EXTERNAL DEBT, DEBT OVERHANG, CROWDING OUT EFFECTS AND CAPITAL FORMATION IN NIGERIA AND SOUTH AFRICA

MUHAMMAD MUSTAPHA ABDULLAHI

DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA
April 2016

EXTERNAL DEBT, DEBT OVERHANG, CROWDING OUT EFFECTS AND CAPITAL FORMATION IN NIGERIA AND SOUTH AFRICA

BY

MUHAMMAD MUSTAPHA ABDULLAHI

Thesis Submitted to
School of Economics Finance and Banking
Universiti Utara Malaysia
In Fulfillment of the Requirement for the Degree of Doctor of Philosophy

Kolej Perniagaan
(College of Business)
Universiti Utara Malaysia

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Tarikh: 21 April 2016
(Date)

Nama Pelajar (Name of Student)	:	Muhammad Mustapha Abdullahi
Tajuk Tesis / Disertasi *(Title of the Thesis / Dissertation)*	:	External Debt, Debt Overhang, Crowding Out Effects and Capital Formation in Nigeria and South Africa
Program Pengajian *(Programme of Study)*	:	Doctor of Philosophy
Nama Penyelia/Penyelia-penyelia *(Name of Supervisor/Supervisors)*	:	Assoc. Prof. Dr. Nor' Aznin Abu Bakar Tandatangan
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ABSTRACT

The deficiency of saving in Sub-Saharan Africa, as represented by Nigeria and South Africa has led to shortages in funding capital formation, thereby necessitating external borrowing. This has slowed down and restrained economic growth and development. The questions of external debts determinants, effects and causal relationships with capital formation are yet to be adequately responded to; mainly due to weak and non-rigorous methods employed in the previous studies. The focus has not been effective and specific. The objective of this study is fourfold; determine factors affecting external debt accumulation, examine effects of external debt on capital formation, assess impact of debt overhang and crowding out effects on capital formation and investigate causal relationships between external debt and capital formation in Nigeria and South Africa. Autoregressive distributive lag (ARDL) and Vector Autoregressive (VAR) modeling on time series data covering three decades were employed in the study. The results have established that, interest rate and external debt service are the most statistically significant variables explaining external debt accumulation scourge in the selected countries. Additionally, the study has discovered that, external debt has significant negative effects on capital formation in the same manner with debt overhang and crowding out effects. However, these impacts are proven to be more pronounced on capital formation in Nigeria than in South Africa. It is also established that external debt and capital formation Granger causes each other. The overall implication of the research findings is that speed of capital formation has been retarded by the negative effects of external debts. Measures by the government should be tailored towards improving capital formation by designing policies that will reduce the burden of debt accumulation and reducing the cost of external debt services. This can be done through enhancing the debt management process and improving efficiency in funds utilization, so as to ensure timely repayment and servicing of debts.
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Key Words: External Debts, Capital Formation, ARDL, VAR, Granger Causality

ABSTRAK

Kekurangan tabungan di Sub-Sahara Afrika seperti yang berlaku di Nigeria dan Afrika Selatan telah mengakibatkan kekurangan bagi membiayai pembentukan modal yang membawa kepada keperluan pinjaman luar. Hal ini telah memperlahan dan menghalang pertumbuhan dan pembangunan ekonomi. Persoalan berkaitan dengan penentu hutang luar, kesan dan hubungan sebab dan akibat dengan pembentukan modal masih belum dapat dijawab dengan sebaiknya. Hal ini disebabkan oleh kaedah kajian yang digunakan sebelum ini lemah dan tidak padu di samping tumpuannya yang tidak khusus dan tidak berkesan. Empat objektif kajian ini ialah untuk menentukan faktor yang mempengaruhi pengumpulan hutang luar, memeriksa kesan kesesakan keluar hutang luar ke atas pembentukan modal, menilai kesan dari belenggu hutang dan kesan yang membebankan ke atas pembentukan modal serta menyiasat hubungan sebab dan akibat antara hutang luar dan pembentukan modal di Nigeria dan Afrika Selatan. Pemodelan Autoregresif Lat Distributif (ARDL) dan Vector Autoregresif (VAR) ke atas data siri masa selama tiga dekad telah digunakan dalam kajian ini. Keputusan kajian telah membuktikan bahawa kadar bunga dan perkhidmatan hutang luar adalah pembolehubah yang paling signifikan secara statistik bagi menjelaskan kemelut pengumpulan hutang luar di negara-negara yang dipilih. Kajian ini juga telah mendapati bahawa hutang luar mempunyai kesan negatif yang besar ke atas pembentukan modal dengan cara yang sama dengan belenggu hutang dan kesan kesesakan keluar. Walau bagaimanapun, kesan ini telah terbukti menjadi lebih ketara ke atas pembentukan modal di Nigeria berbanding Afrika Selatan. Selain itu, hutang luar dan pembentukan modal didapati penyebab Granger antara satu sama lain. Implikasi keseluruhan dapatan kajian menunjukkan bahawa kelicinan pembentukan modal telah tergugat dengan kesan negatif daripada hutang luar. Kerajaan perlu mengambil langkah yang sesuai ke arah meningkatkan pembentukan modal dengan membentuk dasar yang akan mengurangkan beban pengumpulan hutang, merendahkan kos perkhidmatan hutang luar melalui peningkatan proses pengurusan hutang dan meningkatkan kecekapan dalam penggunaan dana untuk memastikan pembayaran balik dan khidmat hutang tepat pada masanya.

Kata Kunci: Hutang Luar, Pembentukan Modal, ARDL, VAR, Granger Sebab dan akibat

ACKNOWLEDGMENT

In the name of Allah SWT, the Most High, the Beneficent, the Merciful. May Allah's praises and blessings be upon the Prophet Muhammad ﷺ and his companions. First and foremost my appreciation goes to my two supervisors, Associate Professor Dr. Nor Aznin Abu Bakar and Associate Professor, Dr. Sallahuddin Hassan, the Deputy Dean of the School of Economics Finance and Banking (SEFB), for their unquantifiable support in this study.

My appreciation also goes to my internal reviewers in the persons of Professor Dr. Jauhari Dahalan and Professor Dr. Fatimah Wati Ibrahim for their constructive comments and valuable suggestions during my proposal defence. Same goes to my internal examiner, Associate professor Dr. Hussin Abdullah, external examiner, Associate Professor Tamat Sarmidi form UKM, and Chairman of the Viva session Professor Dr. Jamal Ali. The supports and resources of the Universiti Utara Malaysia, in general and the School of Economics, Finance and Banking in particular are very much appreciated.

My sincere appreciation goes to my entire family members, too numerous to mention here. In particular, however, my appreciation goes to my wives, Amina Shehu and Amina Lawal, my daughters; Rukayya, Fatimah, Khadija, Aisha and Maryam; and my sons Abdullahi, Usman, Al-Mustapha, and Abu-Bakr. I also pray and appreciate my late parents whose sacrifice majorly facilitated and ensured my smooth educational foundation. I pray that the almighty Allah bestow on them, His highest honours.

Finally my profound gratitude goes to my employer and sponsor, the Bauchi State University, Gadau; and to especially the Vice Chancellor Professor, Dr. Ezzeldin M. Abdurahman and his management team. The TETFUND sponsorship has made the period of the study a more comforting and memorable experience.

Colleagues and friends in and out of the Post Graduate reading rooms are hereby recognized. It has been quite a positive relationship throughout our stay together.

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2SLS	Two-Stage Least Squares
ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive-Distributive Lag
BOP	Balance of Payments
BUD	Budget Deficits
CAP	Capital Formation
CBN	Central Bank of Nigeria
COE	Crowding Out
CUSUM	Cumulative Sum of Recursive Residuals
CUSUM-Q	Cumulative Sum of Squares of Recursive Residuals
DF	Dickey and Fuller
DMO	Debt Management Office
DOH	Debt Overhang
ECT	Error Correction Term
EDS	External Debt Service
EXC	Exchange Rate
EXD	External Debt
FDI	Foreign Direct Investment
FOLS	Fully Modified Ordinary Least Square
FPE	Final Prediction Error
FPI	FPI: Foreign Private Investment
GEXD	Public External Debt
H-Q	Hannan- Quinn
ICOR	Incremental Capital Output Ratio
IFA	International Finance Agencies
IMF	International Monetary Fund
INR	Interest Rate
IRF	Impulse Response Function
LR	Likelihood Ratio
ML	Maximum Likelihood
OLS	Ordinary Least Square
PEXD	Private External Debt
RESET	Ramsey's Regression Equation Specification Error Test
RHS	Right Hand Side
SAP	Structural Adjustment Programm
SAV	National Saving
SBC	Schwarz Bayesian Criterion
SSA	Sub-Saharan Africa
VAR	Vector Autoregressive
VD	Variance Decomposition
VECM	Vector Error Correction Model
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The research topic and variables of interest are discussed in this chapter. It starts with the background of the study serially discussing the main issues under consideration. The introduction to the concepts of external debt, capital formation and debt overhang was undertaken just as their relationship with other variables. Therefore, this chapter is targeted towards a general introduction of the thesis which is made up of the overall highlights of the study, and an outline of the Nigeria's and South Africa's external debt experiences in relation to capital formation, debt overhang and crowding out effects. It also presents the problem statement, objectives and motivation of the study and the structure of the thesis.

1.2 Background of the Study

External debt or foreign borrowing is as inevitable as the need for capital in economic development while shortage of this capital is one of the major characteristics of underdeveloped economies. The shortage is a resultant product of under savings which makes it compulsory for economies to source for additional funding mostly in form of foreign borrowing (Adepoju, Salau & Obayelu 2007). To this end, a very important role is played by capital accumulation, otherwise known as capital formation; widely established by economists and has been widely observed in the developmental process of many economies, popularly referred to as capital fundamentalism (Youopoulos & Nugent, 1976, Beddies, 1999, Gbura, 1997, Gbura & THadjimichael, 1996).

The foregoing scenario is further captured by the theory of "dual gap analysis" which propounds that the development of a nation is a function of capital formation and that such capital formation or investment requires domestic savings which is mostly inadequate in the developing economies, hence their resort to sourcing of funds from outside the countries (Mckinnon, 1964; Ajab and Audu, 2006; Aliyu & Usman, 2013). This is referred to as external borrowing or external debt (either private or public) used in boosting the investment requirements of individual countries resulting from shortages in domestic savings (Abuzaid, 2011; Ajab & Audu, 2006; Suma, 2007; Were, 2001). On the other hand, the dynamics of external debt indicate that it may not positively add to the improvement of economic development all the times, just as seen in the experiences of many Sub Saharan African countries and many underdeveloped economies (Adegbite, Ayadi & Ayadi, 2008).

For example, in the quest of achieving and maintaining a healthy capital formation cum economic growth, most of these nations pursued a structural adjustment program with a shift in emphasis towards private sector participation allowing less economic activities to be run by government. The intention was to support private entrepreneurs in boosting capital formation so as to uplift economic growth and development. So was the scenario in many African countries that in an effort to achieve this objective, attention was moved from the then pattern of consumption expenditure to investment in capital accumulation through privatization and commercialization of national enterprises (Bakare, 2011).

Unfortunately however, the positive expectations could not be achieved. Even though the program resulted into privatizing and commercializing of some business outfits and uplifting the performance of other macroeconomic indicators; for example rate of interest and supply of money, the overall results were discouraging. The countries continued to witness fluctuations in capital formation and economic growth. The following sub sections will introduce the major variables of interest for ease of discussion.

1.2.1 The External Debt

External debt is defined as a financial commitment that link one party (the debtor country) to another (the lender country); it mostly denotes incurred debt which are repayable in denominations other than the debtor nation's currency (Ajab & Audu, 2006). In other words the total sum of liability owed to foreign companies, governments firms, and individuals is what is referred to as external debt stock. These liabilities must however be in currency other than the debtor's home currency. The total external debt is therefore a total of public, publicly guaranteed and private non-guaranteed long term debt, use of international monetary fund (IMF) credit, and short-term debts (WDIs, 2014).

The major consideration at the time of going into contract for a foreign loan is that, one should take cognizance of the fact that profit from investment should by far be in excess of the expected cost to be incurred in servicing the facility (Ajayi and Khan 2000). It is further opined that by this consideration the borrower will be raising capacity and growing productivity using foreign savings through debt (Mckinnon, 1964).

The abundance and availability of low priced international loans in 1970s lead to the proliferation of these external debts among the third world countries (Ajab & Audu, 2006). This was in addition to shortage of internal savings, huge budget deficits, serious decrease in trade balances and oil price fluctuations; coupled with the rise in public expenditure of especially Sub-African countries as a result of increases in the prices of imports also during the early 1970s. These contributed immensely in encouraging developing countries to opt for importation of funding in order to support local capital (Were, 2001; Leta, 2002; Suma, 2007). External debt is therefore considered very rampant for third world nations in their initial level of development, aiming at smoothing and boosting their capital formation process, which is a sine qua non to investment in particular and economic growth in general (Chenery & Strout, 1966).

Nigeria's external debt experience

The history of foreign debt in Nigeria started barely half a century back with the contracting of US$28 million used in financing the first rail line project in the country. From 1970, the external debt needs were reasonable and within limit up to when the world crude oil market suffered a serious fall in prices in 1978; which naturally exerted a burden on the government, that warranted the signing of more foreign loans in order to finance the increasing deficits in its budgets (Sulaiman & Azeez 2012; Omotoye, Sharma, Ngassan & Eseonu; 2006). The trend continued into the 1980s when Nigeria's foreign debt drastically escalated due to the falling oil exports coupled with the discouragement to invest contributing to the relatively low economic performance of the economy.

With political powers changing hands to the military in 1985 strategies were directed in the area of austerity measures; while the dramatic fall in prices of oil in 1986 added to the increasing need for change which led the Nigerian government into initiating structural adjustment program (SAP) to alter the dwindling opportunities; declining economic development, rising lack of jobs, general increase in price levels, deteriorating poverty levels, growing adverse trade balance, overwhelming charges on loans and advances and increasing budget deficits. The major policy thrust of the SAP, was redirection from inward based import oriented approach to an export oriented approach and the final policy instrument was the exchange rate as a result of which debt stock grew from US$4.6 billion in 1980 to US$18.6 billion 1986, US$29.70 billion in 1988 and US$32.9 billion at the end of 1990; resultant effects of mostly devaluation and deregulation. This scenario is clearly depicted by Figure 1.1.

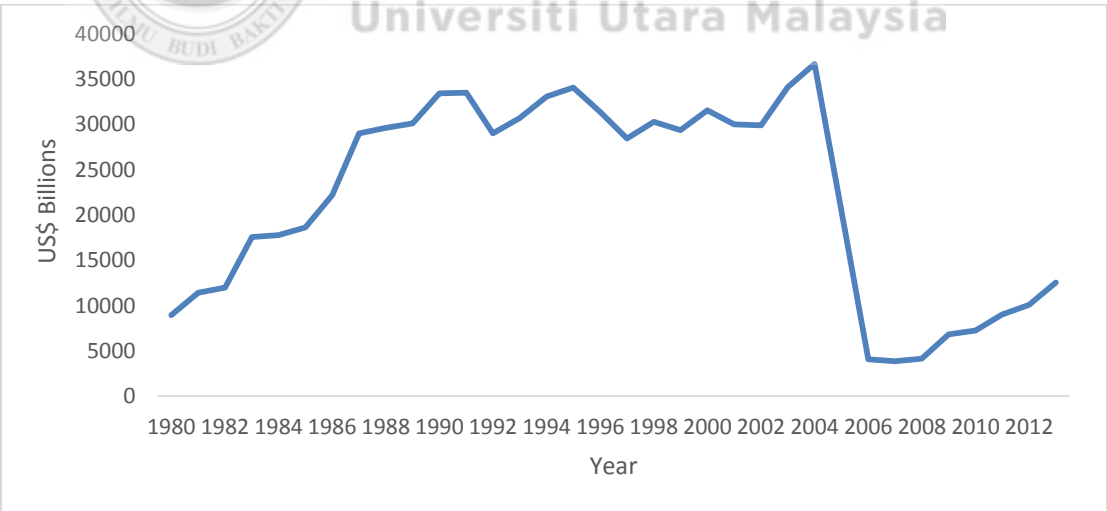


Figure. 1.1
Total External Debt Stock of Nigeria, 1980 – 2013

The country's external debt stock composition at its peak by 2004 was such that US$30.8 billion from the total outstanding debt was from the 14 member Paris Club

and US$2.8 billion from the London Club while US$2.2 billion came from the multilateral financial institutions (Ajab & Audu, 2006). This composition which was grossly skewed in favor of the Paris Club of creditors did not help matters, especially in terms of pricing and the overall contract terms; and subsequent debt relief negotiations. This position is shown in Table 1.1 and explained by Figure 1.2.

Table 2.1
Structure of Total External Debt Prior to Debt Relief

Creditors	(US$ Billion)				
	1985	1991	1992	1998	2004
Paris Club Creditors	7.8	17.8	16.4	20.8	30.8
Non-Paris Club	1.9	1.4	1.2	0.1	0.0
Commercial Creditors	7.8	10.5	5.4	3.6	2.2
Multi-lateral Creditors	1.3	4.0	4.5	4.2	2.8
TOTAL	18.9	33.7	27.6	28.8	35.9

Source*: Debt Management Office Nigeria (2005)*

With total exist from the Paris Club in 2006; the external debt stock figure has significantly gone down to US$3.5 billion and US$3.4 billion in 2006 and 2007, respectively as indicated by Figure 1.1. The debt figure, however, has been on a steady increase since then; US$3.7 billion in 2008, US$3.9 billion in 2009, US$4.5 billion in 2010, US$5.7 billion in 2011, US$6.5 billion in 2012 and US$9.0 billion in 2013 (Debt Management Office, "DMO" Nigeria, 2014). This pattern gives a clear sign of the debt stock position gradually getting back to its previous level within a short time frame.

South Africa's external debt experience

Like other Sub Saharan African countries, loan facilities were easily accessible to the South African economy in the 1970s and beyond owning to the heavy signing of the

loans by both public and private sectors. Similarly, the experience of South Africa's external debt performance may not be radically different from that of Nigeria, given the similar nature of the economies both in terms of size and antecedents. South Africa until very recently has been the largest economy in Africa and currently second only to Nigeria. It has outstanding commitments in external debt amounting to over US$139.00 billion as at the end of 2013 with a GDP, of about US$351 billion translating to external debt GDP, ratio of about 40 per cent. The active history of South Africa's external debt like that of Nigeria started in the early 70s, while rapid increase in external debt stock and decline in foreign investment was witnessed from early 80s to date.

The outstanding total loans stocks for South Africa continuously increases as facilities were signed from either the IMF or other International Finance Agencies (IFAs), especially when requests for facilities were declined by private and commercial lenders. Though South Africa's indebtedness became stabilized through gold swap for a while, its position as regards outstanding loans became serious by 1984, as over and above two third of its facilities were maturing. Major external debt crisis became eminent in 1985 for South Africa as a result of Chase Manhattan withdrawal of its main credit facility. This led to the temporary closing of the financial and foreign-exchange market hence leading to a crash of the local currency exchange unit.

As in the case of Nigeria, the debt profile of South Africa is branded by a high percentage of loans that were denominated in foreign currencies. The country's foreign debt has been much, while it continuously follows an increasing movement, resulting into a sizeable adverse outcome on productivity and growth. For example,

foreign debt as at 2003 was US$38.1 and rose to US$68 billion by 2007 translating to about 78 per cent. On the other hand however the total debt in the short run peaked at US$24 billion in 2007 up from US$9.2 billion in 2003.

