lag order of 5 has been considered, after a series of elimination of the insignificant coefficients and found 3 lags for the explanatory variables - log of oil price (ln*olp*), log of gross domestic savings (ln*gds*) and fiscal deficits (ln*def*) is appropriate for the error correction model. [18]

The parsimonious error correction model is reported in Table 4.6. Interestingly, the results obtained are in agreement with the normalized cointegrating vector reported in Table 4.5. All the estimated coefficients are statistically significant at the conventional

[18] A number of empirical studies have used general to specific approach using 3, 4 or 5 lags in an annual data in order to determine the best fit dynamic model (see, for example, Soytas *et al*., 2001; Chakraborty and Basu, 2002; Akinlo, 2004; Beaudry and Portier, 2006; Bhaskara, 2007; Jayaraman and Choong, 2008; Onafowora and Owoye, 2008; Koutroumanidis *et al*., 2009 among others).

levels (i.e. 1%, 5% or 10%). The coefficients have the reasonable size and magnitude of the variables that long runs are relatively larger than of the short runs. For example, the estimated lagged of external debt negative and significant, indicating that Nigeria was successfully managed to lower country's external debt through debt relief, in spite of this achievement, it gives the country opportunity to borrow more and still indebted. The estimated short run coefficients of the oil price ($\Delta \ln olp_t$) is -0.337, negative and statistically significant at the 1% level. It is approximately 0.34% compared to 1.32% in the long run, respectively. This suggests that a 1% decrease in the oil prices is associated with increase in external debt stock by 0.34%, since the country has to borrow to fill the resource gap due to fall in the oil revenue, which provides over 90% of the Nigerias foreign earnings, respectively.

The estimated coefficient of change in gross domestic savings is also negative and statistically significant at 3 year lag ($\Delta \ln gds_{t-3}$) is -0.174 while the change in fiscal deficits ($\Delta \ln def$) is 0.340 both at the 5% and 1% significant level. Poor domestic savings are normally accompanied by higher fiscal deficits in the government of developing countries like Nigeria, although the external debt ratios remain low, but worsening of fiscal deficit weaken the revenue source leading monumental debt stock. It has been estimated that between 1989 and 2013 the ratio of Nigeria's fiscal deficits to GDP reached an average rate of 14.86%, which is regarded to be 3 times higher than that in the previous years (CBN, 2013). In addition, fiscal deficits are largely financed through external borrowing, hence, the burden of country's external debt could be higher and generate additional debt. These results clearly acknowledged the fiscal gap experience by Nigeria, and advocated the three gap model by Bacha (1990). Also, the positive effect of fiscal deficits on external debt affirmed that high government deficits

deteriorate external debt, and crowd-out resources through debt service payments (Fosu, 1996).

Table 4.6: A Parsimonious Error Correction Model, Equation (4.1) dependent variable - ln*edy*

Variable	Coefficient	Std.Error	t-Statistics	Prob.
Δln$edy_{(-1)}$	-0.178	0.132	-1.346	0.191
Δln$edy_{(-2)}$	-0.388***	0.125	-3.092	0.005
Δln$edy_{(-5)}$	-0.199	0.121	-1.645	0.113
Δln*olp*	-0.337***	0.116	-2.900	0.008
Δln$olp_{(-3)}$	-0.098	0.065	-1.491	0.149
Δln$olp_{(-4)}$	-0.176***	0.061	-2.865	0.008
Δln$gds_{(-3)}$	0.174**	0.077	2.253	0.033
Δln*def*	0.340***	0.048	6.950	0.000
Δln$def_{(-3)}$	0.096	0.059	1.627	0.117
DED_86	-0.107*	0.062	-1.732	0.096
DDR_05	0.254**	0.102	2.469	0.021
ect_{t-1}	-0.044*	0.025	-1.774	0.089
R^2	0.810			
Adjusted R^2	0.694			
F-statistic	7.013***			
DW	2.033			

Diagnostic check	*F*-statistics [*p*-value]
χ^2*SERIAL* (1)	0.3240 [0.7113]
χ^2*NORMAL*	0.2264 [0.4766]
χ^2*ARCH* (3)	0.6722 [0.3598]
χ^2*RAMSEY* (1)	0.1283 [0.2052]

Notes: ***, ** and * indicate 1%, 5% and 10% level of significance. Figures in bracket (…) and square bracket [...] are the lag selected and the *p*-values. *DW,* χ^2*SERIAL,* χ^2*NORMAL,* χ^2*ARCH, and* χ^2*RAMSEY* are Durbin-Watson, LM tests for serial correlation, Jaque-Bera normality test, Heteroscedasticity and functional form (Ramsey RESET) respectively. The *ect* is the residual series of ln*edy* = -0.1.319ln*olp* - 2.355ln*gds* +0.831ln*def* +0.395 from the Johansen approach in which passes a battery of diagnostic tests.

The null hypothesis for the diagnostic tests are as follows:

(i) Serial correlation LM test: H_o: $\rho_1 = \rho_2 = \ldots \rho_\rho = 0$; H_1: $\rho_1 \neq \rho_2 \neq \ldots \rho_\rho \neq 0$

(ii) Normality : H_1: $X = N(.)$; H_1: $X \neq N(.)$

(iii) ARCH: H_o: $\rho_1 = \rho_2 = \ldots \rho_m = 0$; H_1:$\theta_{\rho k} \neq 0$, $1 \leq k \leq m$

(iv) RAMSEY RESET: H_o: $\varepsilon \sim N(0,\sigma^2 I)$; H_1: $\varepsilon \sim N(0,\sigma^2 I)$, $\mu \neq 0$

(v) CUSUM and CUSUMSQ: H_0: $\beta_i = \beta$; H_1: $\beta_i \neq \beta$

The estimated coefficient of the dummy for exchange rate devaluation (*DED_86*) that captures government economic reform policy (SAP) introduced in 1986 is (-0.107), negative and statistically significant at the 10% level. A 1% point in exchange rate devaluation leads to a significant increase in external debt approximately by 0.11%. This implies that the government economic reform policy (SAP) championed by the

World Bank and International Monetary Fund (IMF) had contributed significantly to the external debt accumulation in Nigeria. The result can be additionally argued that devaluation in the real exchange rate is associated with the huge trade deficit, which is attributed to government policy that allow the real exchange rate to converge towards equilibrium. This suggests that the more the exchange rate devaluation, the higher the external debt since the domestic currency (i.e. Nigerian Naira) losses its value to foreign currency, notably US dollar or pound sterling because external debt is denominated in foreign currencies, which affect the debt stock significantly. Similarly, it result to contractionary effect via external debt whereby the devaluation increases the debt service payments, which also deteriorated the external debt stock. For example, in 1980, debt ratios were 32% and 15% of the country's exports and GDP. By 1990, both ratios reached 227% and 120% of Nigerias exports and GDP. However, following the debt relief package received by the country, the country's debt ratios declined drastically to 6% and 3% of the exports and GDP after the debt relief in 2006. Meanwhile, the decision by Nigeria to continue external borrowing concurrently with the devaluation of Naira tends to have a serious effect on the stock of external debt in the country. In a nutshell, exchange rate devaluation has been a core factor among the determinants of external debt in Nigeria.

On the other hand, the estimated coefficient of the dummy debt relief (*DDR_05*) is 0.254, positive and statistically significant at the 5% level. A 1% increase in resources freed as a result of debt relief influences external debt borrowing approximately by 0.25%. Although, the provision of debt relief to highly indebted poor countries by the multilateral debt relief initiatives reduced the rate of inflation, but provide an opportunity for government to increase public sector budget deficit as a result the fiscal adjustment remain unsuccessful as the demand for more external debt increases. This indicates that debt relief granted by the Paris club creditors in 2005, made Nigeria to be

creditworthy, and open the chance for the government to re-borrow, in which the external debt reached US$8.8 billion in 2013 from US$3.7 billion in 2006. This finding is consistent with the view of Easterly (2002) and Tiruneh (2004) that debt reduction brought an insignificant benefit to the debtor countries as the debt reduction or forgiveness has paved the way for the beneficiary countries to seek for fresh loans corresponding to the sum of debt reduction to overcome capital deficiency, until they restored the previous net worth, and convert to heavily indebted countries.

The estimated coefficient of the error correction term (ect_{t-1}) is in negative sign as expected by the theory, and it is statistically significant at the 10% level. This finding further confirmed the existence of a co-integrating relation among the respective variables under investigation. The estimated coefficients of this term (ect_{t-1}) is -0.044, which captures the speed of adjustment toward equilibrium after a shock to the system, it is 0.04% per year.

The diagnostic tests are presented in the lower bottom of Table 4.6. The $\chi^2 SERIAL$ statistic indicated the absence of serial correlation. While the Jaque Bera test suggested that the estimated residuals are normally distributed. The autoregressive conditional heteroscedasticity and Ramsey RESET tests confirmed that the estimated models had been specified correctly including the lag structure. Figures 4.1 illustrate the respective CUSUM and CUSUMSQ results (Brown *et al*., 1975) that the estimated ECM is stable as the test statistics are within the 5% significant level in the both CUSUM and CUSUMSQ.