The ratio of foreign debt to GDP, reached 22.9 in 2003, and marginally increased to 23.2 in 2007. The external debt GDP, ratio reached an all-time high of 40 per cent as at December 2014. Even though the debt level may show a healthy debt sustainability characteristics; that may not necessarily be in tune with reality. As at then, government owns 16 per cent of the country's outstanding external debts; while 44 per cent is owned by the private sector, 40 per cent was out of which is incurred by the banking sector.

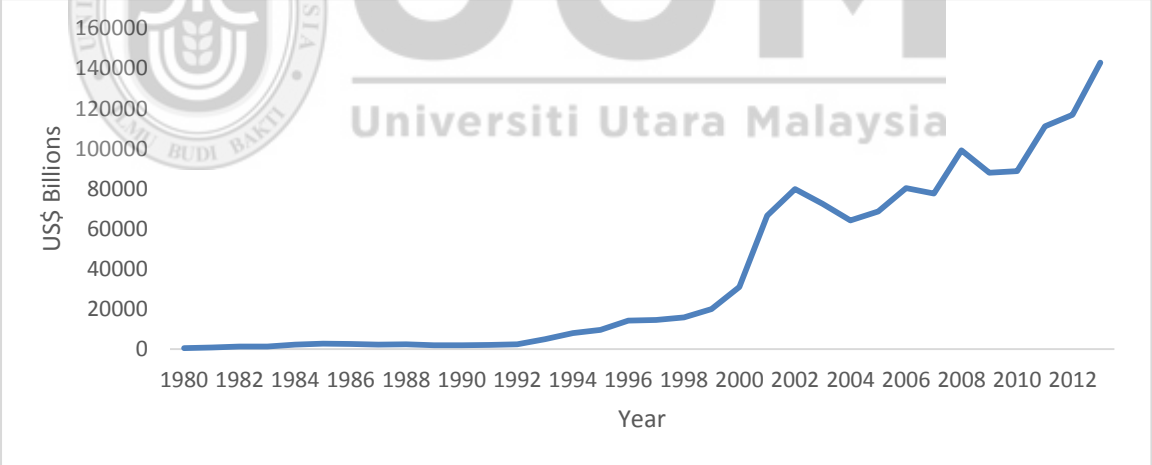


Figure 1.2
Total External Debt Stock of South Africa, 1980 – 2013.

A key issue in servicing South Africa's loans was that it is recorded in non US Dollar hard currencies, while appreciating in dollar. South Africa nevertheless settled between US$1.7 billion and US$1.9 billion of the debt by 1990 while some foreign financial institutions were increasingly willing to refinance the maturing credits.

Various rescheduling arrangements were entered into, which saw the reduction of South Africa's debt figure with about US$8 billion in a short span of four years, from US$14 billion to US$6 billion.

At a point there was virtually no foreign loans signed by South Africa from 1985 to 1990, which made it a net capital exporter in the late 1980s. South Africa decreased its total foreign debt to less than US$20 billion in early 1992, down from nearly US$24 billion in 1985. Exchange rate fluctuations jerked South Africa's foreign debt up to US$25.8 billion at the end of 1993, and the figure continued to increase in 1994. South Africa was considered to have under borrowed by conservative financial criteria; with a foreign debt to export ratio of about 60 per cent and a foreign debt to GDP, ratio of 15.1 per cent (South African Reserve Bank, 1994). Foreign borrowing rose by 1995, when total external debt to GDP, ratio increased to almost 22 per cent.

Amongst factors that contributed to the deplorable condition of high debts accumulation were high inflation rate, persistently depreciating exchange rates and very huge budget deficits. It should be expected also that as debts commitments increase, available exports earnings decrease since part of the income will be used in servicing debts. These will consequently have indirect effects on public spending and hence adversely affecting economic development in general and can be seen as a major cause of debt overhang in particular.

1.2.2 Capital Formation

The position of growth theories is that the more the society saves the better the chances of that society's investment and given the fact that growth in savings and

investments positively affects economic growth and development (Hunt, 2007). Similarly, Sachs (2002) views were that increase in capital and investment will lead to a sustained rise in economic growth.

Nurkse (1953) opined that capital formation is generally defined as that part of a resource which the society does not employ for current fruitful activity to the needs and desires of instant consumption. The unused capital in the production or production of capital goods, tools and implements, machines and all types of real funds that can greatly increase the efficiency of production in the future. Some scholars defined it as the proportion of current income saved and subsequently put into profitable ventures in order to enhance future production and returns (Todaro, 2009). As a result, new resources are added or existing resources upgraded with its essential feature involving a trade-off between present and future consumption giving less now in order to have more in the future (Enders & Harpers, 2013). It therefore, refers to all new investments in landed property, physical equipment and human resources; through improvement in health, education and job skills with the ultimate aim of boosting future economic development.

In the same perspective, Bakare (2011) defines capital formation as, that part or percentage of current earning in form of income that is not consumed but saved and invested so as to uplift future production and income. Bakare maintained that this mostly emanates from acquirement of new factories together with their machinery and equipment including all capital goods in production line. This is a resultant effect of an increase in countries capital stocks with equal investment in both societal and commercial arrangement (Bakare, 2011; Khan, 2007). Gross fixed capital formation is

generally subdivided into two; investment in both private and public sectors. The public investment comprises of public and private. The gross domestic investment thus represents gross fixed capital formation in addition to total differences in the level of the firm's records (Bakare, 2011; Ugochukwu, Judith & Edith, 2014).

"Capital fundamentalism" is the idea that; rate of physical capital accumulation is a crucial determinant of economic growth. The Harrod-Domar growth models form the original theoretical basis for capital fundamentalism. Theory and empirical evidence abound to prove the fact that no meaningful economic growth can take place and be sustained without countries and economies surviving capital formation at a less than the GDP growth rate. It is well known that the capital formation GDP, ratio that is less than 27 per cent could not sustain meaningful economic development (Harnandez-Cata, 2000). It has been documented that gross capital formation ratio to GDP, in SSA countries that have witnessed slowing growth rates in the 1990s was below 17 per cent, while advanced economies recorded over and above 27 per cent. The SSA countries ratio has therefore fallen far below the acceptable minimum ratio (Gillis, Perkins, Roemer & Snodgrass, 1987).

The foregoing scenario therefore, rationalizes the link between slow economic growth rates and the rate of growth of capital formation in developing economies. The uncertainty in the procedure and the dynamics of capital formation has an important negative impact on economic growth and development. It can be concluded therefore that the degree of capital formation when compared to GDP, which can at the same time endure a vigorous and healthy economic growth process should not be below 27 per cent (Harnandez-Cata, 2000).

Records have shown that between 1970 and 2013 Nigeria's capital formation reached a maximum of US$29.8 billion, 9.9 times its 1970 position of US$3 billion. The average annual increase of capital formation of Nigeria is US$0.64 billion or 21.3 per cent while the least was in 1995 (US$2.1 billion). In-between 1970 to 2013, capital formation per capita in Nigeria grew by 3.3 times, to US$176.4. Its average annual growth per capita in Nigeria was US$2.9 or 5.6 per cent.

During 1970-2013 period, capital formation of South Africa rose by US$68.4 billion (by 13.9 times) to US$73.7 billion. The average annual growth of capital formation of South Africa was 30 per cent. South Africa's minimum capital formation was US$5.3 billion, while the maximum was US$79.8 billion in 2011. Capital formation of South Africa in 2013 was US$73.7 billion, ranked 36th in the world and was almost at par with capital formation of Nigeria of US$75.8 billion during the same period.

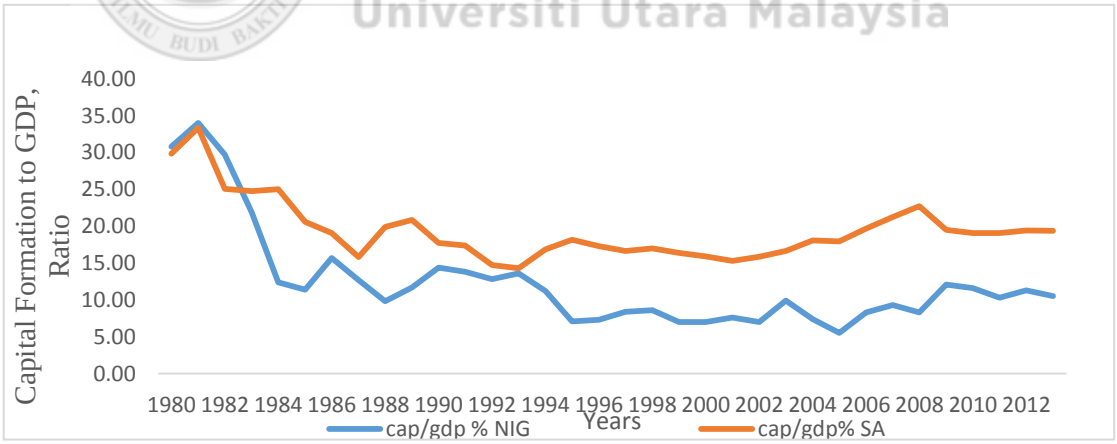


Figure 1.3
Nigeria and South Africa's Capital Formation to GDP Ratio, 1980-2013

As earlier observed in the two previous paragraphs, the ratio of capital formation to GDP that is below 27 per cent cannot sustain meaningful economic development (Harnandez-Cata, 2000). As that of Nigeria, the South Africa's Capital formation to

GDP, ratio has fallen below this minimum requirement. This can be clearly seen from Figure 1.3.

1.2.3 Debt Overhang Effect

It is important to note that borrowing from abroad is known to have both negative and positive effects on the debtor nations. But the current trend in debt crisis has shown that the numerous costs of external debt seem to out-weight its benefits in many developing economies (Suma, 2007; Elbadawi, Ndulu & Ndungu, 1999; Pattillo, Poirson, & Ricci, 2002, 2004). In addition, Clements, Bhattacharya and Nguyen (2003) established that the relationship between foreign loans and economic growth is a nonlinear one thus having a bell shaped pattern, therefore suggesting that up to a certain point the impact of external debt on economic growth is falling and adverse. Specifically, it was confirmed by Pattillo *et al.* (2004), that the marginal effects of foreign borrowing on economic growth in less developed economies is negative.

The best-known explanation as to why a large level of accumulated external debt hinders capital formation and investment can be seen from the "debt overhang theory". The theory propounds that if there is expectation of countries repayment ability in the future becoming less than the external debt burden, investors will be discouraged from investing in these economies. The fear of potential investors will be that future productions will be taxed in order to service outstanding debt stocks. Potential investors will therefore not be prepared to invest today for the sake of increased future productivity. Krugman (1989) and Froot and Krugman (1988) theorized the debt overhang model by applying the Laffer curve theory in analyzing trend of the existence of a nonlinear relationship between external debt and growth.

The debt Laffer curve theory presumes a situation where the repayment of debt and accumulated debt stock is always linked to weaker prospects of debt settlement. (Krugman, 1988, 1989).

Accumulated external debt stock retards macroeconomic performance through "debt overhang" effect (Adegbite, Ayadi & Ayadi, 2008) which could manifest in form of tax disincentive, in which accumulation of debt stock dampens investments due to fear by willing entrepreneurs that there may be taxes on subsequent inflows and production which will be used in servicing foreign loans. In addition, increases in deficits leads to macroeconomic instability which is a resultant effect of infrequent funding, devaluation and depreciation and likely financial growth slowdown and projected increase in the general price level (Claessens, Detragiache, Kanbur, & Wickham, 1996).

In the same vain, while examining the correlation between foreign borrowing and economic growth Ashinze and Onwioduokit (1996) reported a period of positive and active usage of foreign loans and finance consequently leading to a noticeable improvement in economic growth. On the other hand a period of inefficient utilization of funds was also reported resulting into serious decline in economic productivity. Iyoha (1997) also reiterated the crowding out effects and the negative impact of debt overhang especially in form of cost of funds. He emphasized that the said outcomes describe to a great level the motives for the discouraging pattern of investment in developing countries.

1.3 Problem Statement

The resultant effects of shortages of funds and savings deficiencies especially in Sub-Saharan Africa (SSA), coupled with low costs of funds from developed nations have led to succumbing to the temptation of foreign borrowing (Ajab & Audu, 2006; Adepoju, Salau & Obayelu 2007). This is in addition to, huge budget deficits, decrease in trade balances and oil price fluctuations. These have contributed immensely in encouraging developing countries to opt for importation of funding in order to support local capital (Were, 2001; Leta, 2002; Suma, 2007).

External debt is therefore considered very rampant for third world nations in their initial stages of development (Chenery & Strout, 1966). The dynamics of external debt have however indicated that it may not positively add to the improvement of economic development all the times, just as witnessed in the experiences of many Sub Saharan African countries (Adegbite, Ayadi & Ayadi, 2008). This follows from the fact that external debts effects have imposed enormous burden on nations, most notably, adverse effects on investment and capital formation in form of debt overhang and crowding out effects.

The current trend of external debt accumulation and its aftermath, in most developing countries has shown that the numerous costs of external debt seem to out-weight its benefits (Suma, 2007; Elbadawi, Ndulu & Ndungu, 1999; Pattillo, Poirson, & Ricci, 2002, 2004). Specifically, Pattillo *et al.* (2004) confirmed that the marginal effect of foreign borrowing in developing economies is negative. Accumulated external debt stock retards macroeconomic performance through "debt overhang" effect (Adegbite *et al*., 2008) which could manifest in form of tax disincentive, whereby it dampens investments due to fear by willing entrepreneurs that there may be taxes on subsequent

inflows and production which will be used in servicing foreign loans. Claessens, Detragiache, Kanbur, & Wickham, (1996) and Iyoha (1997) reiterated the crowding out effects and the negative impact of debt overhang especially in form of cost of funds. They emphasized that this scenario describes to a great extent the reasons for the discouraging patterns of capital formation in developing countries.

In view of the foregoing therefore, it is worth noting that, Nigeria's external debt figure peaked at over US$36 billion dollars in the early 2000s. This situation continued to worsen up to the end of 2005 when a historic US$18 billion debt relief was signed in Nigeria's favor. The external debt stock figure of Nigeria significantly went down to US$3.5 billion and US$3.4 billion in 2006 and 2007, respectively. The debt figure, however, has been on a steady increase since then; US$3.7 billion in 2008, US$3.9 billion in 2009, US$4.5 billion in 2010, US$5.7 billion in 2011, US$6.5 billion in 2012 and US$9.0 billion in 2013 as indicated by Figure 1.1, (Debt Management Office, "DMO" Nigeria, 2014). The external debt accumulation trend however seems to be repeating itself from 2006 to date with a seemingly rising external debt stock. The country does not seem to have learnt from its bitter lessons of the past three decades.

In the same direction, external loans facilities were easily accessible to South Africa in the 1970s and beyond, leading to the heavy signing of loans by both public and private sectors. South Africa has outstanding commitments in external debt amounting to over US$139.00 billion as at the end of 2013 with a GDP, of about US$351 billion translating to external debt GDP, ratio of about 40 per cent. The active history of South Africa's external debt like that of Nigeria started in the early 70s, while rapid increase in external debt stock and decline in foreign investment was witnessed from

early 80s to date. The worst statistics are that the external debt, GDP ratio was 22.9 in 2003, and has peaked at 40 per cent as at December ending in 2014. The implication here is that while the indicator portrays a not so serious position of the debt condition, there is the possibility that the external debt situation may be very difficult to manage in the future, if remedial measures are not taken, (Murwirapachena & Kapingura, 2015).

Theory and empirical evidences abound to prove that, no meaningful economic growth can take place and be sustained without maintaining capital formation at a less than the GDP growth rate. It is known that the capital formation to GDP ratio, that is less than 27 per cent could not sustain meaningful economic development. The average Gross capital formation ratio to GDP, in SSA countries, that have witnessed slowing growth rates was below 17 per cent, while advanced economies recorded over and above 27 per cent. The SSA countries ratio falls far below the acceptable minimum ratio throughout the period under study (Gillis, Perkins, Roemer & Snodgrass, 1987; Harnandez-Cata, 2000). This scenario, rationalizes the link between slow economic growth rates and the rate of growth of capital formation in developing economies. This can be clearly observed from Figure 1.3 for Nigeria and South Africa.

It can therefore be seen that, an enormous damage has been made on these economies and in effect, capital formation. Invariably, therefore, foreign loans acted as key restraints to capital formation in Nigeria while causing a lot of obstacles in South Africa (Adegbite, et al., 2008). The fluctuation and intermittent decline in the ratios of capital formation to GDP, and its inability to reach the minimum level of 27 per cent;

which is a pre requisite for sustainable development for up to three decades was witnessed, and continued unabated in the two nations. Indeed, the overall speed and the performance of these economies remained far below expectation due to weak capital formation.

Conflicting and inconclusive results from previous studies, were mainly due to employment of weak analytical tools and non-rigorous methods. This thesis is therefore aimed at improving the level of quality and standards of past studies employing broad time series data set spanning a period of over three decades. The study will therefore be among the few if any, to focus specifically on the effects of external debt on capital formation in these two nations.

In addition, Causality amongst variables may not necessarily be unidirectional. It may, instead be a two-way or zero causality. This need to be examined and a position established. These discrepancies have added to the existence of a gap in the literature and thus necessitating a more efficient, wide-ranging, more concentrated and specific study of the relationship between external debt and capital formation. Therefore, different conclusions on these issues both at the theoretical and empirical levels stands out as a motivational factor for the research using Nigeria and south Africa (the two largest economies in Africa) in order to provide a clearer view for policy makers.

1.4 Research Questions

From the foregoing, therefore, four main questions are raised of which this study is aimed at providing answers to:-

i. What are the major determinants external debts in Nigeria and South Africa?

ii. Are there short and long run relationships of external debts on capital formation in Nigeria and South Africa?

iii. To what extent has debt overhang and crowding out effects impacted on capital formation in Nigeria and South Africa?

iv. Is there any causal relationship between external debt and its determinants and between external debts and capital formation in the two countries?

1.5 Research Objectives

The general objective of this study is to examine the determinants of external debts in Nigeria and South Africa. It is also aimed at investigating the effects of external debt on capital formation in SSA countries in general and Nigeria and South Africa in particular. Specifically, the following objectives are the focus of this study:-

i. To establish the major determinants of external debts in Nigeria and South Africa.

ii. To examine the short and long run effects or relationships of external debt on capital formation in Nigeria and South Africa;

iii. To examine the impact of debt overhang and crowding out effects on capital formation in Nigeria and South Africa.

iv. To investigate the direction of causality between external debt and its determinants in the two nations and between external debt and capital formation.

1.6 Scope of the Study

Borrowing in general, and external loans in particular, have long been under close examination in academic circles and various studies have different results and findings on its merits and demerits. It is in this regards that this study is focused. In the literature, many studies are in agreement that external loan is amongst the major causes of economics growth slowdown especially in terms of economic development due to its unattractive and weak role on the process of capital formation. The study covers Nigeria and South Africa's experiences in this regard. The choice of Nigeria and South Africa for the study was of course to strengthened the scope of representation of the SSA countries. While Nigeria represents the Economic Community of West African States (ECOWAS), South Africa represents the Southern African Development Community (SADC); and that is in addition to been two of the strongest economies in these geopolitical blocks

Thus the concepts of "debt overhang" and "crowding out effects" as they affect capital formation were closely examined. Analysises were undertaken in respect of the external debts effects on these economies using Granger causality as an econometric tool to determine the direction of causality amongst the dependent and independent variables of the study. The period of coverage is 34 years for the two countries based on availability of data. This research looked into both the aggregate and disaggregate forms of foreign loans subdivided into total, public, and private external debts.

1.7 Significance of the Study

The history of the economic growth and development for Nigeria and South African economies may not be completely understood without looking at the influence of external debt on capital formation. This is with the understanding that capital

formation has been recognized as an important issue that defines economic growth and development in all nations. These fact justifies the numerous research works on the relationships between external debt and investments, economic development and economic growth.

Most of the studies on external debt and investment concentrate on the topical relationships that do not lend any credence to policy making or meaningful support for academic contribution. Few that did were too broad and were not focused on specific determinants as in this case, for example, (Audu, 2004; Ajisafe, Nassar, Fatokun, Soile & Gidado; 2006; Ali, 2013). In addition these studies mostly conclude with mixed results without robust empirical evidences and thus allowing for speculations. This thesis is therefore aimed at improving the level of quality and standards of past studies employing broad time series data set spanning a period of over three decades. The study will therefore be among the few to focus specifically on external debt and capital formation.

Apart from conflicting and inconclusive results, the analytical tools employed were weak and non-rigorous. These discrepancies have added to the existence of a gap in the literature and thus necessitating a more efficient, wide-ranging, more concentrated and specific study of not only the adverse relationship between foreign loans and economic development in general in Nigeria and South Africa but also the relationship between external borrowing and capital formation in particular. Additionally to make the thesis contribution richer it will look into external debt relief and capital formation in details especially in Nigeria. This will therefore be no small a measure of

contribution to the field of knowledge in general and literature on economic development in particular.

The need to study Nigeria and South Africa's external debt experiences cannot be overemphasized. It is such an important issue that has been left out by researchers. Making the concept of capital formation the variable of interest is thus seen as an important academic gap intended to be filled by this research. More importantly is the sequence of analysis employed, after determinats of external debts were established, the effects of the external debts on capital formation were investigated. Causal relations between the dependent and independent variables were also examined to further establish teir proper relationships for meaningfull planning for the future.

1.8 Structure of the Thesis

This study consists of five chapters. While theoretical and empirical literature reviews is done in Chapter Two. Chapter Three deals with methodological aspects of the research, which comprises of empirical and theoretical framework, definition of variables and methods of analysis used in the study and sources of data. Chapter Four presents the results of the study, while Chapter Five is the last chapter of the thesis that dealt with research findings, and policy implications and conclusions.

1.9 Conclusion

The discussion in this chapter revolves mainly around the background of the study area as an introductory chapter. The key issues being the variables of interest as external debt and capital formation were briefly reviewed. This thesis, thus, focuses on Nigeria and South Africa, the two biggest economies in Africa South of the Sahara. It

is evident from the study backgroundof the work that the issue of causality between external debts and its determinants and between external debts and capital formation have remained scanty, and inconclusive, where it exits, both at theoretical and empirical level. Therefore different conclusions on these issues both at the theoretical and empirical levels stands out as a motivational factor for the research using Nigeria and south Africa in order to provide a clearer view for policy makers in mapping out developmental strategies for not only the two nations but the Sub Saharan Africa in particular.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

It is widely believed that economic development is the main focus of all nations. The concept of economic development as defined by economists is focused at uplifting the living standard of the people of particular nations employing effective and maintainable mix of scarce means. Economists or the theory of economics revolves around human existence and that this existence faces challenges of improving wellbeing of the citizenry.

Research into economic recognizes that external debt is one variable that as a matter of necessity emerged during or after the debt crisis of the early 80s which was experienced by most of the developing world. Debt or borrowing is vital for enhancing savings and hence financing development and economic growth in general and capital formation in particular (Hunt, 2007). It is also basic that growth will likely take off only when the stock of capital has increased to a certain level. Continuously it is believed that as the increased stock of capital leads to improvement in investment, savings continue to grow (Sachs, 2002) after a given stage the growth in savings and capital will be enough to lead to a self-propelling economic growth. The purpose behind this postulation is strongly believed to be the dual gap theory. This theory suggests that investment as a purpose for savings needed external support in view of the insufficient domestic savings that will guarantee sustained economic growth and development. It is therefore simply rational to search for the use of external goods and services in form of foreign financing to make up for the shortage.

Many scholars studied the connection or relationship with external borrowing and growth, foreign loan and investment and by extension capital formation in Nigeria. Results from these studies were mixed. While some came up with positive relationships, others reported negative relationships. The existence of debt overhang effect was widely reported in a number of these studies, including Ashinze and Onwioduokile (1996), Edo (2002), and Osinubu and Olaleru (2006). Others were of the view that external borrowing can become a poverty encouraging tool, employment overexploitation mechanism and a serious obstacle to economic growth in developing countries. This chapter examines the works and studies that relates to capital formation and foreign indebtedness and its resulting effects, both theoretically and empirically.

2.2 Theoretical Review

Knowledge generally begins with theories which consequently results into laws. The basis of our discussions in this work will be guided by the theoretical underpinnings of the issues under discussion. It is the intention of this section therefore to provide the theoretical framework of our study which will guide our analyses and ultimate findings.

2.2.1 The External Debt Theories

As earlier observed at the beginning of this study, developing economies in an attempt to accelerate economic development mostly count on foreign sources of funding to complement the shortages of capital (Panizza, 2008). Therefore the hope is that third world nations faced with dearth of resources acquire external support in terms of external debt to augment internal savings (Pattilo *et al*., 2002).

The Dual Gap Theory

According to Hunt (2007), neoclassical theorist who worked on economic growth and development are of the perception that underdeveloped economies face low and weak growth rates because of the inherent nature of under savings which is unable to provide more financial support for investment in both private and public sectors of their economies. In other words savings and investment supports and sustains economic growth. Sachs 2002 opined that economic growth cannot be sustained and maintained unless the level of capital reaches a certain threshold. Growth in capital and investment will stimulate an automatic growth resulting from an increase in savings over time. This therefore clearly illustrates the concept of the dual gap theory which has its roots from insufficiency in internal savings hence opting for foreign lending. It suffice to reaffirm that the theory of dual gap analysis is strongly backed by the understanding that all investments are resultant effects of local funds which is not sufficient to sustain the impending growth hence the resort to foreign borrowing (Chenery & Strout, 1966).

It follows therefore, that external borrowing becomes a necessity. Ajayi and Khan, (2000) propounded that the most important consideration in contracting external debt is a simple and direct one; signing up for debt from abroad only when the funds can generate higher returns than the cost of funds when invested. Therefore borrowing nations would be enhancing their productivity and national output through investments facilitated by borrowed funds. The dual-gap concept refers to the role of

foreign capital in this process. The purpose of foreign capital is that it allows third world nations to invest over and above what they save locally (McKinnon, 1964).

The work of Were (2001), observed that the capacity of the difference between consumption and income in underdeveloped economies has not been high enough due to the inadequacy of income and should therefore be augmented with external funds to enhance investment that will lead to improvement in economic growth and development. It should be born in mind however, that this will happen only when such funds are efficiently invested and profitably utilized. This will lead to the enhancing the speed of growth of GDP, and have the capacity of servicing its outstanding commitments. Significant contribution to economic growth is expected from foreign debts as has been the results in many developing countries where the reason for incessant dearth of capital mostly originates from inadequate inflow from outside their economies in form of foreign exchange (Ajab & Audu, 2006). All these are aimed at improving the position of capital formation which is considered a necessity for a sustained economic growth.

The Financing Gap Theory

Generally, the idea of a financing gap theory which is an offshoot of the dual gap theory has infested the developing countries which opened the floodgates for the so called foreign borrowings. Financing gap is essentially the variance between funds from domestic sources and total investment requirement and closing this gap is by contracting foreign facilities. Easterly (1999) opined that the idea was propounded by Domar (1946). Dormar hypothesised a proportional affiliation amongst investment, expenditure and the over-all progress of GDP. Therefore, the rate of investment

desired compared to the targeted growth speed can be calculated, using Incremental Capital Output Ratio (ICOR).

In the same vain the financing gap idea appeared Rostow (1960), "the Stages of Economic Growth". He suggested that for any nation to change from a developing to a developed one it has to pass by a system of five stages. These are "the pre-existing society, the correct conditions favorable for take-off to a growth cycle that can be self-sustained; the actual take-off, the urge to reach maturation and the era of intensive mass consumption". Rostow deduced that the compulsory condition for take-off is that investment moves from five to ten per cent of profits which means that if a nation is not endowed with enough resources at home the gap can then be made up with foreign aid debt.

Chenery and Strout (1966) improved the Harrod-Domar Financing Gap model with the aim of having savings funded externally. In an event of a deficit concerning investment capacity and saving ability savings ability can be complemented by external aid using the ICOR formulation. A nation can only finance itself if it has enough marginal saving. Easterly (1999) and Effendi, (2001) observed that the model has proved to be amongst those generally employed theories in explaining growth phenomenon in economics and in reaching the financing requirements decisions by International Finance Institutions despite its weaknesses.

2.2.2 Capital Formation Theories

According to Bakare (2011), current unspent savings meant to supplement future productivity and output is known as capital formation. It is the resultant effect of

acquiring of new industrial unit together with its machinery and paraphernalia which are inclusive of all useful capital possessions. It is also known as growth in assets of an economy with concentration in public and government interests. It is usually subdivided into two; private and public capital formation (Ugochukwu & Chinyere, 2013). These views were shared and buttressed by Youopoulos and Nugent (1976) and reaffirmed by Bakare (2011). In a nutshell therefore capital formation or accumulation of capital is referred to as the build-up or keeping of resources of value, growing of the value of wealth or more creation of same. It has been widely established by economists that capital formation plays a vital function in economic progress modeling (Beddies 1999; Gbura & Hadjimichael 1996; Gbura, 1997).

Economic growth theories like Romer (1986) and Lucas (1988) forecast that improved capital formation can lead to an enduring increase in the speed of economic growth. It defines the national volume of production that also affects economic growth. Capital naturally has a significant role in economic growth and development process and rightly seen as potential growth enhancing player, its deficiency is cited as the one important limitation to maintainable economic growth (McKinnon, 1964). Meanwhile, an understanding of the major source of funding and the process of capital formation is a critical criterion in choosing an intervention policy for the attainment of economic development.

Jhingan, (2006) described the procedure of capital formation to involves stages; the existence of real savings, existence of financial institutions and their attendants credit functions, mobilization of credits and distribution of the credits and using these savings for investment in the process of capital formation. Furthermore, the rise in

public external loans indirectly decreases the GDP, level through the encouragement of capital flights and discouraging capital formation. Experience has also shown that in order to finance external debt obligations, governments increases taxes (Karagol, 2002). In the same vein Savvides (1992) opined that the net return on investment in indebted countries is decreased by the debt induced taxation on capital. Thus, from the debtor country's perspective, debt overhang performed the role of a high marginal tax rate leading to the slowing down of investment and hence discouraging domestic capital formation.

The Walras Theory of Capital Formation

One of the early scholars to give attention to the concept of independence in decision making especially as regards the issue of investment was Keynes who in 1936 viewed that the bedrock of investment lies with the potentiality of the marginal efficiency of capital. This in relation to the cost of funds replicates the opportunity cost of the invested resources. Thus advancement of investment theories was related to Keynes models of growth theories. Subsequently the accelerator theory was born out of these models which perceive investment as a linear per cent age of changes in productivity (Ugochukwu *et al.* 2014).

The Walrasian theory of savings and capital accumulation as unique as it were was left out of the conventional economic literatures and theories. This theory was only referenced or quoted, only when criticizing its controversies. Part of the characteristics of Walras model however gives backing to this adverse perception. A primary assumption of the theory is the lack of an obvious successive indexation of the variables; therefore, the time bound of the theory is solely to one understands. It is

theoretically not clear as to whether the model is static; a single-period model or dynamic. Moreover, since consumers are known to channel their savings towards investment in assets goods only, they recognize them as seamless alternatives. Accordingly, it became difficult for Walras to drive a precise demand functions explanations and analysis for capital goods.

To take care of the aforementioned shortcoming, Walras put forward the fabricated product concept otherwise known as "commodity E" (the net perpetual income), whose promotional worth denotes ones present savings. The over-all likeness of capital goods rates of return was further imposed as an equilibrium condition, so that the cumulative savings is made up of the capital goods, provided that the extreme predictable return can be achieved. Since the scientific validation of the initial Walras' theory in which the equilibrium settings were expressed in terms of equalities, it is known that competitive evenness may be unable to hold for random endowments of capital assets. Consequently, in equilibrium it is not likely to get the equivalence of proportions of profit from all investments. It is therefore very common to reach a final verdict that the capitalistic nature of the country is bound to adjust especially from a non-neoclassical point of view. Therefore, such an equilibrium formation does not meet the requirements of long run equilibrium (Eatwell 1987, Garegnani, 1990).

The Financial Intermediation Theory

The financial intermediation theory is traceable to McKinnon (1973). The theory paid attention to the function of financial expansion and costly rates of interest in encouraging growth in underdeveloped economies (Akpokodje, 2000). This view in economic development parlance is conceptualized as "capital fundamentalism as

supported by Youopoulos and Nugent (1976). Literature from growth related studies such as Romer (1986) and Lucas (1988) predicts augmented capital formation leading to a enduring upsurge in economic growth.

The models and theories of financial intermediation are basically built on the concepts of resource allocation based on perfect markets. Gurley and Shaw (1960) and many successive authors have stressed the function of transaction costs, such as, fixed costs of asset evaluation. Allowing such costs to be shared by intermediaries gives the needed advantage as against individuals. Similarly, it means that the intermediation functions can be more easily diversified than when controlled by individuals (Allen & Santomero, 1998).

2.2.3 The Debt Overhang Theories

On the one hand econometrics findings have affirmed that foreign loans results into positive results especially as its affects economic growth but to certain level only. After a certain threshold level the effects of additional debt on the economy gradually drop. The reason for this from the economist point of view is one fold. Pattillo *et al.* (2004) are of the opinion that at the beginning, capital in underdeveloped economies is limited, and especially that these nations had the encouragement to sign for foreign loans meant for investment in as much as the return on capital is above their cost of funds. As much as the borrowed funds are efficiently invested, the result should be increase in growth thereby leading to timely debt settlement. In the same direction the work of Warner (1992), that studied middle income countries, concluded that debt crisis does not dampen investment.

On the other hand, the literature on the relationship between economic growth and external borrowing is awash with negative relationship between foreign debt and investment which consequently results into lower capital formation. Krugman (1988) and Sachs (1988) defined this negative relationship as "debt overhang", where the potentials of repayment of outstanding facilities fall lower than the signed value. He provided a straightforward definition of the problem of debt overhang as being the anticipated current value of any potential resource allocation as not adding up to its outstanding loans. Several scholars like Krugman and Sachs, Greene and Villanueva (1991), Elbadawi *et al.* (1997) and Chowdhury (2001) have supported this theoretical base having concluded in the same direction with ample proofs that back the debt overhang phenomenon.

Krugman (1988) described debt overhang as the circumstances where the estimated settlement on external debt drops short of the determined worth. When a nation's outstanding facility is likely to beat the country's loan settlement ability with a possibility in the forthcoming time frame, proposed debt service and cost of funds should be anticipated to be a growing function of the country's productivity and output. From the foregoing therefore we can deduce that part of the return on investment in the national economy is effectually "taxed away" by foreign lenders while investment by local and international investors and to some extent economic growth is discouraged. In its unique origination, the "debt overhang" theory rotates around the adverse effects and relationship of foreign loans on investment (Clements *et al.*, 2003).

It can be further observed that in economies with heavy indebtedness, "external debt overhang" is considered a leading cause of distortion and slowness of economic growth (Sachs, 1989; Bulow-Rogoff, 1990). The conclusion was that economic growth slows down in that these nations no more have any hold of the investors' confidence. In addition the cost of servicing and managing the debts varnishes up so much of the indebted country's inflows to the extent that the prospect of returning to growth paths is curtailed (Levy-Livermore & Chowdhury, 1998). Their study suggested that even with structural adjustment programs in these countries, adverse effects can still be felt on the economic performance. In addition and from the point of view of debtor nations there could be an motivation misrepresentation as lenders may be compensated more than the lending nations themselves (Krugman, 1988).

The studies pertaining to the connection amongst external loans, investment and economics growth fixated on the adverse effects of such a relationship in the form of debt overhang as maintained by Krugman (1988, 1989) and Sachs (1989); reaffirming that nations financial abilities are expected to exceed servicing abilities: that is to say the expenses involved with the maintenance of the facilities will negatively affect the performance of the economies. Benefits might accrue to the lending nation since part of the debt is repaid from the returns of the investment in the local economy. On the other side also, the debt overhang issues signified a huge marginal tax on the economy, which automatically leads to reduction in the returns on investments of most especially foreign investors. This in turn hampers the formation of domestic capital which results into negative effect on long- term economic development (Cohen, 1989).

There is also the possibility of debt overhang decreasing motivations for policy reforms as this can most likely be targeted only at assuaging creditors (Corden, 1989; Deshpande, 1997). The presence of a serious liquidity impact of external lending on investment has been established in numerous empirical studies like Cohen (1993) and Elbadawi *et al.* (1997). More recently however empirical studies have tilted in the direction of establishing that, the effects of large debts stocks overpowers the liquidity effects. This was strongly observed in studies like Clements, Gupta, and Inchauste, (2003); Cordella, Ricci, and Ruiz-arranz, (2005), Imbs and Ranciere (2005); Pattillo, Poirson, and Ricci, (2002, 2004) and Presbitero (2008). In other words, external debts become detrimental to investment after a period of time. Cordella *et al.* (2005) has established that there is an upper limit for the proportion of foreign loan to GDP, limit which forces development; that is to say after a certain boundary of the share any additional external debt to the system becomes unfruitful or even negative.

An important problem to be addressed pertaining to the theory of debt-growth is the possibility of large external debt stocks amassing may subsequently results into a decline in economic growth. Sachs (1989) was the first study to attempt at explaining the debt crisis through the debt overhang theory. He provided an answer that if domestic and foreign investors notice weaknesses in a nation's capacity to service and payback it liabilities they get discouraged from funding more investment (Krugman, 1988; Sachs, 1989). The focus of the theory under this circumstance is that the local economy is burdened; having to incur the debt service costs which consequently made prospects to reduce their participation, thus depressing economic growth. Also in expectation that part of the loan may have to be given up, private international

entrepreneurs will refrain from disbursing new loans, thus decreasing the nation's capability to amass capital (Elhanan & Krugman, 1989).

It is also stressed in a different measure of debt-overhang theory that enormous loan accruals raises the prospects of writing off liabilities and be affected by distortionary measures some of which may include inflationary taxes and decreases in government investment (Agenor & Montiel, 1999). These authors insists that the ambiguity surrounding potential levies for non-government local representatives tend to be negatively affecting the local economies just as depressing effects on officials. Whenever there is budget deficit, there is mostly the likelihood of enlarged taxation, and until more something changes positively, private investment is likely irreversible. Private investors therefore prefer to wait, or remain with a condensed volume of investment; transmitting their assets in the direction of undertakings that will fetch quick returns with bigger threats or resolves to channel their funds aboard Habimana (2005). On the other hand, Serven (1997) viewed that if ambiguity surrounds an investment, private investors may likely wait for more promising conditions.

Finally the negative effect of debt overhang is measured as a liquidity set-up, if foreign borrowing amassment is not too high, but the indebted nation has to fight hard with the necessity of allocating limited resources amongst consumption, investment and external transfer in order to service outstanding loans. It is generally known that reducing of funding meant for consumption or unproductive ventures is very difficult to reach politically and that consumption spending consumes a significant part of the borrowing nation's returns, thereby bringing down investment and depressing future productivity.