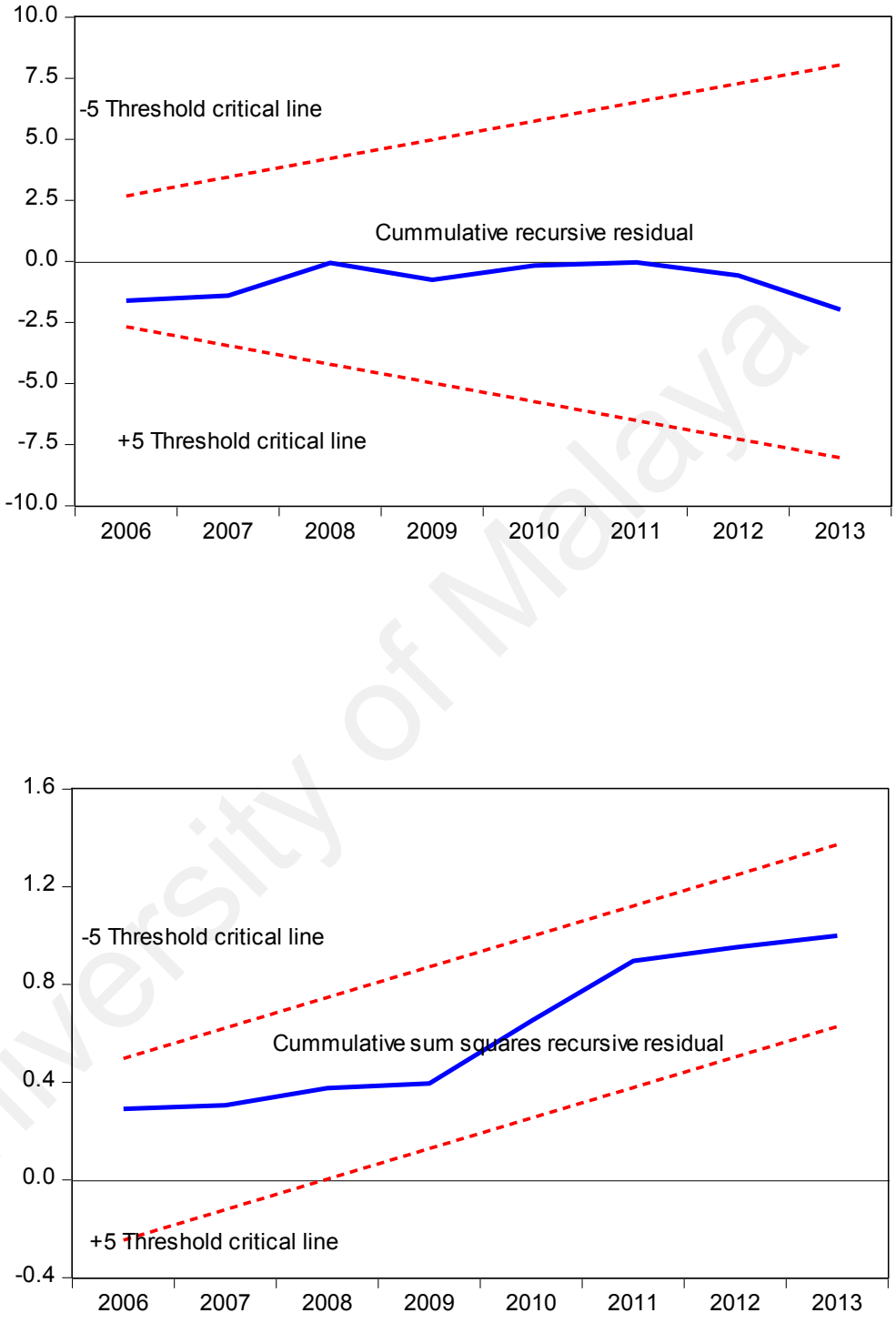


Figure 4.1: Residual Plots of CUSUM and CUSUMSQ for the parameter stability

4.3. Summary

This chapter investigates empirically the factors determining the behaviour of external debt in Nigeria over the period 1970 to 2013. After examining the stationarity of the variables, Johansen multivariate cointegration test has been applied to observed the long run cointegrating relationships among the variables. Two exogenous zero-one *step* dummy variables was incorporated in the cointegration test to take care of the outliers. The empirical results suggest a unique cointegrating relationship among the underlying variables. The estimated normalized long run coefficients sign was according to the theory deliberated in the study. Nevertheless, the presence of long run cointegrating relation suggests that the estimated model for the Nigerian external debt equation is consistent with the theory. Also, two zero-one *impulse* dummy variables was incorporated in the short run model to account for the government economic reform of 1986 and debt relief in 2005. It was found that oil price, gross domestic savings, fiscal deficit and the dummy variables are significant. This implies that all the variables are important 'drivers' for determining the Nigerian decision on external borrowing as well as debt build-up in the country. Besides foreign earnings from the exports primary products, sourcing capital through external finance to augment savings and investment gap in the case of dwindling commodity prices is of paramount importance for developing countries (Chenery and Bruno, 1962; Mckinnon, 1964; Chennery and Strout, 1966). Nigeria should focus on investment in real sectors, especially in agriculture and manufacturing sectors to increase export performance. This could enable the country to generate adequate foreign earnings and stimulate domestic savings, and reduce dependency on oil revenue and high demand for foreign resources. Furthermore, deficit financing through external borrowing increases the stock of external debt. Hence, the government should curtail unnecessary expenditures, because experiences have shown that a large portion of the borrowed funds were spent on unproductive

investment rather than productive investment. Therefore, improving sources of government income through a simplified tax base structure, in conjunction with the shift from overemphasizing on Keynesian view of fiscal stabilization through deficit spending would reduce the high deficit and the increasing tendencies for government borrowing.

CHAPTER 5: IMPACT OF EXTERNAL DEBT ON FINANCING PUBLIC CAPITAL FORMATION: EVIDENCE FROM NIGERIA

5.1 Introduction

The objective 1 (Chapter 4) had been examined basically on the factors governing the determination of external debt in Nigeria, which are largely caused by dwindling oil prices and other macroeconomic uncertainties such as shock of domestic savings, fiscal deficits, exchange rate and so on. To extend the analysis of external debt issues in Nigeria, this chapter documented the empirical results of the preceding model (equations 3.4), which focuses on public investment (objective 2). Given that infrastructure development projects are the major constraint to the potential growth in developing countries, and it is largely financed through external borrowing. More formally, it looked at the effect of external debt on financing public capital investment.

5.2 Empirical Results and Discussion

This sub-section presents and discusses the empirical estimates of equation (3.4), investigating the impact of external debt on financing public capital formation in Nigeria (as in Objective 2).

5.2.1 Unit Root Tests

Like in the preceding chapter, before the specification of the VAR model, the properties of the 4 variables – public investment (ln*ing*), external debt (ln*edy*), debt service (ln*dsx*) and foreign direct investment (ln*fdy*) under investigation have been examined using two conventional unit root tests - ADF and PP unit root tests. Table 5.1 reports the results of the unit root tests of the 4 candidate variables of the investment equation specified in

section 3.3.1 equation 3.4. Except ln*fdy* based on PP test,[19] all the variables are not stationary at level. However, by taking the first difference on the data eliminate the non-stationary, therefore, all the variables were assumed stationary at first difference, *I*(1) process.

Table 5.1: Unit root tests

Variable	ADF $H_0: \rho$ has a unit root		PP $H_0: \rho$ has a unit root	
	Constant	Constant and Trend	Constant	Constant and Trend
ln*ing*	-0.698 [3] (0.835)	-2.319 [1] (0.414)	-0.282 [3] (0.918)	-1.788 [1] (0.693)
Δln*ing*	-3.927 [1] (0.004)***	-4.678 [1] (0.002)***	-5.218 [3] (0.000)***	-5.742 [2] (0.000)***
I (*d*)	*I* (1)	*I* (1)	*I* (1)	*I* (1)
ln*edy*	-0.708 [0] (0.404)	-0.949 [0] (0.940)	-0.761 [3] (0.819)	-0.714 [7] (0.965)
Δln*edy*	-5.791 [0] (0.000)***	-5.014 [1] (0.001)***	-5.767 [6] (0.000)***	-6.533 [13] (0.000)***
I (*d*)	*I* (1)	*I* (1)	*I* (1)	*I* (1)
ln*dsx*	-0.932 [0] (0.768)	-0.931 [0] (0.942)	-1.164 [2] (0.680)	-1.126 [2] (0.912)
Δln*dsx*	-5.563 [0] (0.000)***	-5.765 [0] (0.000)***	-5.572 [2] (0.000)***	-5.819 [6] (0.000)***
I (*d*)	*I* (1)	*I* (1)	*I* (1)	*I* (1)
ln*fdy*	-1.822 [1] (0.364)	-1.796 [1] (0.688)	-3.217 [2] (0.025)**	-3.123 [1] (0.114)
Δln*fdy*	-10.805 [0] (0.000)***	-10.717 [0] (0.000)***	-11.531 [7] (0.000)***	-11.523 [7] (0.000)***
I (*d*)	*I* (1)	*I* (1)	*I* (1)	*I* (1)

Note: ***, ** and * indicate 1%, 10% and 1% significance level. The optimum lag [.] is suggested by Akaike Information Criterion (AIC) with maximum lags of 3 due to limited annual observations, while the Newey and West Bartlett kernel are used for PP test.

5.2.2 Lag Length Selection

Since a stationarity has been established for the variables under investigation, the question is whether or not the long run equilibrium among the variables can exist. Prior to cointegration test, an appropriate number of lag of the VAR model has to be identified as the Johansen cointegration test is sensitive to lag selection. The optimum lag is chosen from a number of lag length criteria, namely, the Akaike Information

[19] For detail, see foot note No. 16

Criteria (AIC), sequential modified test statistic of likelihood ratio (LR), Final prediction error (FPE), Schwarz information criterion (SC) and Hannan-Quinn information criteria (HR). Despite the fact that LR, FPE, AIC, SC, and HQ may suggest a similar lag order, however, emphasis is given on criteria with lowest or minimum value for the cointegration test. Table 5.2 reports the lag order selection criteria in which the minimum value is chosen to determine the cointegration relation among the variables. Thus, a lag order of 2 is chosen based on the minimum value of Final prediction test statistic for the external debt model. To ensure that the proper lag is incorporated in the cointegration test, VAR lag exclusion test were checked. As shown in Table 5.3, the Wald test suggests lag order of 2 as indicated by the joint significant in the VAR system.

Table 5.2: VAR Lag Order Selection Criteria

VAR lag order selection criteria						
Lag	Sequential modified LR test statistic (Log L)	Likelihood ratio (LR)	Final prediction error (FPE)	Akaike information criterion (AIC)	Schwarz information criterion (SC)	Hannan-Quinn information criterion (HQ)
0	-159.721	NA	0.0421	8.1860	8.3549	8.2471
1	-65.757	164.438	0.0008	4.2878	5.1322*	4.5931*
2	-45.316	31.683*	0.0007*	4.0658*	5.5858	4.6153
3	-34.930	14.021	0.0010	4.3465	6.5420	5.1403
4	-14.370	23.643	0.0009	4.1185	6.9896	5.1566

Note: * indicates lag order selected by the criterion. Each test at 5% level.