2.2.4 The Crowding Out Effects Theory

There are other ways in which the maintenance of a huge foreign debt can adversely influence economic performance which include the crowding out effects. Crowding out effects usually occurs due to excessive real interest charges while the balance of trade of an indebted economy become worsen while foreign capital funding may not be there. Claessens *et al.* (1996) identified the decrease in investment as one of the causes for decline in the availability of resources for financing investment and macroeconomics activities. This consequently reduces the country's ability in maintaining its debt resulting from the negative problem of the crowding out effect. The efforts made in meeting obligations leads to little capital for domestic investment (Patenio & Agustina, 2007).

Also a circumstance in which enormous public borrowing derives up the real interest rate to the extent that individual businesses find it very hard or near impossible to access loans facilities is generally referred to as crowding out effects. The philosophy behind this concept assumes that government debts expends a greater part of the national savings meant for investment due to increase in demand for savings while supply remains constant, the cost of money therefore increases. Crowding out effects sets in at a point when only government and its agencies would be able to borrow due to excessive interest charges. Individual entrepreneurs and firms are thus unable to compete and hence crowded out of the market. Economic growth is thus affected via the economy's inability to generate enough capital for investment. Governments should therefore give a serious consideration while making any plan that will increase the per cent age of its funding through the capital market.

External debt service as against capital formation may be negatively affected by the impact of crowding out effects through the crowding out of private investment or varying the configuration of government expenditure and consequently capital formation. “Ceteris Paribus” excessive debt charges has the tendency of boosting the government interest charges and hence budget deficit which automatically lead to a decrease in public budget that consequently lead to an increase in interest rates or crowd out funds accessible for lending and investment. Clements *et al.* (2003) further confirmed the foregoing negative reviews and scenarios and the effects of excessive borrowing were further validated by this and other findings which relates that the adverse effects of foreign borrowing on economic growth can be observed through debt stock and flow of service payments facilities that most probably crowd out public investment.

In addition also the findings of Taylor (1993) deduced that debt caused liquidity restraints is a resultant effect of decline in government expenditure due to the continuous servicing of outstanding debt stocks in excess of what the economy can contain. Investment especially is hampered along the line. The significance of this emanates from the fact that public spending may be a determining factor for a number of economics activities, with capital formation on the lead (Fosu, 2007). Karagol (2004) established that there is so much to learn from developing countries since debt overhang has negative effects on investment and thus economic growth while Claessens *et al.* (1996) discussed debt overhang theory, showing that expected debt liability is an increasing aspect of a nation’s productivity as debt rises.

A condition may arise that debt services spreads to such a level that the country is unable to settle. As debt services grow, external lenders effectively eradicate many of the earnings accruable from local investment. Coupled with the loss of earnings is the complete deterrent of new investments from aboard (Clements, Bhattacharya & Nguyen, 2005). This will in no small measure directly hamper capital formation (Dijkstra & Hermes, 2001). Effectively, therefore, debt servicing allocates wealth from the local arena to international arena thus creating certain dramatic multiplier accelerator effects that reduce the economy's capacity to development while simultaneously enhancing its dependence on foreign debts (Metwally & Tamaschke, 1994).

Adepoju *et al.* (2007) observed that Nigeria's external debt cost has inflicted hurting and painful costs for the nation and citizens well-being. The cost of maintenance and servicing of these foreign loans has seriously infringed upon resource accessibility for other social and economic activities that ensure economic growth, social development and poverty reduction. Nigeria decided in its annual budgets that not more than 30 per cent should be expended annually on debt servicing from its total oil revenue. This decision however could not bring the desired relief (Oyeshola & Lawal, 2009). Nigeria's experience had been so bitter that Clements *et al.* (2003) observed that between 1985 and 2001, Nigeria expended over US$32 billion on external loan interest payment and management cost alone.

2.3 Empirical Review

This section reviews scholarly works in the area of external debt in general and some macroeconomics variables in particular. Some of these variables include "capital

formation, debt overhang, crowding out effects and external debt relief". Due to the dearth of studies in the area of external debts as it relates to capital formation which is the main concern of this research the review will concentrate on the relationship of external debt with investment in particular and economic growth in general.

2.3.1 External debt

Among the early literature on the association of foreign borrowing and economic advancement in Africa in general and Nigeria in particular was the work of Ajayi (1991). His work, a macro approach to the investigation of external debt issue in Nigeria was undertaken with the broad objectives of analysing the origins and direction of external debts stocking and servicing , formatting the debt service ratios and ability modelling a debt feasibility path and creating suitable circumstances and mapping out policy inferences from the findings. Some of the important findings of the study were, Serious malfunctioning of macroeconomic policies or lack of them which has led to the accumulation of external debts beyond the capacity of the economy to maintain and service. Strong recommendations were made, especially the need for the evolution of domestic savings and promotion of domestic investments. The study conclusively observed an obvious problem of weak investment base.

From a different perspective and to allow for comparison, Edo (2002) examined the determinants of foreign debt accumulation with specific attention on Nigeria and Morocco. In line with other findings the study deduced that foreign loans servicing and accumulation has seriously and negatively impacted on the two countries and has severely and adversely affected investment. Thus the conclusion of the study was that

majorly macro variables like public spending negative balance in international trade and global interest rate were the major determinants of accumulation of foreign loans.

Adepoju *et al.* (2007) used time series data for Nigeria within a time frame of 44 years, 1962 to 2006, discovering sequential act of international donors as a consequence of a lot of mutual and many-sided arrangements. The study resolved that build-up of external debt hindered economic growth in Nigeria. On the same focus Ezeabasili, Isu and Mojekwu (2011) investigated the link between Nigeria's external loans with economic growth between the periods of 1975 to 2006. Adopting the most recent development as at the time of the study in time series econometrics as advanced by Eagle and Granger (1987) and Andrews (1991) with co-integration and error correction techniques, they established that; external debt in Nigeria has an adverse affiliation with economic growth. Econometric evidences and findings confirmed stationarity of the variables at their first difference, while the Johansen Cointegration approach also sanctions the existence of one cointegrating relationship at one and five per cent levels of significance.

Adegbite *et al.* (2008) studied the effect of the vast external debt stock, with its equally negative impact on the South African and Nigerian economies that have so many similarities when it comes to economic growth and development. The degree of these similarities was studied and assessments prepared using mostly the performance of some macro-economic variables. Debt servicing burden and macroeconomic performance of the Nigerian and South African economies were examined using advanced models of econometric; the Neoclassical econometric growth model, which combines external sector, debt indicators and some macroeconomic variables, were

employed in the analysis of the study to search for both the linear and non-linear effects of debt on economic development and investment. Test results showed the adverse effects of debt and its costs of other services on growth being clearly visible in both countries. Equally, external debt was revealed to have contributed positively up to a point after which its positive impact becomes negative; thus sanctioning the existence of non-linearity or debt overhang (Adegbite *et al.*, 2008).

Another study by Ajayi and Oke (2012) investigated the impact of the cost of foreign borrowing of Nigeria as a developing economy. Using regression analysis in its approach to the study and employing secondary data from the Central Bank of Nigeria (CBN) and other sources, variables such as external debt service payment, external reserves, interest, and foreign exchange rates were employed. Results from the study established a strong adverse relationship between foreign loan and the nation's income and per capita income. This study established that devaluation; belt tightening and substandard educational services were the resultant effects of the excessive external debt accumulation. Depending on these results therefore the study suggested that debt service obligations should not be endorsed to rise above external exchange income and that the loan contracted in profitable ventures whose returns should be able to service these external debts (Ajayi & Oke, 2012).

Suleiman and Azeez (2012) examined the impact of foreign borrowing on the economic advancement of Nigeria. The study was built on a model that adopted GDP, as a proxy of the dependent variable which represented economic growth which was determined by exports of goods and services, inflation rate and exchange rate which represented the independent variables. Annual time series data accessed from the CBN

statistical bulleting and the DMO for 30 years was used. The research confirmed the presence of an elongated and positive connection among the observed variables and a positive contribution towards economic growth.

2.3.2 Capital Formation

Serious linkages between capital formation and the frequency of growth have been ascertained by many empirical studies like Collier and Gunning (1999), Ghura and Hadji Michael (1996). Others that reconfirmed this assertion were Hernandez-Cata (2000), Ndikumana (2000), and Ben-David (1998). These studies were mostly piloted in Africa, Asia and Latin America with a beyond reasonable doubt proofs. Apart from the study of Ghirmay and Cade (1998) in which the effects of Foreign Direct Investment (FDI) on private capital formation in SSA which includes Nigeria were studied, no attempt have been made by any author to investigate the effects of capital formation on any macroeconomic variable or vice versa with a particular reference to Nigeria (Ugochukwu & Chinyere, 2013). It is thus very important to acknowledge that the speed of progress of the Nigeria economy can hardly be studied without a proper understanding of the concept of capital formation and its contribution to the growth and development of the Nigerian economy.

Capital formation is defined by the CBN as the rise or decline in the value of fixed assets in the economy in addition to fixed assets either for replacement or new investments. It is the increase in fixed capital stocks of the capital made (CBN, 2007). Capital formation regulates the general productive capacity that invariably, upsets economic advancement. Shortage of capital has been seen to be the most important restriction to a viable growth in developing countries (Mackinnon, 1964). Capital

formation is also defined as the expansion, build up or stockpiling of resources of importance, the growth in prosperity or the materialization and regeneration of more wealth.

It can be distinguished from savings due to the rise in stock of desired investments. Investment can be in monetary and social capital or real assets. The increase in investment through assets that are non-financial in nature in addition has been seen as value-adding to the economy while at the same time improving the GDP (Adekunle & Aderemi, 2012).

It has been established that capital formation has a significant and a very important role to play in boosting and uplifting the economic development of third world countries. For example studies like Bakare (2011) and Orji and Mba (2010) have given reassurance on that. From another perspective Stock markets also have been seen to be providing a positive contribution to the growth and development of capital formation in Nigeria; while both inflation and interest rate had an adverse impact on economic growth. The result further confirms an elongated correlation amongst capital formation and economic growth in the country for the period under studies (Bakare, 2011).

Ajao (2011) concluded that capital formation in the long run was not found in the capital market alone but via the marginal impact of market recapitalization and new offers. This is linked with the findings of Sarkar (2006), which established that there is absence of a significant association between the stock market capitalization and gross fixed capital formation. Orji and Mba (2011), on the other hand, evaluated the

correlation amongst foreign private investment (FPI), capital formation and growth in the country employing the Two-Stage Least Squares (2SLS) estimation procedure. The study established that the influence of capital formation and FPI is higher in the long run than short-run effect on economic growth. There is thus a long-run equilibrium connection between the series under consideration as the error correction term (ECT) was found to be weighty. But the rapidity of adjustment in both models seemed insignificant.

The studies of Ghura and Hadji Michael (1996) and Ghura (1997) using econometric approach maintained that private capital formation has a long-lasting and more advantageous impact on economic growth rather than public capital formation due to its greater efficiency and less close association with corrupt practices. Accordingly, Adekunle and Aderemi (2012) established that real domestic investment increases the overall capital holdings in the country, through employment of more capital-yielding and income accruing assets.

2.3.3 Debt Overhang

There have been a number of studies that tested the debt overhang theory using time series. Though not exhaustive these scholars include Borensztein (1990), Cohen (1993), Sachs (1989) and Warner (1992). Others include Patillo *et al.* (2002), Elbadawi *et al.* (1997), Clements *et al.* (2003), Levy and Chowdhury (1993), Chowdhury (2004) and Fosu (2007). Not many studies, however, have concentrated on the way, manner and channels foreign borrowings or funding influence economic growth in general and capital formation in particular. In view of the foregoing therefore Patillo *et al.* (2004) concluded that the effects of external debt are felt

majorly via total factor productivity and investment. While many studies paid specific attention to under developed countries, others focus on relatively low income economies. In most of these studies however debt overhang is understood to be the adverse additional effects of debt on economic growth resulting from high external debt accumulation.

The Debt Overhang effect theoretically known as the negative impact of accumulated external debt strongly reduces macroeconomic performance through deterrence resulting from the fear of future tax burden and macroeconomic volatility. Tax deterrence means that investment is depressed due to the amassment of considerable debt stock in that prospective investors presumes that taxes on impending earnings will be imposed so as to meet up with debt obligations. The macroeconomic volatility on the other hand relates to growth in budget deficits, ambiguity due to unsettled financing, conversion rate, devaluation, likely financial growth and likely price increases. These were the major understandings of Cleassens *et al.* (1996). Audu (2004) stressed the importance of debt overhang proposition in Nigeria that the negative effects of external debt considerably retards the country's speed in economic growth, thus aggravating its economic and social difficulties.

Provision of essential services by important agencies geared towards easing the standard of living of those communities that are not strong were not supported due to collapsing infrastructure Scaling down of budgets on both commercial and non-profit making outfits and economic structure, means the government seems to inhibit private businesses and growth through abridged externalities and insufficient funding partly resulting from huge debt servicing burdens. These problems, therefore, reduce the

level of economic participation by private entities, since government concerns becomes higher in proportion to the total business activities within the economy.

Studies on Debt Overhang

The debt-overhang theory has attracted so much attention from scholars of economics development. This follows acknowledgement by the IMF in form of intervention programs initiated in 1989 and subsequent policies especially the highly indebted poor countries debt relief package initiated in 1996 and upgraded in 1999. Pundits and analysts have attempted to justify or criticize this resourcefulness on debt reprieve by investigating the presence of the debt overhang effect in the highly indebted poor countries. Their findings have been diverse and mixed.

From the foregoing, therefore, close attention was thus paid to the theory of the debt overhang by several researchers in which confirmations or otherwise were published. Fosu (1996) found strong evidence in favour of the debt overhang effect when he empirically investigated the phenomenon in thirty five SSA nations. Interestingly however Hansen (2001) found no important adverse association amongst external debt and economics growth hence the total absence of debt overhang in a study of 54 underdeveloped nations. So also were conclusions from the works of Savvides (1992), who proved that the ratio of debts to GDP, had no substantial consequence on nation's economic development. Inconclusive findings were also found by Djikstra and Hermes (2001).

On the other hand, robust proofs of debt overhang outcomes and consequences were confirmed in Latin American economies (Kaminsky & Pereira 1996) and similarly as

in Deshpande (1997) for a selected set of 13 economies, just as in Elbadawi *et al.* (1997) that studied a set of 99 underdeveloped economies. The adverse effects of foreign loans on investment, economic growth and development have been reemphasized by Were (2001), where she substantiates the presence or otherwise of the debt overhang phenomenon in Kenya. She established that, interest and administrative charges do not seem to adversely impact on economic growth but rather end up with other negativities in the form of crowding out effects on investment. On the other hand, Fosu (1999) found that in spite of the seemingly small and negligible impact on investment rate it is probable that foreign borrowing negatively affects economic development via decreasing the resultant additional output from given increase in capital.

The foregoing argument is in the same direction with the proposition of Hameed, Ashraf, and Chaudhary (2008). Their work argued and confirmed that the debt maintenance cost has adverse effects on the resultant output of principal and labour which ultimately leads to a decline in economic growth and circumstantially capital formation.

When examining the debt–growth nexus Pattillo *et al.* (2002) established the existence of nonlinear relationships in a set of 100 underdeveloped economies adopting quadratic equations and changing approaches to control for endogeneity. The study employed external debt taking into consideration the net present value together with the insignificant terms, identified a by far less overhang edge, of almost about 20 per cent of GDP. Clements, Bhatacharya and Nguyen, (2003) virtually came to same conclusion. Following their own study of 2002, Pattillo *et al.* (2004) enforced a spline

function with a disruption at the branded edge and let the task to have altered slopes for economies with diverse plans. These studies affirmed that highly indebted countries have an inverse effect of excessive debt stock on growth.

In the same direction studying the economy of Nigeria, Iyoha (1997) confirmed a similar relationship, perceiving its limitation towards encouraging funding further business activities in the country. In a yet related study also, Iyoha (1999) concentrated on SSA nations, employing simultaneous equation and simulation methods. The outcomes were similar. Large external debt stock appeared to have had a negative relationship with economic growth and development. Additionally, in yet another study, Iyoha (2000) established that the proportion of external debt to GDP was significant with an adverse sign. Invariably however, debt service adversely impacts growth by the crowding out public investment and appears as statistically insignificant. Settlement of borrowed funds and contracted facilities is found to be associated with borrowing nation's economic growth rate.

In line with Iyoha's findings it was further confirmed by a scientific examination of the debt overhang effects in Zimbabwe that nations suffering from debt overhang were those economies who found themselves on the wrong or bad side of the Laffer Curve due to high debt accumulation that always results into debtors inability to service their debts as and at when due (Wijeweera, 2005). Supporting other scholars such as Deshpande (1997) assumed that discouraging investment is one of the negative impacts of debt overhang. These effects he further asserts were felt in two simple ways; wholesome disincentive effect and adjustment actions adopted by these extremely indebted nations. Calvo (1998), on the other hand, related the problem of

growth and debt to the problem of capital flight using a model with high debt associated with low growth which further again relates to debt servicing and repayment.

Scenarios from various part of the world have confirmed and reasserted the statistically significant negative relationships between external borrowing and major macroeconomic variables and the general economic growth. The works of Ahmed and Shakur (2011) and Nawaz, Qureshi, and Awan (2012) from Pakistan observed the presence of protracted run negative relationships amongst economic growth and external debt variables and unidirectional causativeness consecutively from GDP, to foreign loans. Likewise other works from Pakistan reaffirm that debt service and cost of borrowings were adversely associated with economic advancement (Hameed *et al.*, 2008, Malik *et al.*, 2010). Before then, Chowdhury (1994) studied the dual association of foreign debt and economic advancement in two Asian economies. Results showed a bidirectional causality with external debt and growth of the GDP, while there was no causal relationship between GDP, growth rate and external debt accumulation.

Ezikwe and Mojekwu (2011) and Ezeabasili *et al.* (2011) were two different studies in Nigeria that established supported evidences of adverse effects of debt on economic growth and one way interconnection at the centre of foreign debt interest charges and maintenance fees and economic growth as well as been statistically interdependent between foreign loan and economic development. Inconclusive outcomes have mostly been conveyed on the effects of foreign loans and economic growth and development.

On the other hand, many studies were of the views that developing countries engaging in reasonable levels of borrowing are likely to improve in their economic growth (Wang, 2009). Such improvement is understood to occur through capital formation and increase in output (Hameed *et al.*, 2008). According to the traditional Neo classical model, debt increases capital mobility growth being one of the assumptions of the model permits capital mobility, and the ability to involve foreign sources in both borrowing and lending. This provides capital-scarce countries with an incentive to get loan and invest since the marginal output of capital is greater than the global interest rate (Pattillo *et al.*, 2002).

2.3.4 Crowding Out Effects

It has been scientifically established that the negative effects of external debt was part of the causes or reasons that weaken non-public sector investment in the Philippines beyond 1982 (Yap, 1990; Borensztein, 1990). Borenzstein outlined diverse means through which investment can be affected by external debt; credit restriction and debt overhang. Adopting a simulation method, he found that, for heavily indebted poor countries, these two non-mutually exclusive effects are important in explaining the decrease in investment in the 1980s. However, credit rationing was established to be a more important limitation to investment when compared to debt overhang. One major study on crowding out effects that utilized time series data in order to analyze and confirm the existence of the crowding out effects was Iyoha (1997). This is in addition to confirming the debt overhang effects on the economy resulting from excessive debt servicing burden. The small level of investment in the economy was confirmed to be a resultant effect of debt overhang and crowding out effects.

In the same direction the small level of investment in the economy was confirmed to be a resultant effect of debt overhang and crowding out effect. In this direction, Ashinze and Onwioduokit (1996) studied the result of external debts associating with economic growth on the Nigerian economy using macroeconomic modeling. The result of the study was two folds. While a period of actual utilization of outside finance, resulting in to a higher level of economic growth; it also established periods when foreign funding was not carefully utilized ensuing into a drop in economic growth.

In the same perspective, Edo (2002) examined the foreign borrowing difficulties experienced by African countries using Morocco and Nigeria as case study. The study affirms that these debts have negatively affected investment seriously in these countries. Public expenditure, balance of payments (BOP) and global interest rate were cited among the many determinants of debt accumulation in the studied countries. Measures were suggested in reducing these problems. Some of the measures were privatization, unrelenting export promotion, and reforms and expansion of the capital markets.

2.4 External Debt versus Capital Formation

Since there are limited studies on the relationship between external debt and capital formation in the literature, this review concentrated on the impact of external debt on economic growth in general and investment in particular. This arose from the fact that capital formation is one major determinant of economic growth while investment is the nearest in meaning to capital formation in the literatures.

There are varying arguments in respect of the exact association amongst foreign borrowing and economic growth which became pronounced since the early 1980s as earlier stated; and there seems to be two diametrically opposing views distinctively divided in this relationship. On the one hand, scholars like Krugman (1988) and Sachs (1989), have empirically examined the effects of debt overhang and crowding out and have affirmed that the relationship between a set of normal variables and growth or investment was significant and negative.

Bulow and Rogoff (1990), Kenen (1990), Sachs (2002), and Chowdhury (2000) also examined the main and critical problem of whether cost of foreign borrowing is an indicator or source of slow speed in economic advancement. While Sachs (1989) and Kenen (1990) were of the opinion that the external debt overhang effects was the major reason for the sluggishness in economic growth, Bulow and Rogoff deduced that foreign borrowing was just a mere symptom of substandard management of economic resources and poor leadership quality. Chowdhury, however, failed to confirm any proof in backing these other scholars.

Instructively, however, as earlier observed, huge foreign borrowing was confirmed to have had an adverse effect on especially private investment and economic advancement, thus affirming the existence debt overhang in Kenya by the work of Were (2001). The findings of the study goes to confirm that the cost of the loans in form of interest and charges does not seem to have an adverse effect on growth but rather has some crowding out effects on investment hence exhibiting an indirected negative relationship on growth through factor productivity which heavely lies on capaital fromation.

On the other hand, it is argued that though external debt may have an insignificant effect on investment it is likely that it may negatively affect economic growth via declining capital productivity. This is in line with a later confirmation by Hameed *et al*. (2008) who were of an established view that cost of borrowing has an adverse statistical relationship with growth through mainly the known channels of labour and capital output decrease.

Thus the relationships between foreign aid, capital formation and external borrowings were examined by Xiaoyong and Gong (2007) and their findings argued that in the long run capital will grow, expenditure will rise and the external funding will fall each time there is a long-lasting increase in foreign aid. The study also offers major support concerning an important effect of external aid on economic growth and development in the case of developing economies. In the same vain studies on external finance and its influence on internal savings, investment and economic progress have been upheld by theoretical findings of several studies, like Burnside and Dollar (2000, 2004), Svensson (2003), Collier and Dollar (2002) and Collier and Dehn (2001) that the likelihoods of negative relationships were high.

In view of all these studies, investment comparisons for a sample of 81 developing economies from 1965 to 1987 were examined by Cohen (1993). The result indicated that debts do not have much effects on growth rate, while he establish that high debt has negative impact on growth for Latin American countries. Pattillo *et al.* (2002), on the other hand, examined the debt-growth association in a sample of about 100 underdeveloped economies using a number of nonlinear provisions and diverse

methodologies to control for endogeneity and employing debt both in net present value and minor terms. They identified much lower overhang signals of about 20 per cent of GDP. Comparable results were proven by Clements, Bhatacharya, and Nguyen (2003) and Presbitero (2008).

In contrast, external debt service negatively affects growth by crowding out public investment and appears as statistically insignificant were the conclusions of Claessens *et al.* (1996); while Wijeweera *et al.* (2005) investigated the Debt Overhang Hypothesis in Zimbabwe empirically where results of the study reinforced the view that debt repayments are connected to economic growth of the debtor economies.

Studies based on regional perspectives on the direct and indirect influence of debt overhang on growth and investment were tested by different scholars. For example, Fosu (1996, 1999) established proof of a direct effect of the "debt overhang" in a trial of SSA economies depicted by an adverse connection concerning external loan, investment and economic growth. The indirect effect was, on the other hand, examined by Deshpande (1997) on a sample of obligated countries where the results suggested that countries with a debt overhang, caught most of the side issues of other independent variables probably labelled by investment. Sawada (1994) examined whether indebted economies disturbed with their external debt problem remain solvent and liquid. It was confirmed that these countries had debt overhang problems since their foreign borrowing was by far more than the anticipated present value of the forthcoming returns.

2.5 Public External Debts versus Private External Debt

External debts are usually subdivided into different components according to their purpose and source. Productive debts are employed in the process of production and creation of wealth. In other words, these are facilities that are used in the purchase and building of the means of production. These loans play an important role in the acceleration of the process of capital formation to the borrowing nations (Folorunsho et al., 2008). It strongly assists the productivity of nations economy, as well as refining the balance of payments by improving productive capabilities that will positively support foreign trade. In addition, productive loans also complement in the servicing of external debt facilities.

On the other hand, however, unproductive external loans are loans that do not contribute to the increase or the expansion of production capacities of the debtor country (Currie, 2005). They are employed in purchase of consumables, or in acquiring military equipment and armament. These types of facilities are indeed only a burden to the balance of payments, being a dead weight on the resources of the country (Chand, 2000). Government external debt are those debts are required for the use of the public sector and are usually, Public and publicly guaranteed debts which comprises of long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity (WDI, 2015). Private external debt on the other hand are those debts that are Private and nonguaranteed external debts with long-term external obligations which are initiated by mostly the private sector and are not guaranteed for repayment by a public entity (WDI, 2015).

2.6 Research Gap and Contribution

The external debt theories comprising of the Dual Gap Theory and the Financing Gap Theory were closely examined, while the capital formation theories, which include the Walras theory of capital formation and the financial intermediation theory were also covered. This been the second chapter of the thesis, the theoretical underpinnings of the study was exhaustively dealt with. This emanates from the fact that there are varying arguments in respect of the exact nature of the association between foreign borrowing and economic advancement; and there seems to be two diametrically opposing views distinctively divided in the outcomes of the observed relationships. In the same manner the external debt versus capital formation concepts were closely examined. While some studies concluded on a negative note others concluded on a positive note leaving many others with mixed outcomes.

The theoretical perceptions and the empirical reviews summarized so far have therefore brought out the inherent deficiency in the area of informed analysis of the association amongst foreign debt and economic development in general and foreign loan and capital formation in particular. While studies on the direct relationship between external debts abound both in SSA and Nigeria in particular same cannot be said on the relationship between external debt and capital formation in Nigeria and South Africa. Therein lays the knowledge gap which this work intends to fill; The concept of capital formation in its relation to external debts is thus seen as an important academic gap intended to be filled by this research. Empirically in addition the dearth of modern tools of analysis in previous studies will be taken care in an attempt to argument the contribution of this study to the field of economics development.

2.7 Summary of the Chapter

The literature review chapter has given a sequencial exposition of the theoretical and empirical background of the thesis. Starting with the external debt theories the chapter discusses in details the under pinning theories of both external debt (The dual gap theory and the financing gap theory), and capital formation theories (in form of Walras theory and the financial intermediation theory). Finally the effects of external debt thesrie were anlysised, in both their theoretical forms and empirical facets. These are the debt overhang theory and the crowding out efffcets theory. Reviewing the chapter lead to a summary which brought out the inherent shortcomings of previous studies and the focus of the contribution of the study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the theoretical framework and the methodology applied in the study. It comprises of six essential sections; the theoretical framework, specification of the models, justification of the variables and sources and measurement of data. The final sections discusse the methodological approaches to the study.

3.2 Theoretical Framework

Developing economies in an attempt to accelerate economic growth mostly depend on foreign funding to complement the deficit in domestic capital. This mostly comes in form of foreign capital transfer, (Mckinnon, 1964; Chenery & Strout, 1966). It is in fact projected that underdeveloped nations experiencing acute shortage of capital will always be willing to sign in for foreign debts to support local savings which serve as a bedrock for capital formation (Were, 2001; Pattilo *et al.*, 2002; Ajab & Audu, 2006). The theory is thus seen as an illustration of the need and function of external funding in the growth process of any nation.

Developing countries are thus enabled to invest over and above what they save at home by the grace of the "dual gap analysis". This theory was first propounded by Mackinnon (1964) and renewed by Green and Khan (1990). They affirmed that the size of savings in underdeveloped nations was by far below the capital requirement for a sustained economic growth due to majorly small and inadequate income, whose trickle down effects lead to low savings and thus low investment. External debt can

thus contribute significantly as is the case in many developing countries whose major obstacle to economic development is capital (easterly, 1999; Iyoha, 1999; Ajab & Audu, 2006).

The Dual Gap Analysis postulates that the significance of savings is that it induces investment to engender a self-sustaining economic advancement. The main idea behind this neoclassical thought is that underdeveloped nations must save more in order to finance further investment; given that growth in savings and investment leads to economic advancements (Hunts, 2007). Since this requirement cannot be met internally due to inadequate domestic savings there arises the need for external capital and most conveniently in form of external debt.

The analysis in this study is based on Chenery and Strout, (1966) two gap model which is an extention of the dual analysis model of Makiinon (1964), to determine the factors affecting external debt accumulation and the Solow type neoclassical model to investigate the effects of external debt on capital formation as well as assess the relationship between debt overhang and crowding out effects on capital formation as in Adegbite et al. (2008). Therefore, the model employed in this study is derived as in Equation [3.1] to Equation [3.4].

$$GDP=C+S \quad [3.1]$$

Alternatively,

$$GDP = C + I + (X - M) \quad [3.2]$$

where C, consumption; I, investment; X, exports; M, imports; S, saving. In the model, investment includes both private sector investment and government investment expenditure. This is depicted by Equation [3.3].

$$I = I_p + I_g \quad [3.3]$$

where $I_g = G$ is defined as government expenditures and I_p is private sector investment.

Since GDP equals domestic consumption plus domestic saving, it follows from equations (1) and (2) that the demand for domestic investment equals the sum of domestic savings and the imports balance on current account which is then financed by net borrowing from abroad.

$$I = S + (M - X) \quad [3.4]$$

where (M - X) is the net foreign borrowing.

Following from the foregoing therefore, in determining the factors affecting external debt accumulation, the two-gap model of Chenery and Strout (1966) becomes the theoretical guide. In the study the model depicts net external borrowing as basic transfer (BT), mathematically measured as the difference between the net capital inflow (gross capital minus the amortization on past debt) and interest payments on remaining accumulated external loans.

$$BT = Dd - rD \quad [3.4a]$$

or

$$BT = (d - r) D \quad [3.4b]$$

where D, is total accumulated foreign debt; d, percentage rate of increase in total debt; r, average annual interest rate; Dd, net capital inflow or the rate of increase in total external debt; rD, total annual interest rate payments. Equation (4b) shows losses or gains in foreign exchange from international capital flows by a country in a given year. BT indicates gain if d > r and loss if d < r. Generally, if borrowing is linked with productive use when rates of return supersedes r and BT is positive, raising the external debt will not retard the performance of the recipient economies in the long run. Since the theory relates to inter-temporal budget constraint, in a period-to-period flow, therefore, Equation [3.4c] becomes applicable:

$$(D_i - D_{t-1}) = Y_t - rDt - Ct - It - Gt \qquad [3.4c]$$

Here, $(D_i - D_{t-1})$, net change in debt, from a period t, to a period t + 1; Y_t, GNP in period t (net remittance is included); C_t, consumption in period t; I_t, domestic investment in time t.

In equation [3.4c], the size of the foreign loan in a given time can be condensed by an increase in a country's output and a reduction in consumption, domestic investment and government expenditure. When an economy fails to periodically under take flow analysis and to attain a stage where the total production, consumption, domestic investment and government expenditure is below the BT, the resultant effects are debt crisis as shown in Equation [3.4d]:

$$C_t + I_t + G_t - Y_{t<} dDt - rDt \qquad [3.4d]$$

It should be noted that $dD_t - rD_t = BT_t$, where dD_t, rD_t and BT_t are as previously explained by Equations [3.4a] and Equation [3.4b].

3.3 Model Specification

In line with the objective of the research, literature reviewed and the foregoing theoretical framework, external debt model, capital formation model, debt overhang and the crowding out effect models were developed in line with Adegbite et al. (2008). A neoclassical production function is thus applied to estimate the determinants of external debts in Nigeria and South Africa. Components of total external debts in form of Public External Debt and Private External Debt, to estimate disaggregated short-run and long-run relationships between these external debts components and the macroeconomic factors. Capital formation is reviewed as being determined by domestic savings (SAV), external debt service (EDS); and other macroeconomic variables such as exchange rate (EXC), interest rate (INR), savings (SAV) and budget deficits (BUD), whereby the impact of external debt on capital formation is analyzed. The neoclassical growth model is also adopted and extended to include debt overhang (DOH) and crowding out effects (COE) in order to investigate the relationship between capital formation and debt overhang and crowding out effects.

The analysis is divided into aggregate and disaggregates analysis for the external debt models and capital formation models. For aggregate analysis, these models involve using same frame work. For disaggregate analysis, external debt is divided into total external debt *(EXD)* representing the external debt stock private external debt (*PEXD*) and public external debt (*GEXD*). For ease of comprehension, the models will be numbered as Model 1 to Model 6 for external debt Models and Model 7 to Model 12 for the capital formation model sub divided into Nigeria and South Africa, respectively.

3.3.1 The External Debt Models

Equation [3.5] – Equation [3.7] are external debt models for both aggregate and disaggregate analyses. Amongst the independent variables of interest for the external debt model are; external debt service (*EDS*), interest rate (*INR*), budget deficits (*BUD*), exchange rate (*EXC*), and saving (*SAV*).

$$EXD_t = \alpha_0 + \alpha_1 EDS_t + \alpha_2 INR_t + \alpha_3 EXC_t + \alpha_4 BUD_t + \alpha_5 SAV_t$$

[3.5]

where α_0 is the intercept and $\alpha_1, \alpha_2, ..., \alpha_5$ are the coefficients of the independent variables.

$$GEXD_t = \theta_0 + \theta_1 EDS_t + \theta_2 INR_t + \theta_3 EXC_t + \theta_4 BUD_t + \theta_5 SAV_t$$

[3.6]

where β_0 is the intercept, $\beta_1, \beta_2, ..., \beta_5$ are the coefficients of independent variables.

$$PEXD_t = \beta_0 + \beta_1 EDS_t + \beta_2 INR_t + \beta_3 EXC_t + \beta_4 BUD_t + \beta_5 SAV_t$$

[3.7]

where θ_0 is the intercept, $\theta_1, \theta_2, ..., \theta_5$ are the coefficients of the independent variables.

3.3.2 The Capital Formation Models

The capital formation models involve *GDP*, *INR*, *BUD*, *EXC*, *SAV*, and *EDS*. The capital formation model will be divided into three for each country. The first capital

formation model will have total external debt stock as its variable of interest, while the second and third captures disaggregated debt stocks in the form of private and public external debt as their variables of interest represented by *EXD*, *GEXD* and *PEXD*, respectively. The capital formation models are presented in Equation [3.8] – Equation [3.10].

$$CAP_t = \delta_0 + \delta_1 EDS_t + \delta_2 EXD_t + \delta_3 GDP_t + \delta_4 INR_t + \delta_5 EXC_t + \delta_6 BUD_t + \delta_7 SAV_t \quad [3.8]$$

where δ_0 is the intercept, $\delta_1, \delta_2, ..., \delta_7$ are the coefficients of independent variables.

$$CAP_t = \gamma_0 + \gamma_1 EDS_t + \gamma_2 PEXD_t + \gamma_3 GDP_t + \gamma_4 INR_t + \gamma_5 EXC_t + \gamma_6 BUD_t + \gamma_7 SAV_t \quad [3.9]$$

where γ_0 is the intercept, $\gamma_1, \gamma_2, ..., \gamma_7$ are the coefficients of the independent variables.

$$CAP_t = \pi_0 + \pi_1 EDS_t + \pi_2 GEXD_t + \pi_3 GDP_t + \pi_4 INR_t + \pi_5 EXC_t + \pi_6 BUD_t + \pi_7 SAV_t \quad [3.10]$$

where π_0 is the intercept, $\pi_1, \pi_2, ..., \pi_7$ are the coefficients of the independent variables.

3.3.3 The Debt Overhang and Crowding Out Effect Model

Based on the theories of the debt overhang and crowding out effect as explained in Section 3.2, Equation [3.11] was established, where, *DOH* is debt overhang variable, and *COE* is the crowding out effect variable. In this model, *DOH* is measured by the proportion of external debt to *GDP*, and *COE* is measured by scaling external debt service to the total exports of goods and services.

$$CAP_t = \lambda_0 + \lambda_1 EDS_t + \lambda_2 DOH_t + \lambda_3 COE_t + \lambda_4 INR_t + \lambda_5 EXC_t$$

[3.11]

where, λ_0 is the intercept, $\lambda_1, \lambda_2, ..., \lambda_5$ are the coefficients of independent variables.

3.4 Justification of Variables

This section briefly and succinctly discusses the variables of interest in the study defining same where necessary and introducing their theoretical underpinnings and their relationship to one another and especially as regards the dependent and independent variables.

3.4.1 The External Debt Stock

The total stock of external debt (*EXD*) is representing the totality of accumulated external debt stock of a borrowing country. The effect of total external debt on *GDP*, resulting from its effects on capital formation depends on the degree of outstanding and unpaid facilities which might manifest themselves in more than one way. When the countries outstanding loans gets higher all things been equal, the more the countries influence, and the higher the external debt sources becomes and the larger the amount of financial stress and illiquidity that negatively affects *GDP*, and local investment.

Second, the rise in public external debt might discourage *GDP*, level indirectly by inspiring capital flight due to the expectations of tax to rise. Nonetheless, a positive relationship between capital formation and external debt can be expected, if a significant proportion of external borrowing is invested towards funding efficient investment in productive businesses.

It is believed especially in neoclassical theories that realistic levels of foreign debt influxes should anticipate to have a favourable impact on growth. In traditional neoclassical models, which allows for capital flexibility and the possibility to lend and borrow from overseas sources, debt encourages interim growth. When the marginal product of capital is higher than the global interest rate, there is the impulse for capital-scarce countries to sign in for external loans from the developed nations (Pattillo *et al.,* 2002). The relationship may therefore either positive or negative depending on the economic circumstances governing the signing and utilization of the loans facilities.

3.4.2 The Debt Overhang Effects

Traditionally the measurement of external debt to gross domestic product is used as an indication of the extent of the effects of accumulated debts to its productive capacity especially at the marginal level. It is thus considered as a yard stick that indicates the relationship between external debt and nation's productive capacity. It is instructive that the higher a country's debt volume is the greater the debt burden when compared to its output, or indebtedness of the country (Ayadi & Felix, 2008). DOH is theoretically considered as the per cent age of the outstanding debt to GDP.

By considering GDP, as the denominator; "the rate may provide some suggestions of potentials in servicing external debt by substituting resources from the production of local goods to the production of exports", IMF (2000). Indeed, if exports comprise a tiny part of GDP, a country might have an enormous debt to export ratio with a low debt to GDP, ratio. The debt overhang problem shows how in an over indebted

country, further accumulation of foreign debt may lower the benefits derivable from investment with foreign sourced funding.