Table 5.3: VAR Lag Exlusion Wald Tests

No. of Lag	ln*ing*	ln*edy*	ln*dsx*	ln*fdy*	Joint
1	48.378	51.361	5.247	4.920	115.640
	(7.873)	(0.060)*	(0.262)	(1.295)	(0.000)***
2	2.531	22.184	4.914	6.088	36.803
	(0.038)**	(0.184)	(0.006)***	(0.192)	(0.002)***
df	4	4	4	4	16

Notes: Figures in bracket are probability values. df indicate degrees of freedom.

5.2.3 Johansen Multivariate Cointegration Tests

Table 5.4 presents the Johansen multivariate cointegration results for investment equation. The optimum lag of 2 was used, and two *step* dummy variables (exchange rate devaluation and debt relief) was included in the test to overcome structural changes stemming from the trend data. As can be seen, both trace test and max-eigenvalue statistics indicate cointegrating vectors at most 2 in each of the 5 testing specifications. This indicates the existence of a long run stable relationship among the variables in all the specifications over the sample period 1970 to 2013. Meanwhile, the estimated cointegrating equation of specification 2 is preferred for interpretation as in line with the theoretical expectation of the public investment behaviour.

Table 5.5 presents the normalized cointegrating equation estimates (normalized on the public investment variables). The empirical results provide a reasonable support for the *a priori* expectation that the respective variables have their expected sign and statistically significant as indicated by the *t*-statistics in square bracket at most 10% level. This indicates that the models are correctly specified, and reliable to explain the variables relationship. The estimated long run coefficient of external debt, lnedy_t is (-6.036), negative and statistically significant at the 1% level. This implies that for every 1% point increase in external debt, public investment fall by 6.04%, respectively. This suggests that the increasing external debt has not provided the expected infrastructure development to provide stimulus for potential economic growth. Similarly, the estimated coefficient of debt service, lndsx_t is (-2.845), and statistically significant at the 1% level. A 1% increase in debt service payments would reduce public investment approximately by 2.85%. The implication of this finding to the Nigerian economy is that debt service increasingly overwhelmed large portion of national resources (oil revenues and external debt).

Table 5.4: Johansen Multivariate Cointegration Test, VAR=Lag (2)

Specification 1: No intercept or trend in CE or test in VAR		
Hypothesis No. of CE (s)	**Trace test statistics**	**Max-eigen value statistics**
None	52.385 (0.001)***	22.482 (0.082)*
At most 1	29.902 (0.008)***	21.211 (0.014)**
At most 2	8.691 (0.187)	8.391 (0.150)
At most 3	0.299 (0.645)	0.299 (0.645)
Cointegrating vectors	2	2
Long run normalized equation: ln*ing* =	5.385ln*edy*	3.496ln*edx* 2.303ln*fdy*
	(2.857)	(1.069) (1.762)
	[1.884]*	[3.270]*** [1.307]
Specification 2: Intercept (No trend) in CE – no intercept in VAR		
None	66.851 (0.002)***	37. 883 (0.002)***
At most 1	28.967 (0.200)	14.370 (0.428)
At most 2	14.597 (0.250)	11.603 (0.210)
At most 3	2.993 (0.581)	2.993 (0.581)
Cointegrating vectors	1	1
Long run normalized equation: ln*ing* =	-6.036ln*edy*	-2.845ln*edx* -1.103ln*fdy* 12.752
	(1.277)	(0.675) (0.644) (2.166)
	[-4.726]***	[-4.215]*** [-1.712]* [5.887]***
Specification 3: Intercept (no trend) in CE and test VAR		
None	54.688 (0.010)**	22.819 (0.181)
At most 1	31.869 (0.028)**	20.943 (0.053)**
At most 2	10.925 (0.216)	10.653 (0.172)
At most 3	0.271 (0.602)	0.271 (0.602)
Cointegrating vectors	2	0
Long run normalized equation: ln*ing* =	-6.449ln*edy*	-2.179ln*edx* -0.181ln*fdy*
	(1.311)	(0.857) (1.077)
	[-4.919]***	[-2.542]** [-0.168]
Specification 4: Intercept and trend in CE-no intercept in VAR		
None	74.614 (0.004)***	41.292 (0.002)***
At most 1	33.321 (0.320)	21.514 (0.167)
At most 2	11.807 (0.825)	17.234 (0.482)
At most 3	0.500 (1.000)	0.500 (1.000)
Cointegrating vectors	1	1
Long run normalized equation: *ing* =	-3.898ln*edy*	-0.638ln*dsx* -2.289ln*fdy* -0.188trend
	(0.521)	(0.414) (0.436) (0.036)
	[-8.188]***	[-1.619] [-3.568]*** [-5.222]***
Specification 5: Intercept and trend in CE-intercept in VAR		
None	65.636 (0.004)***	37.691 (0.006)***
At most 1	27.944 (0.232)	21.440 (0.112)
At most 2	6.504 (0.827)	6.246 (0.792)
At most 3	0.258 (0.611)	0.258 (0.611)
Cointegrating vectors	1	1
Long run normalized equation: ln*ing* =	-3.742ln*edy*	0.689ln*dsx* 2.211ln*fdy*
	(0.503)	(0.399) (0.421)
	[-7.844]***	[1.726]* [5.251]***

Note: ***, ** and * indicates 1%, 5% and 10% significance level. Two *step* dummy variables (*DED_1986* and *DDR_2005*) have been incorporated as the exogenous variables in the estimation.

Table 5.5: Normalized Cointegrating Equation (CE) of Public Investment (Specification 2)

ln*ing* =	-6.036ln*edy*	-2.845ln*dsx*	-1.103ln*fdy*	12.752
	(1.277)	(0.675)	(0.644)	2.166
	[-4.726]***	[-4.214]***	[-1.712]*	[5.887]***

Note: *** and * indicates 1% and 10% significance level. Figures in bracket and square bracket are standard errors and t-statistics.

Because the resources that would have been channeled into infrastructure projects to provide an enabling environment for foreign investments, unfortunately, these resources are used for debt service payments. Consequently, instead of external debt to be a source of capital for bridging the gap between savings and desired investment, however, it has become an issue of concern for the country. High external debt accompanied by high debt service retard infrastructure development, and discourages private sector investment and affect the potentials for long term economic growth negatively. These findings are similar to those studies by Deshpande (1997), Kim and Seo (2003), Jave and Sohino (2009), Quattri and Fuso (2012) among others. However, the results contradict the studies by Chaudry et al (2009) and Ali (2013), respectively. Sachs (1989) pointed out that much of the external debt obtained by the developing countries (e.g. Nigeria) did not finance public investment, but spent on financing deficits and capital flight.

The estimated coefficient of foreign direct investment (ln*fdy*) is -1.103, it is negative and significantly correlated with public investment at the 10% level. A 1% decrease in foreign direct investment is associated with a decline in public investment approximately by 1.10%. Considering the magnitude and sign of the coefficient, the result implies that a depressing effect of foreign direct investment on public investment could be seen from four perspectives. First, most foreign direct inflows focus on primary sector investment as Ndikumana and Verick (2008); UNCTAD (2007) and

Kohpaiboon (2003) reported that foreign direct investment may not necessarily influence public investment in developing countries as most of the investment are capital intensive and developing countries have no comparative advantage. Added to that, absence of rivalry and a misconstrued regulatory framework and poor incentive such as tax concession has reduced a considerable number of FDI inflow. Second, it could be attributed to the low level of skilled manpower and poor coordination between foreign direct investment and public investment by the government of the host country. Third, foreign direct investment may not necessarily augment public investment because foreign investors do exercise management and transfer of control over the host country's investors, as a result, the gain from the FDI may not benefit the host countries rather being transferred immediately to the investor's country (Singer, 1950). Lastly, the increasing debt stock discourages foreign investors from making a new investment commitment because of the fear that high tax might be charged in order to meet the debt service obligations. In line with this, Rajah *et al.,* (2010) added that inflation, transaction costs and political instability when motivated by specific interest such as investment in oil and gas industry constitute a problem. Likewise, Boko Haram and the Niger-Delta terrorist activities have been part of the integral factors, which may also be an obstacle for their operation at full capacity (Adamu, 2016). This finding disregard studies of Ali (2013), and Mileva (2008).

5.2.4 Parsimonious Error Correction Model

Provided that the variables are cointegrated, then a parsimonious short run dynamics model can be formulated within the equilibrium error correction framework. Using the long run normalized estimates. Thus, the dynamic model can be specified as:

$$\Delta \ln ing_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta \ln ing_t + \sum_{i=0}^{p} \beta_2 \Delta \ln edy_t + \sum_{i=0}^{p} \beta_3 \Delta \ln dsx_t + \sum_{i=0}^{p} \beta_4 \Delta \ln fdy_t + \beta_5 DED\_86 + \beta_6 DDR\_05 + \psi T_t + \lambda_1 ect_{t-1} + \mu_t \quad (5.1)$$

where Δ is the first difference operator, p is the lag length and $\beta_{i,}$ are the coefficients of the variables corresponding to the short run dynamics of the models and ψ and λ are the coefficients of time trend and error correction term. t and μ are time dynamic and the Gaussian error term to capture unobserved variables in the model. While T is the linear time trend to identify any deterministic decrease or increase trend over the sample period (Wu, 2004). Like the previous chapter, two *impulse* dummies are incorporated to account for exchange rate devaluation following the government reform in 1986, and the HIPCs and MDRI debt relief in 2005, respectively. Hence, the study also looks at alternative estimate with error correction model in a parsimonious form as suggested by Hendry (1995).

The result of the parsimonious error correction model is reported in Table 5.6. Like the preceding chapter, a number of lags from 1 to 4 has been considered. After a series of elimination of the insignificant coefficients and found 4 lags as the best fit to explain the variables relations. Interestingly, all the coefficients – external debt (edy_t), debt service (dsx_t), foreign direct investment (fdi_t) and the two dummy variables (*DER_86* and *DDR_05*) are statistically significant at conventional levels (1%, 5% and 10%). All the coefficients maintain their signs as in the normalized long run equation. It is found that a 4 year lag public investment is (-0.487), negative and statistically significant at the 5% level. A 1% point decrease in public investment at 4 period lag is associated with a decrease in the current public investment approximately by 0.49%. The estimated coefficient of external debt at 4 year lag is (-0.729), remained negative and statistically significant at 4-year lag. This implies that an increase in external debt by 1% might decrease public investment approximately by 0.73%, respectively. Similarly, the estimated coefficient of debt service is (-0.181), also negative and statistically significant at the 10% significant level. A 1% point increase in debt service payments

decreases public investment by 0.18%. On the other hand, foreign direct investment is (-0.338), negative sign and statistically significant at 2-year lag. This suggests that a 1% decline in foreign direct investment retard public investment approximately by 0.34%, respectively.

Table 5.6: Parsimonious Error Correction Model, Equation (5.1), Dependent variable – ln*ing*

Variable	**Coefficient**	**Std.Error**	***t*-statistics**	**Prob.**
$\Delta\ln ing_{t-1}$	-0.217	0.187	-1.157	0.261
$\Delta\ln ing_{t-4}$	-0.487**	0.204	-2.386	0.027
$\Delta\ln edy_{t}$	-0.393	0.319	-1.231	0.233
$\Delta\ln edy_{t-2}$	-0.256	0.242	-1.056	0.304
$\Delta\ln edy_{t-3}$	0.298	0.267	1.114	0.278
$\Delta\ln edy_{t-4}$	-0.729***	0.226	-3.222	0.004
$\Delta\ln dsx_{t}$	-0.181*	0.096	-1.879	0.075
$\Delta\ln dsx_{t-1}$	0.076	0.098	0.776	0.446
$\Delta\ln dsx_{t-2}$	0.032	0.104	0.313	0.757
$\Delta\ln dsx_{t-3}$	0.131	0.079	1.650	0.115
$\Delta\ln fdy_{t}$	0.212	0.130	1.626	0.120
$\Delta\ln fdy_{t-2}$	-0.338**	0.160	-2.104	0.048
$\Delta\ln fdy_{t-4}$	-0.212*	0.121	-1.749	0.096
DED_86	-0.853***	0.215	-3.957	0.000
DDR_05	0.635**	0.261	2.428	0.025
ect_{t-1}	-0.066*	0.034	-1.913	0.070
R^2	0.679			
Adjusted R^2	0.598			
F-statistic	2.120***			
DW	2.03			

Diagnostic check	*F-statistics [p-value]*
χ^2*SERIAL* (1)	3.7733 [0.1515]
χ^2*NORMAL*	1.1672 [0.3350]
χ^2*ARCH* (1)	0.0111 [0.9165]
χ^2*RAMSEY* (3)	1.5274 [0.2511]
CUSUM & CUSUMSQ	Stable

Notes: ***, ** and * indicate 1%, 5% and 10% level of significance. Figures in square bracket [.] are the *p*-values. *DW,* χ^2*SERIAL,* χ^2*NORMAL,* χ^2*ARCH, and* χ^2*RAMSEY* are Durbin-Watson, LM tests for serial correlation, Jaque-Bera normality test, Heteroscedasticity and functional form (Ramsey RESET) respectively. The estimated trend variable was reported here it was statistically significant.. The *ect* is the residual series of ln*ing* = -6.036ln*edy* -2.845ln*dsx* -1.103ln*fdy* +12.752 from the Johansen approach in which passes a battery of diagnostic tests.

The null hypothesis for the diagnostic tests are as follows:

(i) Serial correlation LM test: H_o: $\rho_1 = \rho_2 = \ldots \rho_\rho = 0$; H_1: $\rho_1 \neq \rho_2 \neq \ldots \rho_\rho \neq 0$

(ii) Normality : H_1: $X = N(.)$; H_1: $X \neq N(.)$

(iii) ARCH: H_o: $\rho_1 = \rho_2 = \ldots \rho_m = 0$; H_1:$\theta_{\rho k} \neq 0$, $1 \leq k \leq m$

(iv) RAMSEY RESET: H_o: $\varepsilon \sim N(0,\sigma^2 I)$; H_1: $\varepsilon \sim N(0,\sigma^2 I)$, $\mu \neq 0$

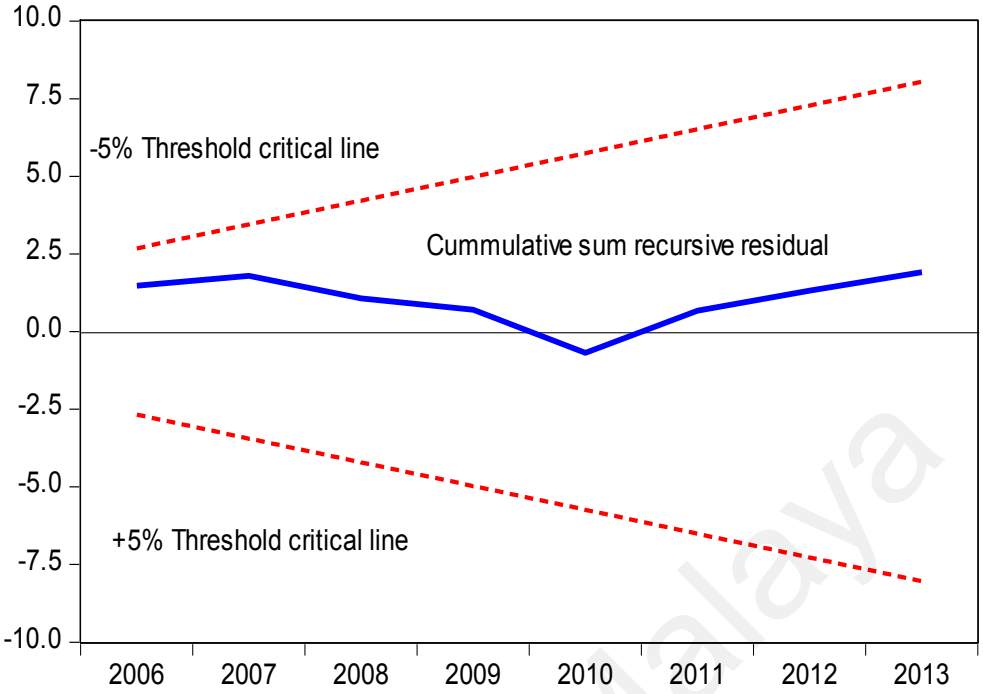
(v) CUSUM and CUSUMSQ: H_0: $\beta_i = \beta$; H_1: $\beta_i \neq \beta$

The coefficient of dummy variable - exchange rate devaluation (*DED_86*) is (-0.853) is negative and statistically significant as expected. A 1% exchange rate devaluation reduces public investment approximately by 0.85%. This suggests that from the introduction of SAP in 1986, exchange rate has been less regulated and Naira undervalued. The adverse effects of these measures discouraged domestic investors and exports, and led to the proliferation and growth of parallel and highly distorted exchange rate markets and affect public investment negatively. Because the devaluation in exchange rate increases the cost of imported capital goods of which a large portion of relevant raw materials, equipments and machineries for the industrial consumption are imported. This would allow foreign investors have access to the domestic market on the account of considerable depreciation of the Naira. Added to that, the government reform policy aim at infrastructure development was financed by borrowing, and the debt was serviced in foreign currency (dollar or pound sterling) at a cheaper exchange rate. The real sector policies also depended on price controls and a system subsidies, while major corporations were wholly-owned or controlled by the government, thus the role of private indigenous or foreign investment was crowded out by the government reform. The dummy variable for debt relief (*DDR_05*) is (0.635), positive and statistically significant at the 5% level. It informs that the debt relief has significantly reduced interest and principal payments, and Nigeria is no longer servicing a large debt like in the previous decades. This provides an opportunity of investing the freed resources in infrastructure development projects. This is consistent with the studies by Cassimon and Compenhout (2007) and Marcelino and Hakobyan (2014) who found a positive effect of debt relief on public investment in heavily indebted poor countries.

Lastly, the one lagged error correction term for the public investment relation, its estimated ect_{t-1} is (-0.066), negative and statistically significant at the 10% level.

This value reaffirmed the existence of a cointegration relationship among the underlying variables in the model. This implies that the deviation from a long run equilibrium in responding to the previous periods is at low speed corrected approximately by 0.07% annually in an event of any shocks to the system.

The test statistics of diagnostic testing are presented at the bottom of Table 5.6. The serial correlation test, Jaque-Bera's normality test of residuals, ARCH test for heteroskedasticity, and Ramsey RESET for functional form, confirmed the best fit of the short run model, in particular they are free from the mis-specification. The CUSUM and CUSUMSQ tests for assessing stability of the short run model is estimated. Figure 5.1 reports the graphical representations. Both CUSUM and CUSUMSQ are within the significant lines, implying that there is an absence of parameter instability over the estimated period.



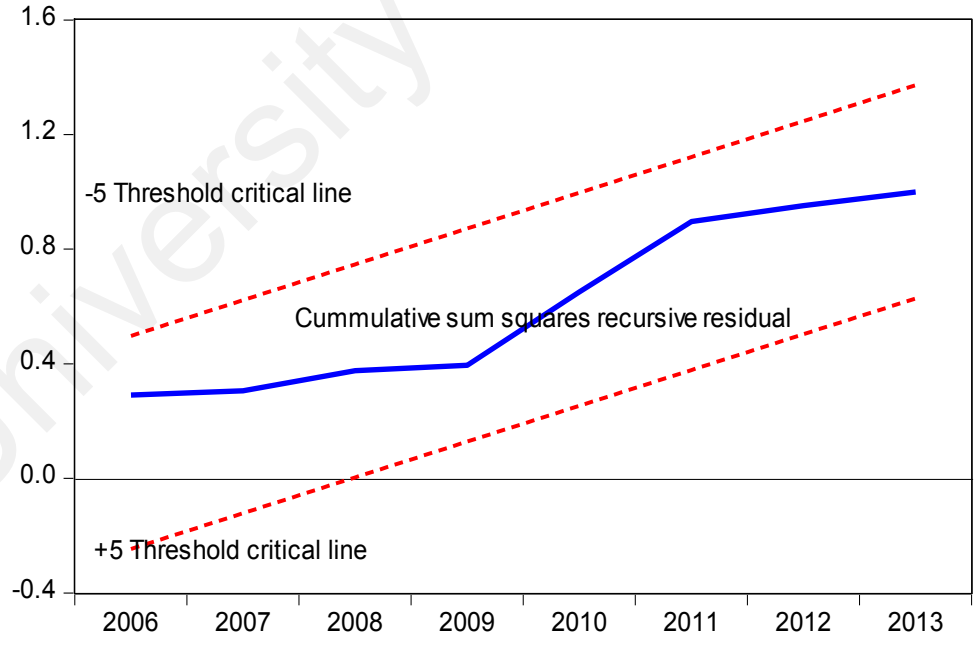


Figure 5.1: Residual Plots of CUSUM and CUSUMSQ for the parameter stability.