3.4.3 The External Debt Service

The external debt service variable has been confirmed to having a negative performance on economic development vis-a-vis capital formation. An unbearably large debts stock of a country is likely to lead to an effect of how labour and capital are treated especially towards the need of servicing such debts (Afxentiou, 1993). More specifically, if external lending agents rather than domestic lenders profit from the growth in national output, the domestic lenders are discouraged from adding or contributing more capital or labour into the production process. But when external debt is efficiently utilized external debt service may not be of negative effects to capital formation especially when rate of return is higher than cost of funds.

Foremost in these effects is that considerable cost of servicing of outstanding facilities mop up the flow of foreign currency and interest in investment from abroad. This therefore weakens the intention of repaying the initial amount and cost of funds (that is interest and other charges). Then comes the fact that, borrowing economies becoming unable to meet up with their debt service obligations in good time, leading to weak credit rating and difficulties in obtaining fresh loan facilities (Karagol, 2002). The debtor countries therefore have to pay much so as to get new credit lines. Among these effects also is that, the productive efficiency of debtor countries fall drastically as a result of difficulty encountered when adjusting to some economic shocks and international financial fluctuations and cyclical circles.

Additionally, to obtain more external inflow of finance through foreign exchange to meet debt obligations, many debtor countries have to cut down on imports and other aspects of international trade. This consequently leads to poor trade performance and unfavourable balance of payment while the intra-country investigation may show the marginal returns of debt burden on the economy decreasing with the increase in debt service costs (*EDS*) (Karagol, 2002). It is also on record that the decline in debt service boosts resource availability for investment (Haraldsottir, 2006).

3.4.4 The Crowding Out Effects

The ratio of debt service to exports of goods and services theoretically shows how much a borrowing nation is misplacing its priorities, when weighted in terms of debt service (Sachs, 1989). The greater the ratio, the more likely the debt maintenance difficulty and vice versa while greater debt service settlement suggests fewer resources are made accessible by the economy for investment by government and thus capital formation and economic growth. Debt service mobs out various uses of factor inputs by borrowing nations, measured as the apparent signs that instantly exposes the liability that debt inflicts on a nation's economic performance. It's functionally known as the crowding out effects (*COE*).

The *COE* variable is to be captured by the total cost of facility maintenance as suggested by Iyaho (1999): that assumption was that a portion of aggregate debt service payments compared with the nation's exports of goods and services. These effects are seen as particularly significant for economies with inadequate capacity to increase incomes or acquire market financing (IMF, 2003).

The theory of crowding out effect, states that, decrease in the debt service cost leads to an increase in investment for the identified level of outstanding obligation. If more or additional part of external resource is used in servicing external debt, therefore very little will be left for investment and economic growth (Chinaeanem & Arochukwu, 2013). The crowding-out thesis predicts that external debt service payments negatively disturb the growth rate of a country's economy by reducing real investment. In other words, the required debt service expense may create a crowding out effect on investment by moving resources out of the country in the form of interest payment and principal repayment.

3.4.5 Interest Rate

Rise in the global rate of interest *(INR*) is confirmed to have adverse effects on growth and development in the third world economies (Edo, 2002; Iyoha, 1997). The effect of interest rate on public external debt is normally known to be through its effects on economic growth. The result effects in terms of increasing the cost of funds and hence the cost of production invariably affects economic growth and hence capital formation negatively.

3.4.6 Capital Formation

The procedure of increasing or maintaining assets of worth, growing of wealth or its additional creation is theoretically termed as capital formation *(CAP)* or capital accumulation. Capital formation and investment have a slight distinguishing line. While investment is considered mostly in fiscal assets, human (capital) expansion, real possessions that can be profitable or unprofitable, Capital formation is seen in terms of savings, in that accumulation deals with the increase in stock of needed real

investments, though not all savings are automatically invested (Ugochukwu & Chinyere, 2014). The increase in investment through non-financial assets is believed to cause improvement in the performance of an economy and a rise in *GDP*, through further increase in variables such as employment generation (Adekunle & Aderemi, 2012).

3.4.7 Gross Domestic Product

Gross domestic product (*GDP)* is incorporated in our models especially for capital formation equation, which is similar to an investment equation, for it is likely to show the "investment accelerator" effect that is expected to result in to higher saving, resultant effect of higher investment. Chenery and Bruno (1962) argued that capital to *GDP*, ratio consistently exceed the saving gap ratio implying the domestic saving was not sufficient to provide the required capital. It is also on record that social and political stability determines capital formation to a great length; a hostile political environment will reduce the inflow of foreign investment which promotes capital formation. Colloier *et al.* (1996) provides an interesting typology of African countries on the basis of their location within the spectrum of the pre requisites or investment and growth. The lack of political and social stability offers hazard related with protection and production.

3.4.8 Exchange Rate

The consequence of the strength of foreign currency against the domestic currency is vague and unclear. Scholars like Chibber and Mansoor (1990) are of the opinion that devaluation acts as a negative supply interruption in the manufacturing process of mostly investment goods. In the short run, depreciation of exchange rate *(EXC)* raises

the prices of newly imported capital goods when compared to home made goods. This tends to discourage new investment while at the same time hampers productivity. In the instance of foreign-indebted businesses, devaluation increases the weight of borrowing; especially when domestic credit markets are imperfect (as is usually the case in underdeveloped economies). Firms may experience credit limitations that tend to negatively affects output.

The experimental work of Easterly on Mexico established how devaluation depressingly affects output. It might also affect output through its effect on total demand. If the net effect is varying, then the fall in economic performance is likely to lead to a drop in output. But if the outstanding effect is expansionary, devaluation may raise real incomes and hence boost production. In instances, when devaluation is considered inevitable, it is expected then to raise confidence and brighten expectations. Devaluation also affects the prices of imported factor inputs used in combination with capital goods and may also affect interest rates, which in turn affects *GDP*, hence the expected negative effects.

On the other hand based on another school of thought the expected relationship between exchange rate and external debt is likely to be positive. Thus the growth and excessive accumulation of external debt and the direction of exchange rate are expected to be positively related to each other. It is generally argued that when the national currency becomes weaker due probably to depreciation, foreign investment is discouraged and the country is forced to rely on foreign borrowing and hence the circle continues (Awan, Asghar & Rehman, 2011). In the same vain it was also found that exchange rates do significantly affect FDI using the Nigerian evidence. In other

studies, it was established that FDI growth to positively and significantly affect exchange rate in Nigeria (Muoghalu, Ezirim & Elike, 2007).

3.4.9 Budget Deficit

The noticeable risk related to the use of shortage budgeting as a counter cyclical tool is the nation's debt stock increases. High non stabilized debts can results into vicious circles that make the behavior of monetary program very hard given that government has to issue more debt or run a left-over to enable payment of interest on the existing liabilities. This, therefore, indicates an unwanted mutually-reinforcing association amongst budget shortfall and public commitment that clearly has severe repercussions on the performance of the economy if not appropriately handled Edo, (2002). One of the difficulties that Nigeria and South Africa confronted as underdeveloped economies was the need to efficiently manage its monetary policies in the circumstance of a growing foreign debts generated by previous deficits in their budgets. A large percentage of the economies past budget sinks into the management of these debts (Murwirapachena and Kapingura, 2015).

An interesting cyclical interrelationship ensues between budget deficits, external debt and economic growth. While budget deficits (BUD*)* are employed during depressions to ginger growth it usually leads to build-up of external debt. Unless debts are managed correctly, it will raise to a level that will wipe off the original growth profits of the debt-financed deficit (Adedokun, 2014). This will likely degenerate the economy into depression. While the theories that explain this cycle starts with the analysis of the role of government budget limitations in fiscal policy sustainability and debt maintenance; it continues with theories that examine the association amongst

external debt and growth; and concludes with the theory of external debt sustainability. Economies react to budget deficits and shortfall in current accounts in different ways, like more controls on foreign purchases and devaluing of the rates of exchange.

3.4.10 National Savings

To a great extent and in line with Harrod Domar theoretical models, savings (*SAV),* interest rate, public investment, capital formation, nominal exchange rate and inflation rate, are the main determinants of economic growth. In the same vain therefore saving is expected to have a positive sign in its association with investment (Adebola & Dahalam, 2012). Additional savings is expected to be capitalized in capital formation. Savings is thus understood as the part of existing returns that is directed to investment after consumption. Capital formation is, therefore, expected to ensure positive sign because rise in capital formation signifies growth in investment which is further expected to lead into growth in national productivity. Increase in the nations rate of interest is likely to spur savings positively and subsequently growth in capital formation. Similarly, investment might be made expensive which will lead to a decline in productivity being the resultant effect of factor inputs in form of foreign capital (Nasiru & Usman, 2013).

3.5 Sources of Data

Secondary time series data is employed for this study. The major advantages of using secondary data, include saving of time, the reduction of research costs, and the reduced likelihood of bias (Sekaran & Bougie, 2009). This study covers a period of 30 years for Nigeria and South Africa guided by availability of data, from 1980 to 2014.

The choice of this time frame is informed by the fact that the accumulation of external debt in the two countries becomes pronounced in the early 80s which coincide with the global debt crises period, while interest in research in the area of external debt got a boost around this time also when most of the external debts manifested into crises level around the world.

This data was sourced majorly through an intensive library survey and search. Use of especially the world Development indicators, statistical bulleting of the CBN and the South Africa's Reserve Bank. The external debt to GDP ratios representing total external debt stocks and other similar ratios were sourced from reports of the CBN annual statistical bulletins and WDIs, and the global development finance publications, which include the World Bank Review of developing countries. Capital formation and its related ratio were accessed and calculated from reports of the two countries apex banks and other regulatory institutions. The figures for EXD, EDS, GDP, SAV,PEXD and GEXD are in Billion US dollars, COE, ratio of EDS to exports of goods and services, DOH ratio of EXD to GDP, INR in percentages, and EXC in absolute terms.

3.6 Method of Analysis

This study used a system of equations comprising; external debt, capital formation, the debt overhang-crowding out effects equations for the respective models. Two approaches of time series methods were adopted for the purpose of the analyses in this thesis; the Autoregressive-Distributive Lag (ARDL) and the Vector Autoregressive (VAR) methods. The ARDL is used in estimating Equation [3.5] – Equation [3.10], while, the VAR method is used in estimating Equation [3.11].

The adoption of the two different time series methodologies was guided by the set objectives of the study. Equation [3.5] to Equation [3.10] were adopted for objective one and two. The ARDL modelling is best suited for this purpose; that is determining both long and short run elasticities and causal relationships with its determinants and the relationship between external debt and capital formation. The VAR model was geared towards achieving objective 3 and objective 4 of the study which are aimed at more in depth analyses of the structural response and decomposition of the relationships between external debt and capital formation over a period of time. In the systematic procedure of both ARDL and VAR, the findings were sensitive to the appropriate choice of both unit root test and optimal lag selections.

3.6.1 Unit Root Test

The prerequisite for time series variables being stationarity or non-stationary is noted in econometrics. Unit root or stationarity test is thus preliminary to the analyses of time series data and is imperative for proper modelling, while it has important economic interpretations (Nuri, 2000). Time series data that are often non-stationary which is generally seen as a problem in empirical analysis (Nelson & Plosser, 1982). Using non-stationary variables may lead to spurious regression results from which further inference is worthless. Thus, the existence of a significant relationship requires the determination of whether the series are stationary at level I(0) or at first difference I(1).

Despite the fact that ARDL framework does not necessarily require that the series be tested for unit root, testing for the order of integration could be helpful in determining

whether ARDL approach is suitable or not (Sulaiman & Abdul-Rahim, 2014). Pesaran, Shin, and Smith (2001) was based on the assumption that all the variables in the model are either I(0), I(1) or mixture of both. Any presence of I(2) variable in the model will render the methodology invalid. As such, unit root test is required to identify the true order of integration of each variable in the model to avoid running spurious regression.

The stationarity of the variables or otherwise is determined by applying the unit root tests of the conventional Augmented Dickey-Fuller (ADF). A Dickey-Fuller (DF) test is an econometric test that examines whether a time series data has a unit root problem otherwise known as non-stationary. It was developed by Dickey and Fuller in 1976 and subsequently by Dickey and Fuller in 1979 and 1981 which resulted into the DF (1979, 1981). DF test is a one-sided test because of the alternative proposition or hypothesis that $\delta < 0$ (or $\rho < 1$). Dickey and Fuller (1979) considered three different regression equations that can be used in testing for the presence of unit root with similar null hypothesis (Enders, 2003) as in Equation [3.12] – Equation [3.14].

$$\Delta Y_t = \delta Y_{t-1} + \varepsilon_t$$

[3.12]

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + \varepsilon_t$$

[3.13]

$$\Delta Y_t = \beta_0 + \beta_2 t + \delta Y_{t-1} + \varepsilon_t$$

[3.14]

Null hypothesis, $H_0: \delta = 0$ (i.e. the data is non-tationary or there is a unit root problem). Alternative hypothesis, $H_0: \delta < 0$ (i.e. the data is stationary or there is no unit root). The intersection is that if the H_0 is rejected the series of y_t is stationary and if it fails to reject the H_0 it means the series of y_t is nonstationary. DF has shown that under the Ho the estimated t-value of the coefficient y_{t-1} follows the τ statistic. The, τ statistic is known as DF-test. Therefore, if the computed absolute value of tau (τ) statistic exceeds the absolute DF critical value, the Ho is rejected. It is, therefore, concluded time series is stationary and vice-versa. In conducting the DF test, it is assumed that ε_t are independently uncorrelated but if otherwise Dickey and Fuller developed another test known as the ADF test. This is conducted by adding the three preceding equations of the lagged values of the dependent variables. ADF, thus, consists of the estimation of Equation [3.15];

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{\rho} \alpha_1 \Delta Y_{t-1} + \varepsilon_t, \quad i = 1,2, \ldots \ldots N \qquad [3.15]$$

where ε_t is a pure white noise and $\Delta Y_t = (Y_t - Y_{t-1})$, $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, while ADF tests whether $\delta = 0 \; or \; \delta < 0$ and the test still follow the same procedure as DF statistic, employing same critical values.

3.6.2 Optimal Lag and the Lag Length Selection Criteria

The optimal ARDL order is determined using appropriate model selection criteria such as Akaike Information Criterion (AIC). The justification for using AIC over other methods is that the AIC perform better when small sample size is employed (Hurvich & Tsai, 1989). Equation [3.16 is estimated in determining the optimal order.

$$AIC_p = \frac{-nm}{2}(1 + log 2\pi) - \frac{n}{2} log \left|\hat{\Sigma}_p\right| - ms \qquad [3.16]$$

where p is the maximum order of ARDL to be selected in the model, $\hat{\Sigma}_0$ is the system covariance matrix estimator in the regression, while $\hat{\Sigma}_p$ represents the maximized log-likelihood function. In a similar manner the VAR order is determined using appropriate model selection criteria such as AIC, Schwarz Bayesian Criterion (SBC) and/or log-likelihood ratio tests. The values of the aforementioned tests derived through Equation [3.17], Equation [3.18] or Equation [3.19] respectively:

$$AIC_p = \frac{-nm}{2}(1 + log2\pi) - \frac{n}{2} log \left|\hat{\Sigma}_p\right| - ms \qquad [3.17]$$

and

$$SBC_p = \frac{-nm}{2}(1 + log2\pi) - \frac{n}{2} log \left|\hat{\Sigma}_p\right| - \frac{ms}{2} \log(n) \qquad [3.18]$$

or

$$LR_{p,p} = n(\log \left|\hat{\Sigma}_p\right| - \log \left|\hat{\Sigma}_p\right| \qquad [3.19]$$

where p is the maximum VAR order to be selected in this study, $\hat{\Sigma}_p$ system covariance matrix estimator in the regression, $\hat{\Sigma}_p$ is the maximized log-likelihood function.

3.7 The Autoregressive Distributed Lag Method

ARDL method has been employed by researchers for quite long, but has recently been shown to provide a valuable means of analysing the long run interactions amongst economic time series. The ARDL method was lately given a boost by Pesaran and Shin (1999) and further extended by Pesaran, Shin and Smith (2001) and Nayaran (2005). This method has various econometric benefits when compared to other Cointegration methods. A major advantage of ARDL method is that it can be useful regardless of the degree of integration of the series. Secondly, ARDL method provides robust results for small sample sizes and well consistent estimates of the long-run coefficients (Pesaran & Shin 1999). In its primary model, an ARDL regression model is as shown in Equation [3.20].

$$\Delta \boldsymbol{y_t} = \omega_0 + \omega_1 \Delta \boldsymbol{y}_{t-i} + \omega_2 \Delta \boldsymbol{y}_{t-i} + \ldots + \omega_n \Delta \boldsymbol{y}_{t-k} + \gamma_1 \boldsymbol{y}_{t-1} + \gamma_2 \boldsymbol{y}_{t-1} + \ldots + \gamma_n \boldsymbol{y}_{t-k} + \boldsymbol{\varepsilon_t}$$

[3.20]

where ε_t, is a random disturbance term and the model is "autoregressive", in the sense that y_t represents a vector of variables employed in the model. The $\boldsymbol{\Delta y_t}$ can be "explained (in part) by change and lagged values of itself. It also has a "distributed lag" component, in the form of successive lags of the other explanatory variable. Sometimes, the current value of the explanatory variable itself is omitted from the distributed lag part of the model's structure.

Let's Equation [3.20] represents the derived ARDL model being (p, q). Given the presence of lagged values of the dependent variable as regressors, OLS estimation will yield biased coefficient estimates. If the disturbance term, ε_t, is auto correlated, the OLS will also be an inconsistent estimator. Using the identified ARDL model to estimate the long-run model, Vector Error Correction Model (VECM) is

employed in estimating a long run and short run coefficients accordingly. Existence of long run equilibrium relationship among serial variables can be investigated by using diverse methods. The most popularly adopted methods include Engle Granger test of Granger (1987), Fully Modified OLS (FOLS) method by Phillips and Hansen's (1990), maximum likelihood (ML) based Johansen (1988, 1991) and Johansen-Juselius (1990) tests.

These methods, however, are considered to be weak as they do not provide robust results for small samples, structural shocks or breaks. Due to these shortcomings, another approach to cointegration known as ARDL modelling has gained popularity. Furthermore, a dynamic VECM can be resulting from ARDL that integrates the short-run dynamic with the long-run equilibrium without losing long run information. In view of the above advantages, therefore, the use of ARDL approach to cointegration analysis and the resulting VECM has become popular. Additionally, ARDL methods have come to play an imperative role recently in the modelling of non-stationary time-series data. In particular, they would be used in implementing the "Bounds Tests", to see if long-run relationships are present in a group of time-series variables, some of which may be stationary at level, while others are not.

3.7.1 The Autoregressive Distributive Lag Model Estimation

ARDL is defined as a least squares regression approach involving the lags of both the dependent variables and explanatory variables. The ARDL models are normally represented by the notation ARDL $(p, q_1, q_2 \ldots\ldots\ldots, q_k)$, where p is the number of lags of the dependent variables, q_1 is the number of lags of the first explanatory variable**,** and q_k is the number of the lags of the k_{th} explanatory variable. A representation of the

ARDL methods is as in Equation [3.20]. Since the ARDL bounds test model uses the OLS regressions, criterion like the AIC, SBC and Hannan-Quinn (HQ) information criterion are popular in the models selection and the determination of the lag lengths.

The ARDL bounds testing methodology of Pesaran and Shin (1999), Pesaran *et al.* (2001) and Narayan (2005) has a number of features that many researchers give as some advantages over conventional cointegration tests. It can be used with a mixture of I(0) and I(1) data series, involving just a single-equation set-up, making it simple to implement and interpret, and different variables can be assigned different lag-lengths as they are included in the model (Nayaran, 2005, Pesaran *et al.*, 2001).