5.3 Summary

This chapter examined empirically the impact of external debt on financing of public capital investment in Nigeria over the annual period 1970 to 2013. External debt and foreign direct investment inflows enhanced the infrastructure development in developing countries due to inadequate financial resources to finance the vast investment opportunities (Dailami and Leipziger, 1998; Clement *et al.,* 2003). Following the confirmation of the order of integration, the analysis is based on the Johansen multivariate cointegration approach. Like in the previous chapter, two exogenous *step* dummy variables was included in the cointegration test. The empirical results indicated that all the variables – public investment, external debt, debt service and foreign direct investment have exhibited a long run cointegrating relationships, in other word they are cointegrated. The econometric estimation of the normalized long run coefficients with trend satisfies the *a priori* expectation of the economic theory. A parsimonious error correction model was estimated. It was observed that external debt, debt service, foreign direct investment, and the dummy variable for exchange rate devaluation are negative and statistically significant. In addition, the time trend confirmed a downward trend indicating a negative effect of the explanatory variables on public investment taking together while the dummy for debt relief indicates a positive impact on public investment.

CHAPTER 6: EXTERNAL DEBT AND GROWTH DYNAMICS IN NIGERIA: FRESH EVIDENCE FROM EXTERNAL DEBT COMPOSITE INDEX

6.1 Introduction

This chapter presents the empirical results for addressing the objective 3 of this study, which was based on growth equation 3.8. It investigates the inter-relationship between external debt and economic growth in Nigeria. As presented in the methodology chapter, this chapter used three debt ratios, namely, debt to GDP ratio, debt to export ratio and debt service to export ratio to construct an *external debt composite index* based on principal component analysis (PCA) method for two reasons. First, to examine the impact of the overall debt indicators on growth rather than using a single indicator as used in the previous studies. Second, to measure whether or not the external debt ratios can stimulate long run economic growth after the debt relief in 2005 (Adamu and Rasiah, 2016). Like the previous chapters, the study adapted similar econometric techniques for the analysis.

6.2 Empirical Results and Discussion

This section presents the empirical results and discussion on the impact of external debt on economic growth (Objective 3). It covers unit root tests, Johansen multivariate cointegration and the error correction model.

6.2.1 Unit Root Tests

The order of integration, I(d) of the 4 variables specified in equation 3.8 (see methodology chapter) have been examined using ADF and PP tests. The variables include real GDP (ry_t) as the dependent variable, external debt composite index (eci_t), domestic credit to the private sector (dcy_t), and human capital (hcp_t) as the explanatory

variables. Table 6.1 presents the unit root results. The ADF and PP unit root tests suggest that all the variables are non-stationary at level, but after the first difference they become stationary, therefore, they are *I*(1) process.

Table 6.1: Unit root tests

Variable	ADF H_0 : ρ has a unit root		PP H_0 : ρ has a unit root	
	Constant	Constant and Trend	Constant	Constant and Trend
ln*ry*	0.704 [0]	0.704 [0]	-0.699 [1]	-1.988 [1]
	(0.990)	(0.604)	(0.990)	(0.590)
Δln*ry*	-6.121 [0]	-6.157 [0]	-6.121 [0]	-6.157 [1]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I (*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)
ln*eci*	-2.603 [1]	-3.051 [1]	-1.183 [5]	-1.062 [15]
	(0.100)	(0.131)	(0.212)	(0.128)
Δln*eci*	-7.551 [0]	-7.442 [0]	-10.853 [14]	-11.111 [15]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I (*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)
ln*dcy*	-2.559 [0]	-2.917 [1]	-2.414 [9]	-2.243 [7]
	(0.109)	(0.167)	(0.143)	(0.454)
Δln*dcy*	-5.222 [2]	-5.434 [2]	-6.603 [18]	-9.168 [7]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I (*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)
Ln*hcp*	-0.074 [0]	-1.948 [0]	-0.041 [2]	-2.175 [3]
	(0.960)	(0.612)	(0.957)	(0.490)
Δln*hcp*	-6.721 [0]	-6.760 [0]	-6.717 [2]	-6.757 [2]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
I (*d*)	*I*(1)	*I*(1)	*I*(1)	*I*(1)

Note: ***, ** and * indicate 1%, 10% and 1% significance level. The optimum lag [.] is suggested by Akaike Information Criterion (AIC) with maximum lags of 3 due to limited annual observations, while the Newey and West Bartlett kernel are used for PP test.

6.2.2 Lag Length Selection

To conduct the Johansen multivariate cointegration test, the optimum lag length has to be selected from a number of information criterion – LR, FPE, AIC, SC, and HQ. This is to ensure no autocorrelation in the residuals. Table 6.2 presents the results of the VAR lag order selection criterion. Based on the number of criterion, the lag length results suggest lag order of 1, and AIC was selected as the criterion with a minimum value for the VAR model. Furthermore, the VAR lag exclusion wald test is reported in

Table 6.3, which confirms that a lag order of 1 is appropriated based on the joint lags significance of the VAR system.

Table 6.2: VAR Lag Order Selection Criterion

Lag	Sequential modified LR test statistic (Log L)	Likelihood Ratio	Final prediction error (FPE)	Akaike information criterion (AIC)	Schwarz information criterion (SC)	Hannan-Quinn information criterion (HQ)
0	-61.151	NA	1.73e-05	3.226	3.435	3.303
1	134.219	333.560*	4.31e-09*	-5.083*	-3.830*	-4.627*
2	158.246	35.161	4.78e-09	-5.036	-2.737	-4.199
3	173.167	18.196	9.09e-09	-4.544	-1.201	-3.327

Note: * indicates lag order selected by the criterion. Each test at 5% level

Table 6.3: VAR Lag Exlusion Wald Tests

No. of Lag	ln*ry*	ln*eci*	ln*dcy*	ln*hcp*	Joint
1	31.671	12.602	46.984	23.723	137.700
	(2.230)	(0.013)*	(1.540)	(0.075)*	(0.000)***
2	0.821	0.304	11.066	5.141	26.843
	(0.935)	(0.989)	(0.025)*	(0.273)	(0.043)**
df	4	4	4	4	16

Notes: Figures in bracket are probability values. df indicate degrees of freedom.

6.2.3 Johansen Multivariate Cointegration Tests

Recall that the results of the unit root tests in Table 6.4 confirmed that all variables under investigation are found to be stationary at first difference, $I(1)$, therefore, the Johansen cointegration technique was employed to identify the cointegrating vectors and analyse the long run relationships by formulating the vector error correction model. Table 6.3 reports the Johansen multivariate cointegration tests. All the 4 variables – real GDP (ry_t), external debt composite index (eci_t), domestic credit to the private sector (dcy_t), and human capital (hcp_t) are found to be cointegrated in all the specifications, and each model has at least 1 to 3 cointegrating vectors, respectively. The estimated

cointegrating equation of specification 1 is preferred for interpretation as in line with the theoretical expectation of the external debt and growth relation.

Table 6.4: Johansen Multivariate Cointegration Test, VAR Lag (1)

Specification 1: No intercept or trend in CE or test in VAR		
Hypothesis No. of CE (s)	Trace test statistics	Max-eigen value statistics
None	44.474 (0.017)**	19.510 (0.018)*
At most 1	24.964 (0.040)**	14.201 (0.160)
At most 2	10.762 (0.090)*	9.368 (0.104)
At most 3	1.394 (0.278)	1.394 (0.278)
Cointegrating vectors	3	1
Long run normalized equation: ln*ry* = -0.411ln*eci* -0.238ln*dcy* +5.251ln*hcp*		
	(0.126) (0.090) (0.147)	
	[-3.261]*** [-2.644]** [34.721]***	
Specification 2: Intercept (No trend) in CE – no intercept in VAR		
None	61.860 (0.008)**	26.347 (0.087)*
At most 1	35.252 (0.049)**	19.506 (0.117)
At most 2	15.746 (0.186)	13.661 (0.108)
At most 3	2.085 (0.760)	2.085 (0.760)
Cointegrating vectors	2	1
Long run normalized equation: ln*ry* = +0.426ln*eci* -0.297ln*dcy* +13.777ln*hcp* +12.877		
	(0.133) (0.102) (2.160) (3.043)	
	[3.203]*** [-2.911]** [6.378]*** [4.231]***	
Specification 3: Intercept (no trend) in CE and test VAR		
None	59.35 (0.002)***	26.538 (0.067)*
At most 1	32.837 (0.021)**	18.743 (0.104)
At most 2	14.093 (0.080)	13.328 (0.069)*
At most 3	0.764 (0.381)	0.764 (0.381)
Cointegrating vectors	2	1
Long run normalized equation: ln*ry* = 0.454ln*eci* -0.295ln*dcy* +14.087ln*hcp*		
	(1.140) (0.107) (2.274)	
	[0.398] [-2.757]** [6.194]***	
Specification 4: Intercept and trend in CE-no intercept in VAR		
None	74.419 (0.005)***	33.440 (0.034)*
At most 1	40.979 (0.077)*	21.998 (0.147)
At most 2	18.980 (0.281)	18.168 (0.074)*
At most 3	0.812 (0.999)	0.812 (0.999)
Cointegrating vectors	2	1
Long run normalized equation: ln*ry* = -0.174*eci* -0.017ln*dcy* +25.22ln*hcp*+0.054trend		
	(0.184) (0.110) (4.175) (0.015)	
	[-0.945] [-0.154] [6.042]*** [3.600]***	
Specification 5: Intercept and trend in CE-intercept in VAR		
None	67.675 (0.02)***	30.906 (0.048)**
At most 1	36.769 (0.032)**	21.996 (0.096)*
At most 2	14.773 (0.149)	14.001 (0.135)
At most 3	0.771 (0.379)	0.771 (0.379)
Cointegrating vectors	2	2
Long run normalized equation: ln*ry* = -0.193ln*eci* +0.111ln*dcy* +33.328ln*hcp*		
	(0.265) (0.158) (6.006)	
	[-0.728] [0.702] [5.549]***	

Note: ***, ** and * indicates 1%, 5% and 10% significance level. All variables are in log form.