3.7.2 Bound Cointegration Test

On a general note the bound cointegration test of the variables in the external debts and capital formation models as in Equations [3.5] to Equation [3.10], would be undertaken using the ARDL method as developed by Pesaran *et al.* (2001) and as depicted in Equation [3.21].

$$\Delta lny_{it} = \omega_0 + \sum_{i=1}^{n} \omega_i \Delta lny_{it-i} + \sum_{j=1}^{p} \gamma_j lny_{it-1} + \varepsilon_{it}$$

[3.21]

where lny, a vector of endogenous variables earlier defined in external debt model Equation [3.5] to Equation [3.7] and the capital formation model in Equation [3.8] to Equation [3.10] expressed in natural logarithms, $i = 1, 2, ..., 7$ and, $j = 1, 2, ..., 7$. The symbol Δ, is the difference operator. The long run relationship is determined using *F*-

statistics to test the significance of the level, *t-1* variables. The joint significance of the model is tested using: $Ho: \gamma_1 = \gamma_2 = \cdots = \gamma_7 = 0$ as the null hypothesis.

The critical values are obtainable from Narayan (2005) for purely level variables $I(0)$, purely differenced variables $I(1)$ and mutually cointegrated variables. The null hypothesis of no cointegration is tested against the alternative hypothesis using the F-statistics values obtained, which are then compared to the two sets of critical values tabulated by Narayan (2005). The two sets of critical values are I(0) and I(1) as mentioned above, representing the lower and upper critical bounds. If the calculated *F*-statistics exceeds the upper bound, cointegration exists, the null hypothesis thus failed to be accepted. When calculated *F*-statistics falls below the lower bound, cointegration does not exist; therefore the null hypothesis fails to be accepted. While if the *F*-statistics falls in between the upper and lower bound, the result is inconclusive. Inference cannot be made unless the orders of integration of the variables are known. If cointegration exists Equation [3.16] and Equation [3.17] are estimated. On the disaggregate level, therefore, the different models are tested for cointegration for the ECM for total external debt, private external debts, public external debt, and capital formation for total private and public external debt for Nigeria and South Africa. The estimable models are specified as Equations [3.22] to Equation [3.27] and designated Models (1) to Model (6), accordingly.

Model 1: Total external debt model

$$\Delta \ln EXD_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i \Delta \ln EXD_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta INR_{t-i} \quad [3.22]$$
$$+ \sum_{i=0}^{k} \alpha_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta \ln BUD_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta \ln SAV_{t-i} + \int_1 \ln EXD_{t-1}$$
$$+ \int_2 \ln EDS_{t-1} + \int_3 INR_{t-1} + \int_4 \ln EXC_{t-1} + \int_5 \ln BUD_{t-1} + \int_6 \ln SAV_{t-1} + \varepsilon_t$$

$H_0 : \int_1 = \int_2 = \int_3 = \int_4 = \int_5 = \int_6 = 0$ (No cointegration)

$H_a : \int_1 \neq \int_2 \neq \int_3 \neq \int_4 \neq \int_5 \neq \int_6 \neq 0$ (Cointegrated)

Model 2: Private external debt model

$$\Delta \ln PEXD_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta \ln PEXD_{t-i} + \sum_{i=0}^{p} \beta_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{p} \beta_i \Delta INR_{t-i} \quad [3.23]$$
$$+ \sum_{i=0}^{p} \beta_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{p} \beta_i \Delta \ln BUD_{t-i} + \sum_{i=0}^{p} \beta_i \Delta \ln SAV_{t-i} + \Phi_1 \ln PEXD_{t-1}$$
$$+ \Phi_2 \ln EDS_{t-1} + \Phi_3 INR_{t-1} + \Phi_4 \ln EXC_{t-1} + \Phi_5 \ln BUD_{t-1} + \Phi_6 \ln SAV_{t-1} + \mu_t$$

$H_0 : \Phi_1 = \Phi_2 = \Phi_3 = \Phi_4 = \Phi_5 = \Phi_6 = 0$ (No cointegration)

$H_a : \Phi_1 \neq \Phi_2 \neq \Phi_3 \neq \Phi_4 \neq \Phi_5 \neq \Phi_6 \neq 0$ (Cointegrated)

Model 3: Public external debt model

$$\Delta \ln GEXD_t = \theta_0 + \sum_{i=1}^{q} \beta_i \Delta \ln GEXD_{t-i} + \sum_{i=0}^{q} \pi_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{q} \omega_i \Delta INR_{t-i} \quad [3.24]$$
$$+ \sum_{i=0}^{q} \psi_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{q} \xi_i \Delta \ln BUD_{t-i} + \sum_{i=0}^{q} \alpha_i \Delta \ln SAV_{t-i} + \Upsilon_1 \ln GEXD_{t-1}$$
$$+ \Upsilon_2 \ln EDS_{t-1} + \Upsilon_3 INR_{t-1} + \Upsilon_4 \ln EXC_{t-1} + \Upsilon_5 \ln BUD_{t-1} + \Upsilon_6 \ln SAV_{t-1} + \eta_t$$

$H_0 : \Upsilon_1 = \Upsilon_2 = \Upsilon_3 = \Upsilon_4 = \Upsilon_5 = \Upsilon_6 = 0$ (No cointegration)

$H_a : \Upsilon_1 \neq \Upsilon_2 \neq \Upsilon_3 \neq \Upsilon_4 \neq \Upsilon_5 \neq \Upsilon_6 \neq 0$ (Cointegrated)

Model 4: Capital formation (total external debt model)

$$\Delta \ln CAP_t = \delta_0 + \sum_{i=1}^{l} \xi_i \Delta \ln CAP_{t-i} + \sum_{i=0}^{l} \vartheta_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{l} \Omega_i \Delta \ln EXD_{t-i} \quad [3.25]$$
$$+ \sum_{i=0}^{l} \sigma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{l} \nu_i \Delta INR_{t-i} + \sum_{i=0}^{l} \alpha_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{l} \kappa_i \Delta \ln BUD_{t-i}$$
$$+ \sum_{i=0}^{l} \rho_i \Delta \ln SAV_{t-i} + \Psi_1 \ln CAP_{t-1} + \Psi_2 \ln EDS_{t-1} + \Psi_3 \ln EXD_{t-1} + \Psi_4 \ln GDP_{t-1}$$
$$+ \Psi_5 INR_{t-1} + \Psi_6 \ln EXC_{t-1} + \Psi_7 \ln BUD_{t-1} + \Psi_8 \ln SAV_{t-1} + \eta_t$$

$H_0 : \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 = \Psi_8 = 0$ (No cointegration)

$H_a : \Psi_1 \neq \Psi_2 \neq \Psi_3 \neq \Psi_4 \neq \Psi_5 \neq \Psi_6 \neq \Psi_7 \neq \Psi_8 \neq 0$ (Cointegrated)

Model 5: Capital formation (private external debt model)

$$\Delta \ln CAP_t = \gamma_0 + \sum_{i=1}^{m} \chi_i \Delta \ln CAP_{t-i} + \sum_{i=0}^{m} \alpha_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{m} \phi_i \Delta \ln PEXD_{t-i} \quad [3.26]$$
$$+ \sum_{i=0}^{m} \sigma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{m} \hat{\lambda}_i \Delta INR_{t-i} + \sum_{i=0}^{m} \hbar_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{m} \ell_i \Delta \ln BUD_{t-i}$$
$$+ \sum_{i=0}^{m} \infty_i \Delta \ln SAV_{t-i} + \Pi_1 \ln CAP_{t-1} + \Pi_2 \ln EDS_{t-1} + \Pi_3 \ln PEXD_{t-1} + \Pi_4 \ln GDP_{t-1}$$
$$+ \Pi_5 INR_{t-1} + \Pi_6 \ln EXC_{t-1} + \Pi_7 \ln BUD_{t-1} + \Pi_8 \ln SAV_{t-1} + \vartheta_t$$

$H_0 : \Pi_1 = \Pi_2 = \Pi_3 = \Pi_4 = \Pi_5 = \Pi_6 = \Pi_7 = \Pi_8 = 0$ (No cointegration)

$H_a : \Pi_1 \neq \Pi_2 \neq \Pi_3 \neq \Pi_4 \neq \Pi_5 \neq \Pi_6 \neq \Pi_7 \neq \Pi_8 \neq 0$ (Cointegrated)

Model 6: Capital formation (public external debt model)

$$\Delta \ln CAP_t = \gamma_0 + \sum_{i=1}^{m} \chi_i \Delta \ln CAP_{t-i} + \sum_{i=0}^{m} \alpha_i \Delta \ln EDS_{t-i} + \sum_{i=0}^{m} \phi_i \Delta \ln GEXD_{t-i} \quad [3.27]$$
$$+ \sum_{i=0}^{m} \sigma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{m} \hat{\lambda}_i \Delta INR_{t-i} + \sum_{i=0}^{m} \hbar_i \Delta \ln EXC_{t-i} + \sum_{i=0}^{m} \infty_i \Delta \ln SAV_{t-i}$$
$$+ \delta_1 \ln CAP_{t-1} + \delta_2 \ln EDS_{t-1} + \delta_3 \ln PEXD_{t-1} + \delta_4 \ln GDP_{t-1} + \delta_5 INR_{t-1}$$
$$+ \delta_6 \ln EXC_{t-1} + \delta_8 \ln SAV_{t-1} + \vartheta_t$$

$H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$ (No cointegration)

$H_a : \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq 0$ (Cointegrated)

When cointegration is established, the long run relationship is estimated from a set of equations for all models as in Section 3.7.3.

3.7.3 The Long Run Relationships

The long run elasticities of the models are estimated based on the determined ARDL models to investigate the effect of the independent variables on the regressand in the long run situation as shown by Equation [3.28] in its general form.

$$\boldsymbol{lny}_{it} = \alpha_0 + \sum_{j=1}^{p} \alpha_j \boldsymbol{lny}_{it-i} + \boldsymbol{\varepsilon}_{it} \quad ; \; i = 1,2,...,7 \text{ and, } j = 1,2,...,7 . \qquad [3.28]$$

Here again lny, is a vector of log variables specified in the external debt model (Equation [3.5] to Equation [3.7]) and the capital formation model in Equation [3.8] to Equation [3.10].

Long-run Models in their specific and disaggregated forms are as in Equation [3.29] to Equation [3.34].

Model 1: Total External Debt Model

$$\ln EXD_t = \alpha_1 + \sum_{i=1}^{k} \phi_{1i} \ln EXD_{t-i} + \sum_{i=0}^{k} \partial_{1i} \ln EDS_{t-i} + \sum_{i=0}^{k} \Psi_{1i} INR_{t-i} \qquad [3.29]$$
$$+ \sum_{i=0}^{k} \Upsilon_{1i} \ln EXC_{t-i} + \sum_{i=0}^{k} \chi_{1i} \ln BUD_{t-i} + \sum_{i=0}^{k} \beta_{1i} \ln SAV_{t-i} + \varepsilon_{1t}$$

Model 2: Private External Debt Model

$$\ln PEXD_t = \beta_1 + \sum_{i=1}^{p} \gamma_{1i} \ln PEXD_{t-i} + \sum_{i=0}^{p} \phi_{1i} \ln EDS_{t-i} + \sum_{i=0}^{p} \lambda_{1i} INR_{t-i} \qquad [3.30]$$
$$+ \sum_{i=0}^{p} \partial_{1i} \ln EXC_{t-i} + \sum_{i=0}^{p} \varpi_{1i} \ln BUD_{t-i} + \sum_{i=0}^{p} \pi_{1i} \ln SAV_{t-i} + \mu_{1t}$$

Model 3: Public External Debt Model

$$\ln GEXD_t = \theta_1 + \sum_{i=1}^{q} \beta_{1i} \ln GEXD_{t-i} + \sum_{i=0}^{q} \pi_{1i} \ln EDS_{t-i} + \sum_{i=0}^{q} \omega_{1i} INR_{t-i} \quad [3.31]$$
$$+ \sum_{i=0}^{q} \psi_{1i} \ln EXC_{t-i} + \sum_{i=0}^{q} \xi_{1i} \ln BUD_{t-i} + \sum_{i=0}^{q} \alpha_{1i} \ln SAV_{t-i} + \eta_{1t}$$

Model 4: Capital Formation (Total External Debt)

$$\ln CAP_t = \delta_1 + \sum_{i=1}^{l} \xi_{1i} \ln CAP_{t-i} + \sum_{i=0}^{l} \vartheta_{1i} \ln EDS_{t-i} + \sum_{i=0}^{l} \Omega_{1i} \ln EXD_{t-i} + \sum_{i=0}^{l} \sigma_{1i} \ln GDP_{t-i} \quad [3.32]$$
$$+ \sum_{i=0}^{l} \nu_{1i} INR_{t-i} + \sum_{i=0}^{l} \alpha_{1i} \ln EXC_{t-i} + \sum_{i=0}^{l} \kappa_{1i} \ln BUD_{t-i} + \sum_{i=0}^{l} \rho_{1i} \ln SAV_{t-i} + \eta_{1t}$$

Model 5: Capital Formation (Private External Debt)

$$\ln CAP_t = \gamma_1 + \sum_{i=1}^{m} \chi_{1i} \ln CAP_{t-i} + \sum_{i=0}^{m} \alpha_{1i} \ln EDS_{t-i} + \sum_{i=0}^{m} \phi_{1i} \ln PEXD_{t-i} + \sum_{i=0}^{m} \sigma_{1i} \ln GDP_{t-i} \quad [3.33]$$
$$+ \sum_{i=0}^{m} \lambda_{1i} INR_{t-i} + \sum_{i=0}^{m} \hbar_{1i} \ln EXC_{t-i} + \sum_{i=0}^{m} \ell_{1i} \ln BUD_{t-i} + \sum_{i=0}^{m} \infty_{1i} \ln SAV_{t-i} + \vartheta_{1t}$$

Model 6: Capital Formation (Public External Debt)

$$\ln CAP_t = \pi_1 + \sum_{i=1}^{n} \hbar_{1i} \ln CAP_{t-i} + \sum_{i=0}^{n} \forall_{1i} \ln EDS_{t-i} + \sum_{i=0}^{n} \ni_{1i} \ln GEXD_{t-i} \quad [3.34]$$
$$+ \sum_{i=0}^{n} \vartheta_{1i} \ln GDP_{t-i} + \sum_{i=0}^{n} \theta_{1i} INR_{t-i} + \sum_{i=0}^{n} \lambda_{1i} \ln EXC_{t-i} + \sum_{i=0}^{n} \psi_{1i} \ln SAV_{t-i} + \upsilon_{1t}$$

The successful estimation of the long run relations paves way for the estimation of the short run in the form of an ECT as in Section 3.7.4.

3.7.4 The Short Run Relationships

The short run elasticities are estimated using ARDL error correction term of the following general form as in Equation [3.35]:

$$\Delta lny_{it} = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta lny_{it-i} + \varphi_i ECT_{it-1} + \varepsilon_{it} \quad [3.35]$$

where Δlny_{it} is the change in natural logarithm of every variable specified in external debt and capital formation models over time. In their specific forms, the models estimated are represented as in Equation [3.36] to Equation [3.41].

Model 1: Total External Debt Model

$$\Delta \ln EXD_t = \alpha_2 + \sum_{i=1}^{k} \phi_{2i} \Delta \ln EXD_{t-i} + \sum_{i=0}^{k} \partial_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{k} \Psi_{2i} \Delta INR_{t-i} \quad [3.36]$$
$$+ \sum_{i=0}^{k} \Upsilon_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{k} \chi_{2i} \Delta \ln BUD_{t-i} + \sum_{i=0}^{k} \beta_{2i} \Delta \ln SAV_{t-i} + \lambda ect_{t-1} + \varepsilon_{2t}$$

Model 2: Private External Debt Model

$$\Delta \ln PEXD_t = \beta_2 + \sum_{i=1}^{p} \gamma_{2i} \Delta \ln PEXD_{t-i} + \sum_{i=0}^{p} \phi_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{p} \lambda_{2i} \Delta INR_{t-i} \quad [3.37]$$
$$+ \sum_{i=0}^{p} \partial_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{p} \varpi_{2i} \Delta \ln BUD_{t-i} + \sum_{i=0}^{p} \pi_{2i} \Delta \ln SAV_{t-i} + \vartheta ect_{t-1} + \mu_{2t}$$

Model 3: Public External Debt Model

$$\Delta \ln GEXD_t = \theta_2 + \sum_{i=1}^{q} \beta_{2i} \Delta \ln GEXD_{t-i} + \sum_{i=0}^{q} \pi_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{q} \omega_{2i} \Delta INR_{t-i} \quad [3.38]$$
$$+ \sum_{i=0}^{q} \psi_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{q} \xi_{2i} \Delta \ln BUD_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta \ln SAV_{t-i} + \varphi ect_{t-1} + \eta_{2t}$$

Model 4: Capital Formation Model with Total External Debt

$$\Delta \ln CAP_t = \delta_2 + \sum_{i=1}^{l} \xi_{2i} \Delta \ln CAP_{t-i} + \sum_{i=0}^{l} \vartheta_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{l} \Omega_{2i} \Delta \ln EXD_{t-i} \quad [3.39]$$
$$+ \sum_{i=0}^{l} \sigma_{2i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{l} \nu_{2i} \Delta INR_{t-i} + \sum_{i=0}^{l} \alpha_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{l} \kappa_{2i} \Delta \ln BUD_{t-i}$$
$$+ \sum_{i=0}^{l} \rho_{2i} \Delta \ln SAV_{t-i} + \psi ect_{t-1} + \eta_{2t}$$

Model 5: Capital Formation Model with Private External Debt

$$\Delta \ln CAP_t = \gamma_2 + \sum_{i=1}^{m} \chi_{2i} \Delta \ln CAP_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{m} \phi_{2i} \Delta \ln PEXD_{t-i} \quad [3.40]$$
$$+ \sum_{i=0}^{m} \sigma_{2i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{m} \lambda_{2i} \Delta INR_{t-i} + \sum_{i=0}^{m} \hbar_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{m} \ell_{2i} \Delta \ln BUD_{t-i}$$
$$+ \sum_{i=0}^{m} \infty_{2i} \Delta \ln SAV_{t-i} + \beta ect_{t-1} + \vartheta_{2t}$$

Model 6: Capital Formation Model with Public External Debt

$$\Delta \ln CAP_t = \pi_2 + \sum_{i=1}^{n} \hbar_{2i} \Delta \ln CAP_{t-i} + \sum_{i=0}^{n} \forall_{2i} \Delta \ln EDS_{t-i} + \sum_{i=0}^{n} \ni_{2i} \Delta \ln GEXD_{t-i} \quad [3.41]$$
$$+ \sum_{i=0}^{n} \vartheta_{2i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta INR_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta \ln EXC_{t-i} + \sum_{i=0}^{n} \psi_{2i} \Delta \ln SAV_{t-i}$$
$$+ \rho ect_{t-1} + \upsilon_{2t}$$

The lag error correction term (ECT_{t-1}) measures the effectiveness of the feedback or the speed of the adjustment mechanism in stabilizing disequilibrium in the model. In other words, it describes how disequilibrium in the model will instantaneously converge to equilibrium after a given shock in the economy. Furthermore, a negative and significant coefficient of the *ECT* term is required to ensure the existence of long run relationship and adjustment of disequilibrium in the model (Narayan, 2005). The higher the magnitude of the *ECT* term, the better will be the speed of adjustment.