Table 6.5: Normalized Cointegrating Equation (CE) for Growth Equation (Specification 1)

ln*ry* =	-0.411ln*eci*	-0.238ln*dcy*	5.251ln*hcp*
	(0.126)	(0.090)	(0.147)
	[-3.261]***	[-2.644]**	[34.721]***

Note: ***, ** and * indicates 1% and 5% significance level. Figures in bracket and square bracket are standard errors and t-statistic

Table 6.5 reports the cointegrating equation of the long run relationships (Normalized cointegrating equation from specification 1). All the estimated coefficients are statistically significant as expected. The coefficient of external debt composite index (lneci_t) is -0.411, negative and statistically significant at the 1% level. This implies that a 1% increase in external debt ratios is associated with a 0.41% decline in real GDP growth. Even though, the debt ratios are below the threshold level, hence, the negative effect of the external debt on growth might be attributed to macroeconomic instability, which is a constraint to viable economic investments to thrive. In addition, poor debt management has been part of the contributing factors of negative effect on growth. This finding match with similar results found by Adegbete *et al*., (2008), Adepoju *et al*., (2007), Ayadi and Ayadi (2008), Were (2001), Ramzan and Ahmed (2014), Abdulhafifh (2014), Wamboye (2012), Chowdhury (2001), Clement *et al*., (2003), and Pattillo *et al*., (2002) and a host of others who found a negative correlation of one or two debt ratios on economic growth. But, contradict the findings of Mohamed (2013), Jayaraman and Lau (2009), Frimpong and Oteng-Abayie (2006), Amin and Audu (2006), and Baker and Hassan (2008) they found a positive contribution of external debt on growth respectively. Also, the finding is consistent with the theoretical expectations of the debt overhang hypothesis by Krugman (1988) and Sachs (1989) that states if there is likelihood in the future the external debt will be higher than the country's repayment ability, the expected debt servicing obligations would discourage domestic and foreign investment, which retard growth (Pattillo *et al*., 2002).

The coefficient of domestic credit to the private sector (lndcy_t) is -0.238, negative and statistically significant at the 5% level. A 1% decline in the performance of domestic credit (loans) leads to a decline in real GDP approximately by 0.24%. Despite the fact that Nigeria's financial sector holds of about 55% of the total investments in government debentures and treasury bills (CBN, 2013), but fails to promote economic growth. This implies that the increase in government borrowing has increased the risk of default by the government, which in turn makes financial intermediaries fragile and less able to provide more credit facilities. Also, this can be attributed to the fact that the Nigeria's financial sector is vulnerable to a number of risk factors such as high lending rates discourages private investment, financial indiscipline and anomalies leading to high rates of non-performing loans due to improper supervision. It has been established that domestic credit serves as a stimulus to private sector investment in order to promote economic growth. Regrettably, the Nigeria financial system has not been stable since from the banking crisis that started in 2005. This indicates that the flow of loans has not met the desired goals and failed to enhance economic growth. In fact, these challenges have raised questions regarding the effectiveness and productivity of domestic credit in the Nigerian economy.

The coefficient of human capital proxy for secondary enrolment is (5.251), positive and statistically significant at the 1% level. This implies that a 1% increase in human capital formation leads to higher growth by 5.25%. The result is not surprising as the contribution of education on growth is well recognized in Nigeria. This is attributed to Nigerias concerted efforts toward building human capital through investment in education, which enhances economic growth even if financed by external borrowing. The positive relationship can also relate to efficient human resource base of the country. This may be due to adequate skilled manpower, which is evidenced by the

establishment of technical and vocational schools every year. This finding is consistent with the studies by Barro (1991); Barro and Sala-i-Martin (1995); Mankiw *et al*., (1992); Otani and Villanueva (1989); Feder (1982) and Kendrick (1993) who found a significant and positive relationship between human capital and long run economic growth. Additionally, the result justifies the finding by Baldacci *et al*., (2008) who found a 1% increase in primary and secondary enrolment rates promotes growth by 0.1% in developing countries, but contradict a study by Prichett (2001) who argued that an increase in secondary enrolment has not promote growth in developing countries, particularly in African countries. Correspondingly, the positive correlation between human capital and growth demonstrated that the secondary school enrolment rate is a good measure and prime indicator of growth (Levine and Renelt, 1992). Therefore, human capital development remains to be an essential tool for stimulating long run economic growth in Nigeria.

6. 2. 4 Parsimonious Error Correction Model

Having confirmed the cointegrating relationship, the next step involves the estimation of an error correction (short run) coefficients in order to assess the dynamics effect of each individual series on economic growth.

$$\Delta \ln ry_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta \ln ry_t + \sum_{i=0}^{p} \delta_2 \Delta \ln eci_t + \sum_{i=0}^{p} \delta_3 \Delta \ln dcy_t + \sum_{i=0}^{p} \delta_4 \Delta \ln sse_t$$
$$+ \delta_5 DER\_86 + \delta_6 DDR\_05 + \lambda_1 ect_{t-1} + \mu_t \qquad (6.1)$$

where Δ is the first difference operator, p is the lag length and δ_i are the coefficients of the variables in the short run dynamics of the parsimonious error correction model. t and μ are time dynamic and the Gaussian error term to capture unobserved variables in the model. Like the previous chapters, two *impulse* dummies are incorporated to account for exchange rate devaluation following the government reform in 1986, and the HIPCs and

MDRI debt relief in 2005, respectively. For more precise estimates, thus, general to specific approach suggested by Hendry (1995) is also applied in order to determine the response of the variables on growth.

Table 6.6 presents the parsimonious error correction result. Like in the long run, all the estimated coefficients have the expected sign and statistically significant according to theory. Interestingly, the previous year real GDP variable at 3 year lag, $\Delta \ln ry_{t-3}$ is positive and statistically significant at the 1% level. The coefficients of these variables is 0.604, respectively. A 1% rise in the previous year real GDP would increase real GDP of the current year by 0.60%. This implies that past year real GDP is a good predictor of the current real GDP in Nigeria. The coefficient of external debt composite index ($\ln eci_t$), capturing the overall effects of external debt ratios on growth is (-0.050), negative at two year lag, and statistically significant at the 10% level. A 1% increase in the external debt composite index (external debt ratios) would affect economic growth negatively by 0.05%, respectively. In spite of the lower debt ratios below the threshold level, still the overall external debt ratios hurt economic growth. This could be due to poor debt management and quality of investment resulting from the disincentive effect of external debt. Although, in the short run, Nigeria is not debt overhang, and still has the capacity to service its debt obligations, and the debt ratios are below the threshold level that the country is no longer experiencing a debt servicing difficulties. But requires efforts from the government to efficiently prepare appropriate debt management measures to avoid debt crisis in the future. The coefficient of domestic credit to the private sector ($\ln dcy_t$) is -0.083, negative and statistically significant as expected at the 5% level. This suggests that a 1% decline in domestic credit leads to a decline in real GDP growth approximately by 0.08%. On the other hand, the coefficient of human

capital (lnhcp_t) is 0.661, positive and statistically significant at the 5% level as expected. It is to say that a 1% increase in human capital increases growth by 0.66%.

Table 6.6: A Parsimonious Error Correction Model, Equation (6.1), dependent variable: ln*ry*

Variable	Coefficient	Std.Error	*t*-Statistics	Prob.
$\Delta\ln ry_{t-3}$	0.604***	0.120	5.026	0.000
$\Delta\ln eci_{t-1}$	-0.040	0.027	-1.501	0.144
$\Delta\ln eci_{t-2}$	-0.050*	0.026	-1.876	0.070
$\Delta\ln eci_{t-3}$	-0.030	0.024	-1.245	0.222
$\Delta\ln dcy_t$	-0.083**	0.036	-2.290	0.029
$\Delta\ln dcy_{t-3}$	-0.028	0.024	-1.155	0.257
$\Delta\ln hcp_{t-2}$	0.661**	0.338	1.955	0.031
$\Delta\ln hcp_{t-3}$	0.826	0.736	1.122	0.270
DEA_86	-0.024*	0.013	-1.764	0.088
DDR_05	0.052**	0.022	2.292	0.029
ect_{t-1}	-0.081**	0.037	-2.186	0.037
R^2	0.640			
Adjusted R^2	0.515			
F-statistic	5.156***			
DW	1.825			
Diagnostic check		*F-statistics [p-value]*		
χ^2*SERIAL*		0.5500 [0.5833]		
χ^2*NORMAL*		0.1024 [0.9500]		
χ^2*ARCH*		0.2624 [0.6115]		
χ^2*RAMSEY*		1.5762 [0.1262]		
CUSUM and CUSUMSQ		Stable		

Notes: ***, ** and * indicate 1%, 5% and 10% level of significance. Figures in square bracket [.] are the *p*-values. *DW,* χ^2*SERIAL,* χ^2*NORMAL,* χ^2*ARCH, and* χ^2*RAMSEY* are Durbin-Watson, LM tests for serial correlation, Jaque-Bera normality test, Heteroscedasticity and functional form (Ramsey RESET) respectively. The estiamted trend variable was reported here it was statistically significant.. The *ect* is the residual series of ln*ry* = -0.411ln*eci* -0.238ln*dcy* +5.019ln*hcp* from the Johansen approach in which passes a battery of diagnostic tests.
The null hypothesis for the diagnostic tests are as follows:
(i) Serial correlation LM test: H_o: $\rho_1 = \rho_2 = \ldots \rho_\rho = 0$; H_1: $\rho_1 \neq \rho_2 \neq \ldots \rho_\rho \neq 0$
(ii) Normality : H_1: $X = N(.)$; H_1: $X \neq N(.)$
(iii) ARCH: H_o: $\rho_1 = \rho_2 = \ldots \rho_m = 0$; H_1:$\theta_{\rho k} \neq 0$, $1 \leq k \leq m$
(iv) RAMSEY RESET: H_o: $\varepsilon \sim N(0,\sigma^2 I)$; H_1: $\varepsilon \sim N(0,\sigma^2 I)$, $\mu \neq 0$
(v) CUSUM and CUSUMSQ: H_0: $\beta_i = \beta$; H_1: $\beta_i \neq \beta$

The estimated coefficient of dummy for exchange rate devaluation (*DED_86*) is -0.024, negative and statistically significant at the 10% level. This implies that as domestic currency losses its value, *ceterus paribus*, economic growth decline. The estimated value of the dummy for real exchange rate indicates that a 1% exchange rate devaluation leads to a 0.02% fall in economic growth. Although, the effect is weak, but

suggests a contractionary effect of the domestic currency (Naira) on growth in the short run. Prior to 1986, the common exchange rate policy was to strengthen appreciation of Naira. However, following the adoption of Structural Adjustment Program (SAP) enforced on the Nigerian economy by the Wold Bank and International Monetary Fund (IMF), Naira was deregulated and Second-tier Foreign Exchange Market (SFEM) was introduced in order to determine the exchange rates and guarantee stability and balance of payment equilibrium, unfortunately, SFEM failed and devaluation of the Naira continues, and led to the debt crisis, which affect growth negatively.

The estimated coefficient of dummy variable for debt relief (*DDR_05*) is 0.052, positive and statistically significant at the 5% level. This implies that a 1% increase in debt relief stimulates growth approximately by 0.05%. The positive effects of the debt relief on economic growth can be viewed from the substantial reduction of the external debt to sustainable levels that eliminates the acute debt burden (Debt overhang) in Nigeria since the debt relief has bailed out a considerable amount allocated for debt service payments. Evidently, between 2006 to 2013, Nigerias real GDP growth was high about 7% (CBN, 2013), this suggest the contribution of debt relief on growth. Also, the debt relief provided growth enhancing resources, an improving economic efficiency, and incentive for productive investment, which made it feasible for Nigeria to settle the Paris club creditors debt buy back agreement and also reduced inflation rate. This finding contravenes the view of Arslanalp and Henry (2006) states that debt reduction or debt forgiveness on its own may not necessarily provide the desired improvement in economic growth as macroeconomic policies and institutional frameworks are critical for this to happen (see, Adamu and Rajah, 2016).

Turning to the coefficient of the error correction terms (ect_{t-1}), which measures the speed of adjustment back to the long run equilibrium. The coefficients is (-0.081), negative and statistically significant at the 5% level as expected by the theory. This reaffirms the cointegrating relation among the variables. Equally, the model adjusts approximately at 0.08% annually to restore equilibrium in an event of any shock to the system. The short run diagnostic tests are presented at the bottom of Table 6.6. The LM test for serial correlation shows absence of autocorrelation in the stochastic error terms. The Jaque-bera test for normality of the residuals also suggests that the errors are normally distributed. Likewise, the models do not show any evidence of autoregressive conditional heteroscedisticity (ARCH). The Ramsey RESET for functional form also confirmed that our models are correctly specified. The plots of the CUSUM and the CUSUMSQ are shown in Figure 6.1, confirmed that the test statistics are within the critical lines at the 5% confidence interval. Suggesting that the overall models are stable over the sample period.

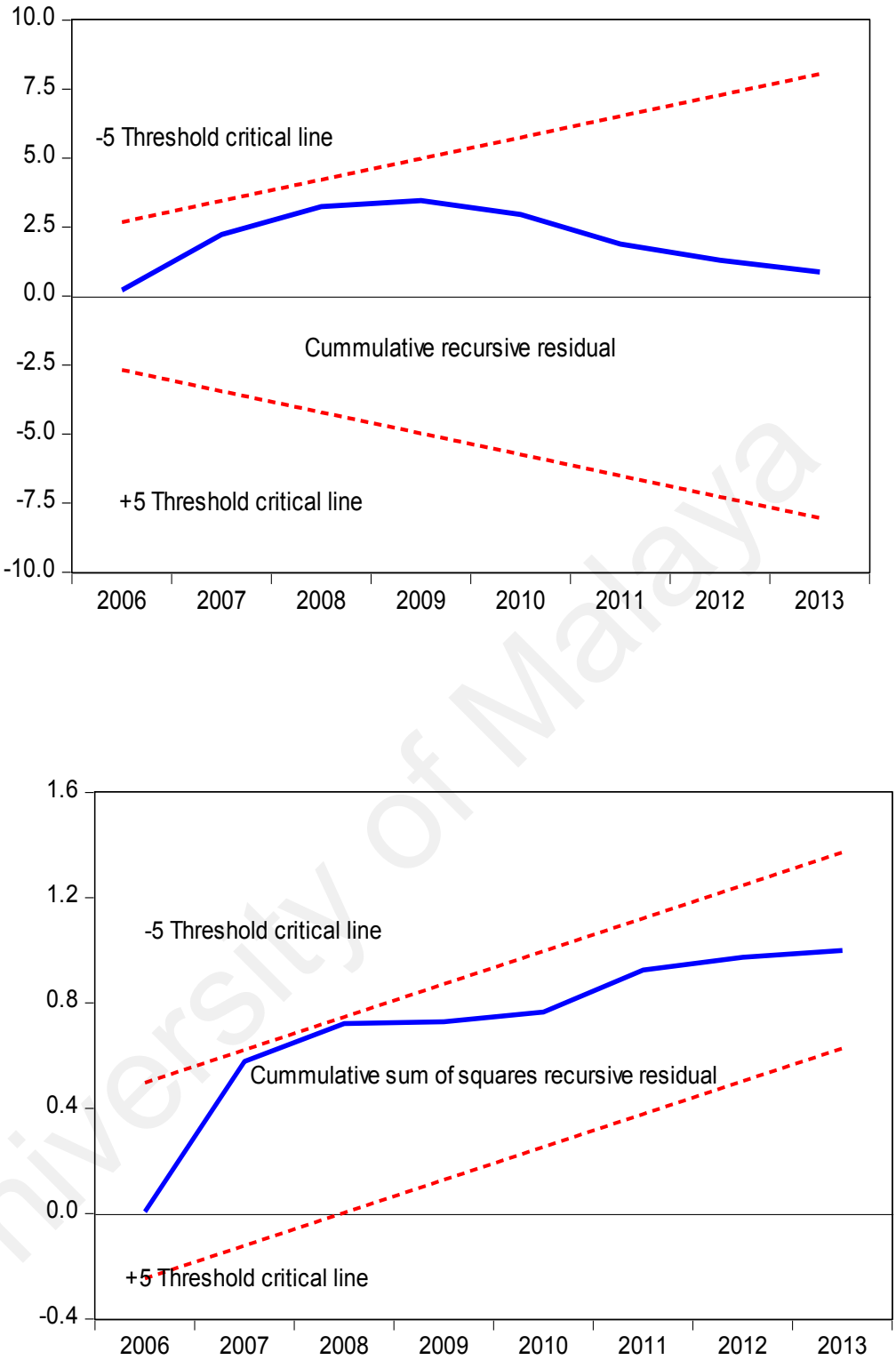


Figure 6.1: Residual Plots of CUSUM and CUSUMSQ for the parameter stability.

6. 4 Summary

Despite the importance of external debt as the major source of capital for developing countries, there is relatively little concern to examine the effects of the complementarity role of the debt ratios taking together on the economic growth of the indebted developing countries. In particular, the aim of this chapter is to consider the dynamic effects of external debt ratios by constructing a unique index of these ratios for the Nigerian economy. Following the test of the orders of integration, the analysis is also based on the Johansen multivariate cointegrating approach. The results revealed a unique long run cointegrating relationship between real GDP, external debt composite index, domestic credit and human capital. In general, all the variables are correctly signed and found statistically significant, according to economic theory. The study also found the external debt composite index proxy of debt ratios and domestic credit are negative and highly significant, indicating a negative effect on growth while human capital exerts a positive sign. From the policy perspective, there are three important lessons drawn from this chapter. First, following the Nigerias exit from the Paris club creditors in 2006, the external debt remained sustainable, but with further borrowing, Nigeria will soon return to another era of debt overhang. Thus, embargo should enforce on new loans, foreign debt can only be obtained for the project that would yield a higher rate of return for debt repayment. Second, effective and efficient external debt management is of paramount importance. This will prevent the country from future debt burden beyond the sustainable level. Third, new investment should be encouraged jointly with reviving non oil sectors of the economy will increase export earnings, thereby, reducing the dependency on oil and external loans.

CHAPTER 7: CONCLUSIONS

7.1 Introduction

This study investigated empirically three fundamental concerns on the effects of external debt on public capital formation, and economic growth in Nigeria over the period 1970-2013. Conventional time series econometric techniques were deployed for long run and short run estimates. Briefly, they include unit root tests to identify the order of integration, $I(d)$ of the underlying variables, Johansen multivariate cointegration tests for testing the existence of a long run relationship, and error correction model. Overall, this chapter presents a synthesis of the main key findings of the study, and draws implications for theory and policy.

7.2 Synthesis of Study

This study confirmed the negative influence of oil prices on the Nigerian external debt determination over the period between 1970 and 2013. In the estimated long run, the oil price coefficient on external debt is statistically significant with a value of -1.319. It suggests that a 1% decrease in the oil price will result in an increase in the Nigerian external debt by 1.32%, in the long run. While, in the short run is expected to raise it by approximately 0.34%. Chapter 4 presented the empirical findings on the determinants governing the behaviour of external debt in Nigeria. The external debt function was built with incorporation of both internal and external factors, such as gross domestic savings, fiscal deficit, oil price and exchange rate. The unit root tests suggest that all candidate variables are non-stationary, $I(1)$ process, and at least one cointegration relationship was suggested by the Johansen multivariate cointegration test framework. The empirical models for both long run relation and error correction model indicate that oil price is an important determinant to explain Nigerian external debt behaviour. Other

determinants are - domestic savings, fiscal deficits, and the exchange rate devaluation and debt relief - which were measured as zero-one (0,1) dummy variables - were significant and have the expected signs. Overall, all the variables are key factors in determining external borrowing and debt build up in Nigeria.

Chapter 5 examined the contribution of external debt in stimulating public capital formation in Nigeria, which is based on the theoretical underpinning that the majority of the developing countries borrow for infrastructure development projects that would assist rapid economic growth. Following the confirmation of unit root test, the empirical result confirms a cointegrating relation among the variables - external debt, debt service and foreign direct investment. They are significant and show a negative effect on public investment. Their estimated coefficients in the long run of -6.04, -2.85 and -1.10 are statistically significant at most 10%. While in the short run, their estimated coefficients of -0.73, -0.18 and -0.34 are statistically significant at most 10%. This implies that the borrowed funds were not utilized to improve public investment. Rather, they have either been mismanaged or invested in activities that have not generated the desired effect of supporting debt repayments. The dummy variables of *DED_86* and *DDR_05* are also statistically significant, indicating they affect public investment.

Chapter 6 analysed the impact of external debt on economic growth in Nigeria. In doing so, this study constructed a unique index called "*external debt composite index*" by deploying the principal component analysis method to assess the overall impact of external debt ratios on economic growth. As in the preceding chapter, integration and cointegration tests were conducted. All the variables were found to be $I(1)$, and cointegrated. In the long run, the empirical results reveal that the external debt composite index is -0.41, is negative and is statistically significant. While in the short

run, it is -0.05 and statistically significant, indicating that the overall external debt ratios affect growth negatively. Other control variables include domestic credit to the private sector and dummy variable for exchange rate devaluation, which also hurt growth negatively. While human capital and debt relief influences growth positively.

Having established a summary of the major findings of the study, the next sections seeks to draw implications for methodology, theory and policy. The results show that implications can be drawn for both Nigeria and other poor developing economies.

7.3 Implications for Methodology

The study adapted and formulated methodologies to analyse the data series, which helps extending the findings drawn by past works (Ajayi (1991); Adegbite *et al.,* (2008); Ayadi and Ayadi (2008); Edo (2002). In the same vein, the study extends the existing empirical models by incorporating other potential factors governing the behaviour of external debt in the indebted country of Nigeria, which helped bridge some of the gaps found in existing studies.

Another methodological contribution of this study is the longer time series data used, which stretches to 2013 to cover the period when over 80% of the Nigeria's external debt was cancelled under the Highly Indebted Poor Countries (HIPCs) and Multilateral Debt Relief Initiative (MDRI). The extended series, including the use of a dummy to address it helped us understand whether or not the response of the debt reduction might have a negative or positive impact on the Nigerian economy. Past studies were constrained by the short series they had used on Nigeria (e.g. Ajayi, 1991; Adegbite *et al.,* 2008); Ayadi and Ayadi (2008); Edo, 2002).

The application of the adapted models, namely, the debt models, by Greenidge *et al.,* (2010); the investment model by Gourinchas and Jeanne (2013), and growth model by Pattillo *et al.,* (2011, 2003, 2002) and Checherita-Westphal and Rother (2012), using data for Nigeria offered us the opportunity to formulate a new approach to examine the contribution of external debt on public capital formation, and to provide a systematic analysis of the external debt in Nigeria

Lastly, this study considered the ambiguous concern that different debt indicators may cause endogenous problems in the assessment of debt behaviour,and hence, sought to solve it by utilizing principal component analysis (PCA) method to construct a representable debt variable, namely, *external debt composite index*. This fresh approach was applied to study the relationship between external debt and economic growth. The PCA on its own is not novel as has been widely applied by other studies in other fields of economics (e.g. energy economics, financial economics, and economic growth studies (see, Esmaeili and Shokoohi, 2011; Jalil *et al.,* 2010; Ang, 2009, 2010; Rehman and Shahbaz, 2014; Madsen *et al.,* 2010).

7.4 Implications for Theory

Having carried out a thorough examination of the determinants of external debt, as well as its impact on the Nigerian economy using some critical theories to underpin the analysis, we seek to draw implications for theory here. The evidence shows that Nigeria has succumbed to the Dutch Disease as volatile booms and busts since the oil shocks of the 1970s and 1980s have not only aggravated the debt situation, but has almost squeezed out the non oil sectors. Clearly, it supports the famous Dutch disease hypothesis that were drawn from Corden and Neary (1982) and Corden (1984). However, the consequences are twofold. Firstly, there is a strong indication that oil

booms led to the shrinking of agricultural and manufacturing output following appreciations in the real exchange rate that took place during commodity booms. Secondly, the booming oil and gas sector drew capital and labour from agriculture and mining. In addition, the mismanagement of oil windfalls in the absence of a cess to support R&D and financing during slumps eventually led high accumulated fiscal deficit and forced Nigeria into massive borrowing to fill the financing gap, which has continued to debilitate economic growth in the Nigerian economy. These findings are consistent with the arguments advanced by Krugman (1987) and Sala-i-Martin and Subramanian (2003).

The gap models postulated that investment depend on savings, and that the level of domestic savings and foreign exchange earnings are inadequate to finance infrastructure development in the developing countries, which consequently has caused chronic fiscal deficits in these countries. Consequently, governments of these countries, including Nigeria resort to external finance to bridge the gaps (Domar, 1946; Harrod, 1939; Chennery and Strout, 1966; Chennery and Bruno, 1962; Bacha, 1990). Thus, to promote investment in infrastructure projects, governments borrow to address the deficits (Truger, 2015; Kellerman, 2007). Our study provides direct empirical support to back this claim. Although Creel *et al.,* (2007) had pointed out that golden rule entails sustainable investment within a manageable debt to GDP ratio, which is regarded as the country's threshold level. But this may not give the desired results as the majority of the public sector projects are unable to yield incomes, while most of them are financed through re-borrowing and future taxes. This cycle of vicious cycle of borrowing end up causing macroeconomics problems that attract fiscal and monetary policies, which in the hands of poor economies are often badly handled (Arslanalp *et al.,* 2010).

The evidence also shows that the increasing debt service takes away resources that could be invested in the key infrastructure and productive sectors of the Nigerian economy to support long run economic growth. This aggravates the liquidity constraint since the county's substantial amount of resources are committed to repaying loans, which then acts as disincentives to investment. The liquidity constraint has also created uncertainty to potential investors from making new investment because of the fear that higher taxes might be charged in order to meet debt service obligations (Elbadawi, 1996; Clement *et al*., 2003).

The evidence of the findings also substantiates the arguments of the well known debt theories of debt overhang and debt Laffer curve advanced by Krugman (1988), Sachs (1989, 1990), and supported by Claessens (1990), Kaminsky and Pereira (1996), Pattillo *et al.,* (2002, 2011), and Reinhart and Rogoff (2010). It is evident that the external debt composite index has exerted a negative effect on growth, which shows that Nigeria is still suffering from the negative effects of accumulated debt, albeit it is not as steep as in the previous decades (largely due to debt relief). Although, Nigeria's external debt has now become sustainable based on threshold levels, there is high tendency that high debt may frustrate government efforts to sustain economic growth without getting trapped in the debt overhang again.

7.5 Implications for policy

Given the robustness of our findings the study attempt to draw implications in this section for policy. The study endorses the following important policy implications. While sourcing capital through external finance to augment savings and investment gap is of paramount importance to developing countries (Chenery and Bruno (1962); Mckinnon (1964); Chennery and Strout (1966), governments should focus on

productive investment to boost development capacity, especially of the non-oil related sectors, which can help sustain long term export performance and reduce import demand. Such a policy can also could generate adequate income, which enable poor countries to service and pay off their debt obligations against the future debt risk.

Restructuring of poor tax base could improve fiscal balance. In Nigeria, improving sources of government income to meet the developmental aspirations of the citizenry has been the major challenges facing the economy for a long time. Therefore, expanding a simplified tax base structure in conjunction with a shift from overemphasizing on Keynesian prescriptions of fiscal stabilization through deficit spending will be helpful as many governments have masked their problems through such perception to borrow, which has increased the debt stock in those countries. Rather, emphasizing a novel tax regime and measures aimed at generating additional income within a favourable framework could help reduce the tendency for further borrowing and at the same time prevent further pressures on external borrowing.

Debt relief or debt reduction has been pursued by Nigeria. This opportunity allows the country to enjoy the lowest debt indicators, which was never recorded in the past decades. Therefore, Nigeria should impose an embargo on external borrowing, unless such loans are clearly identified for special and viable projects, which would provide enough rate return for debt repayment. The central government should also ensure that state governments do not indulge in haphazard external borrowing, which can help maintain debt ratios within the threshold levels against the future debt crisis.

7.6 Limitations of the study

This study acknowledges several limitations that have not been addressed. Firstly, this study is restricted to a single country case study, which restricts its potential for making generalizations for other countries. While the country study is detailed, it can be improved by including other indebted developing countries, such as Ghana, Cameroon, Ethiopia, Bolivia, Afganistan Sudan, and Nepal. It is also interesting to compare the case study with other countries facing different economic structures, political backgrounds, and social structures. The extensions may offer findings that can help broaden policy implications for a wider range of countries. The inclusion of several countries from different continents with application of panel data techniques may increase the generalizability of the study's conclusions.

Furthermore, this study used secondary data from several official databases, such as World Development Indicators, World Bank (WDI, WB), World Macroeconomic Research (WMR), Central Bank of Nigeria (CBN) and the Debt Management Office (DMO), Nigeria. We were not able to use institutional variables to refine the findings further. These variables have been used by other studies such as Perasso (1987) and Ndikumana and Boyce (2011) as part of the major factors contributing to debt build up in developing countries like Nigeria. However, any attempt to use institutional variables such as corruption must be done carefully as the responses tend to be highly subjective and hardly exhaustive.

7.7 Suggestions for Future Research

To advance the current research area on the analysis of the external debt related issues, the following suggestions are offered:

Future studies should use a panel of countries, such as Ethiopia, Sudan, Mali, Pakistan, Haiti, and Cameroun to test if the same findings can be replicated. Future studies could also segregate countries by income levels for comparison.

Further research has to be carried out in order to take account of other potential determinants of external debt, which were ignored in this study due to the lack of availability of data, which includes institutional variables, such as corruption, leadership, and accountability. The study can be extended to other countries facing similar fundamental problems or at global study. In addition, future studies may consider other theories, which this study did not cover in relation to international borrowings, such as the Ricardian equivalence proposition.

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