3.8 Vector Autoregressive Method

In econometric circles, the VAR modeling is employed in examining the relationship between and among a set of economics variables. It is additionally used in situations where the researcher is not confident about whether a variable is exogenous or not while the frequency of its use is mostly in forecasting analysis. The VAR model is generally referred to by scholars of econometrics as a set of linear dynamic equations where each of the variable of concern is specified as a role of an equal number of lags of itself and all other variables in the system (Lada & Wójcik, 2007). It is, thus, seen as a multiple equation systems involving a set of say *k* time series variables taken as lagged values of all the *k* series. A VAR model depicts many advantages when compared with others like univariate time series models or simultaneous equations models.

The VAR method, pioneered by Sims (1980), has been widely used in macroeconomic modelling. It is an estimation approach in which every equation has the same right-hand variables, that also contains their lagged values. VAR models use observed time series of data to forecast economic variables and have confirmed effective for forecasting systems of interconnected time series variables (1996). The VAR model is also commonly used for analysing the active impact of diverse kinds of arbitrary instability on systems of variables such as the monetary transmission mechanism.

VAR modeling was popularized in econometrics by scholars like Sims (1980) as a regular or natural generalization of univariate autoregressive models. It represents systems of regression models (with more than one dependent variable) that can be considered a kind of hybrid between the univariate time series models and the

simultaneous equations models. VAR modeling has often been advocated as an alternative to large scale simultaneous equations models. The simplest scenario that can be entertained is a bivariate VAR, where there are only two variables, y_{1t} and y_{2t}, each of whose current values depend on different combinations of the previous k values of both variables. One of the advantages of the VAR method of analysis is that it allows the value of a variable to depend on more than just its own lags or combinations of white noise terms. VARs are therefore more flexible than univariate AR models; the latter can be viewed as a restricted case of VAR models. VAR models can therefore offer a very rich structure, implying that they may be able to capture more features of the data.

Another advantage of the VAR method is that there is no requirement of specifying which of the variables are endogenous or exogenous. This is critical in that a compulsory prerequisite for simultaneous equations models to be estimable is that all the equations in the system are identifiable. Basically therefore, this obligation boils down to a condition that; while some variables are treated as exogenous, the equations contain different right hand side (RHS) variables.

However, in practice, theory will be at best vague in its suggestions of which variables should be treated as exogenous. This leaves the researcher with a great deal of discretion concerning how to classify the variables. The specification of certain variables as exogenous, required to form identifying restrictions, is likely in many cases to be invalid. Sims (1980) termed these identifying restrictions as 'incredible'. VAR estimation requires no such restrictions to be imposed.

Findings have shown that the forecasts generated from 'traditional structural' models are by far lower in quality than those generated using VAR. For example, Sims (1980) argued that large-scale structural models performed poorly especially in terms of their out-of-sample forecast precision. This could arise resulting from the ad hoc nature of the restrictions placed on them to ensure identification as discussed. McNees (1986) concluded that forecasts for select variables like the US unemployment rate and real GNP are reached more precisely using VARs than using various structural specifications.

3.8.1 Vector Autoregressive Model Estimation

The estimation procedure of the VAR models will be preceded by the determination or selection of the VAR order or lag length. The VAR order will be determined using appropriate model selection criteria such as AIC, SBC and/or log-likelihood ratio tests. The values of the aforementioned tests derived through Equation [3.17], Equation [3.18] or Equation [3.19], respectively as earlier discussed in Section 3.6.2.

3.8.2 Vector Autoregressive Estimation

In examining the impact of debt overhang and crowding out effects on capital formation in Nigeria and South Africa, a system of equations is employed using VAR methodology. Following Sim, (1980) and Karim, Harif, & Adziz, (2006), the generalized VAR model is considered as represented by Equation [3.42].

$$x_{it} = A_0 + A_1 x_{it-1} + A_2 x_{it-2} + \ldots + A_N x_{it-n} + Bz_{it} + \varepsilon_{it} \qquad [3.42]$$

where x, a vector of endogenous variables presented in debt overhang model depicted in Equation [3.15] (Capital formation, external debt service, debt overhang, crowding out effect, interest rate and exchange rate); $i = (1, 2, ..., 6)$ and $j = (1, 2, ..., 6)$. A_0 is a

vector of intercepts, $A_1 \ldots A_N$ and B are $n\ x\ n$ vector of coefficients and ε_t is an $n\ x\ 1$ vector of error terms correlated with each other but independent of its lagged series and lag endogenous and exogenous variables. A major conditionality of the VAR estimation is that the error terms are required to be serially uncorrelated.

3.8.3 Exogeneity Test

Exogeneity is seen as an illustration of the Davidson and Mackinnon version of the Wu-Hausman specification test. It is also known and called the homogeneity test in econometric parlance. For example, if a variable which is a regressor is suspected of being endogenous (jointly dependent) it can be proved or disproved adopting the exogeneity test by adding the residual from the reduced form equation for the suspected variable to the relevant structural form equation and its significance tested. The null hypothesis of exogeneity is rejected if the residual is found to be significant. There are three typs of exogeneity; Weak, Strong and Super exogeneities. Major reason for distinguishing the three types of exegenity is that generally, while weak exogeneity is adequate for estimation and testing, forcasting requires strong exogeneity and super exogeneity is for policy analysis.

3.8.4 Lag Length Selection

In order to escape reporting unauthentic causal relations; for example to avoid reporting of spurious presence or absence of causal relations, it is important to determine the optimal lag length to be used for the estimations. A combination of AIC, SC, Likelihood Ratio (LR), HQ, Final prediction error (FPE) and other lag selection criterions were adopted and ran for the optimal lag length.

3.8.5 Impulse Response Function

The direct interpretation of VAR models is rather difficult because it is composed of many coefficients so that it becomes difficult to understand the dynamic interactions between the variables. It is therefore advantageous to simulate the dynamic effects of the different structural shocks by computing the impulse response function (IRF) (Hall *et al.,* 1996). It shows the effect over time of the structural shocks on the variables of concern. IRF helps this study to see the shock effects of, for example external debt stock on capital formation over a long period of time. This is due to the fact that the impact of external debt stock can hardly be felt instantaneously (Presbitero, 2008; Johansson, 2010). These effects can often be related to the underlying economic model and are thus at the heart of the VAR analysis.

The IRF is derived from the causal representation of the VAR process. Clearly, the IRF depends on the identification scheme chosen. There are n^2 if the system consists of n variables. Usually, the impulse response functions are represented graphically and are estimated to show the effect of shock on the adjustment path of the variables. In this case, the adjustment of capital formation as a result of external debt relief and debt overhang. This is estimated to measure the shock effect on the future dynamic system. It works with the $m\,x\,m$ coefficient matrices A_i, in the infinite representation of Equation [3.43]:

$$\boldsymbol{y_t} = A_0 + A_1 \boldsymbol{y}_{t-i} + A_2 \boldsymbol{y}_{t-i} + \ldots + A_N \boldsymbol{y}_{t-N} + \varepsilon_t \qquad [3.43]$$

where y_t is defined in Equation [3.44]

$$\boldsymbol{y_t} = \sum_{j=0}^{\infty} A_j \boldsymbol{\varepsilon}_{t-j} + \sum_{j=0}^{\infty} B \boldsymbol{y}_{t-j} \qquad [3.44]$$

where, A_j is a matrix computed through Equation [3.45]

$$A_j = \Phi_1 A_{j-1} + \Phi_2 A_{j-2} + \cdots + \Phi_p A_{j-p},\ j = 1,2,\ldots 6; \quad [3.45]$$

From Equation [3.45]; $A_j = 0$, for $j < 0$, and $B_j = A_j \Psi$, for $j = 1, 2, \ldots, 6$

The following Cholesky impulse response decomposition of shocks ε_t covariance matrix is considered as $\Sigma = \boldsymbol{XX}'X$, and given as the lower triangular matrix represented in a moving average specified in Equation [3.46]

$$\boldsymbol{y}_t = \sum_{j=0}^{\infty}\left(A_j X\right)\left(X^{-1}\varepsilon_{t-j}\right) + \sum_{j=0}^{\infty} B_j w_{t-j} \quad [3.46]$$

$$= \sum_{j=0}^{\infty}(A_j^{*}\varepsilon_{t-j} + \sum_{j=0}^{\infty} B_j w_{t-j}$$

where $A_j^{*} = A_j X$, and $\varepsilon_t = X^{-1}\varepsilon_t$.

From Equation [3.46], a new ε_t will be obtained by transformation matrix as in Equation [3.47].

$$E\left(\grave{o}_t \grave{o}_t^{'}\right) = X^{-1} E\left(\varepsilon_t \varepsilon_t^{'}\right) X^{'-1} = X^{-1}\Sigma X^{'-1} = \boldsymbol{I}_m \quad [3.47]$$

Therefore, the shocks in the equations are orthogonal to each other represented as: $\epsilon_t = (\epsilon_{1t,}\epsilon_{2t},\ldots \epsilon_{mt})'$. It therefore means that for any one standard error unit shock at a given time period t to any ith error such as ϵ_{it}, on a given jth variable at $t + N$ is described by the jth element of the following form as in Equation [3.48].

$$A_N^{*}\varepsilon_i = A_N X_{\varepsilon i} \quad \textbf{[3.48]}$$

In this case, the orthogonal sets of innovations do not depend on the VAR ordering, rather by applying a variable specific Cholesky factor computed with the variable based on the Cholesky ordering in respect of their significance.

3.8.6 Variance Decomposition

Another instrument for the interpretation of VAR models is the variance decomposition (VD), which decomposes the total forecast error variance of a variable into the variances of the structural shocks. It is based on the causal representation of the VAR model. Usually, the result is either displayed graphically or in table form. These numbers show which per cent age of the forecast variance can be attributed to a particular structural shock and thus measure the contribution of each of these shocks to the overall fluctuations of the variables in question. VD separates the variation in an endogenous variable into the component shocks to the VAR. In other words, the provides information about the relative importance of each random innovation in affecting the variation of the variables in the VAR. The forecast error shows the magnitude of the forecast error or influence of the variables in the VAR model over time (Rusek, 1994).

In other words, VD provides information on the magnitude of the contribution of each variable in determining the capital formation of Nigeria and South Africa. The process shows how relevant for example is external debt relief compared to other variables included in the model as they relate to capital formation. It gives an insight to the researchers and policy makers alike on the variable to focus on, and manipulate in order to ensure an efficient and sustainable economic growth path. This is estimated using Equation [3.49].

$$\boldsymbol{y}_{t+1} = A_0 + A_1 \boldsymbol{y}_{t-i} + \ldots + \varepsilon_{t+1} \quad [3.49]$$

where conditional expectation of y_{t+1} results into equation [3.50]

$$\boldsymbol{E}_t \boldsymbol{y}_{t+1} = A_0 + A_1 \boldsymbol{y}_t . \quad [3.50]$$

Equation [3.51] is for one-step forecast error.

$$\boldsymbol{y}_{t+1} - \boldsymbol{E}_t \boldsymbol{y}_{t+1} = \varepsilon_{t+1} \quad [3.51]$$

whereas, Equation [3.52] is for two periods,

$$\boldsymbol{y}_{t+2} + A_0 + \boldsymbol{A}_1 \boldsymbol{y}_{t+1} + \varepsilon_{t+2} \quad = A_0 + \boldsymbol{A}_1 (A_0 + A_1 \boldsymbol{y}_t + \varepsilon_{t+1}) + \varepsilon_{t+2} \quad [3.52]$$

where y_t represent the vector of endogenous variables. In a more generalized form, the forecast error decomposition of the variance for every ith variable in the VAR model is depicted as in Equation [3.53]

$$y_{ij,}N = \frac{\sum_{\ell}^{N} (e_i^{'} A_{\ell} X_{ej})^2}{\sum_{\ell}^{N} e_i^{'} A_{\ell} \Sigma A_{\ell}^{'} e_i}, i, j = 1, 2, \ldots m \quad [3.53]$$

where $y_{ij,}N$ is the magnitude of the $N-$step forecast ahead for every variable i accounted for in the innovation of another variable j. The Cholesky decomposition of Σ, XX' is defined as X, $A_{\ell,} \ell = 0,1,2,$ ... are the coefficient matrices in the VAR model, the symbols $e_i' A_\ell \Sigma A_\ell' \, e_i$represent the ith elements diagonal of the matrix $A_\ell \Sigma A_\ell'$. Granger causality test could be highly sensitive to lag selection. If the selected lag length is lower than the true lag, the omission of the relevant lags may cause bias in the results. Conversely, if the selected lag length is greater than the true lag, irrelevant

lags in the equation will cause the estimates to be inefficient (Clarke & Mirza, 2006; Menyah & Wolde-Rafael, 2010).

3.8.7 Granger Causality Test

Relationships between dependent and independent variables may not necessarily be unidirectional. Granger causality test is a statistical hypothesis test for determining whether a time series variable is useful in forecasting one another. The granger causality test is as in Equation [3.54] and Equation [3.55].

$$X_{it} = \sum_{i=1}^{k} \phi_i Y_{it-i} + \sum_{j=0}^{k} \partial_j X_{it-j} + \varepsilon_{it} \quad [3.54]$$

$$Y_{it} = \sum_{i=1}^{k} \rho_i Y_{it-i} + \sum_{j=0}^{k} \lambda_j X_{it-j} + \varepsilon_{it} \quad [3.55]$$

These equations postulate that a current value of a dependent variable is related to a past value of itself as well as that of the independent variable in form of regressors, where it is assumed that the disturbance error term are uncorrelated. Causality amongst variables may not necessarily be unidirectional. It may instead be a two way relationship. Unidirectional causality from a dependent variable to an independent variable is showed if the estimated coefficients on the lagged values of independent variables of a model are statistically significant and different from zero as a group and the set of estimated coefficients on the lagged dependent variable is not statistically and away from zero. On the other hand, unidirectional causality from dependent variables exist if the set of lagged independent variables coefficients are statistically and significantly different from zero.

3.9 Diagnostic Checks

Conducting the tests of stability leads to the determination of the goodness of fit of the ARDL model achieved through the diagnostic test. The test also includes the serial correlation test, functional, normality and heteroscedisticity tests. While the stability test involves employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUM-Q) tests, determination of the prediction error of the model is another way of ascertaining the reliability of the ARDL model. If the error or the difference between the real observations and the forecast is infinitesimal, then the model can be considered as best fitting model.

3.10 Conclusion

This study investigated the relationship between external debt and investment in form of capital formation in Nigeria and South Africa using secondary sources of data employing time series analysis. It is important therefore to ensure that time series variables included in the model are stationary; that is every variable has a constant mean and constant variance. This will make the prediction of future values possible. If variables are not stationary, as is expected of most macroeconomic data, they will be subjected to estimation residual to OLS technique. To confirm and ascertain the stationarity of the series, the unit root test is be conducted to take quality control of heterogeneity problem.

Having ascertained the stationarity of the variables after applying the unit root test, ARDL and VAR methods were used in estimating the parameters of the model. The chapter is systematically organized to present the procedural approach of the thesis. It started with the theoretical frame work after which the models of the study were specified based on the underpinning theories. Methods adopted and their estimation

procedures were highlighted while all important variables were defined and justified and their salient features discussed.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The chapter is divided into seven sections. Section 4.2 and Section 4.3 started with the description of statistics and reporting of the correlation matrix, respectively. In Section 4.4, empirical results of the estimations of external debt models as represented by Equations [3.5] to Equation [3.7] for both Nigeria and South Africa were presented. Section 4.5 reports and discusses the empirical results of the capital formation models as represented by Equation [3.8] to Equation [3.10] for the two countries using the bounds test approach. The third objective is aimed at examining the impact of debt overhang and crowding out effects on capital formation in the two countries under review. The fourth objective is embedded in the granger causality results of the various models. This is archived employing the VAR estimation of Equation [3.11] in Section 6. Section 7 summarizes and concludes on the study.

4.2 Descriptive Statistics

This section describes the degree of confidence and reliability of the data sets employed. Descriptive statistics results have been presented comparatively for the two countries under studies. The results are presented in Table 4.1 for both Nigeria and South Africa. The table indicates that the mean values of external debts *(EXD)* for Nigeria and South Africa are very high apart with South Africa reporting as much as three to four times the figures of Nigeria. For example, the external debt series for South Africa reached its maximum with a value of US$145 billion in 2014 and a

minimum of US$19.56 in 1990 as against Nigeria's highest of US$36.69 and US$3.75 million, respectively.

Table 4.1
Descriptive Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum
Nigeria:				
EXD	22.12	10.89	3.75	36.69
EDS	3.50	2.22	0.23	7.14
CAP	12.37	6.85	5.50	34.00
GDP	103.61	135.40	15.79	521.80
INR	7.97	3.63	3.25	18.87
EXC	55.92	51.34	0.61	133.50
BUD	61.05	13.06	0.66	80.05
SAV	19.78	24.77	0.59	107.07
PEXD	3.50	2.24	0.23	7.14
GEXD	18.62	10.77	3.50	32.55
DOH	64.97	53.60	1.99	194.67
COE	21.24	23.80	0.13	90.87
South Africa:				
EXD	50.42	40.46	19.56	145.08
EDS	11.00	8.91	2.90	29.96
CAP	18.07	2.04	14.31	22.71
GDP	192.81	100.23	67.07	403.89
INR	15.45	4.21	8.75	22.33
EXC	100.46	14.20	69.46	123.40
BUD	-67.03	20.22	-102.06	-42.60
SAV	30.79	13.64	16.55	67.72
PEXD	30.10	1.16	24.16	54.89
GEXD	16.25	20.45	2.05	85.53
DOH	24.12	7.55	15.96	41.06
COE	8.75	10.51	1.37	41.06

Note: the figures for EXD, EDS, GDP, SAV,PEXD and GEXD are in Billion US dollars, COE, ratio of EDS to exports of goods and services, DOH ratio of EXD to GDP, INR in percentages, EXC in absolute terms.

In the case of capital formation (*CAP)* variables, the characteristic of the series are similar, with Nigeria's capital formation maximum being higher than that of South Africa. The minimum and maximum statistical values of the *CAP* in both countries appeared far below the theoretically expected consistent average value over time of 27 per cent which will guarantee a sustained and efficient economic growth rate (Hernendaz-Cata, 2000). The *GDP*, series recorded a maximum value of US$522

million and US$404 million for Nigeria and South Africa, respectively with the series maintaining a gradual increase as expected. The *GDP*, figures have been moving in line with series movement of similar economies. The pattern and characteristics of the public and private external debt series followed same with the total external debt stock (*EXD)* variable. The debt overhang variable reached its peak in the mid-nineties defining the highest credibility moment for the country's external debt experiences. *DOH* and *COE* are similarly of same pattern with Nigeria leading in the indices indicating the level of negative effects of external debt on the economies of the two nations. While Nigeria recorded a *DOH* effect of over 194 per cent which is by all standards far above normal, South Africa recorded a reasonable level of 41 per cent.

It is also worth noting that in Nigeria the relatively higer SAV figure of $107 billion USD and the lower CAP shows lack of investment, but the figure was just for one year. In south Africa however the average SAV in the economy is much higher depeicting also weak inevestment culture. For Nigeria however the high SAV figure may be explained by lack of security that serves as a guranntee for investment.

4.3 Correlation analysis

The results of the correlation test between dependent variable and independent variables proved to be very useful in pre estimation analysis especially as regards potential relationships suggested by theories. Therefore prior to the econometrics analysis, the statistical correlation of the variables are examined which helped in determining the statistical relationships between and amongst the variables.

The correlation coefficients as calculated for Nigeria indicate strong relationship between the dependent variable *EXD* and the independent variables as in Table 4.2. It can thus be concluded that the correlation amongst the variables of interest is relatively high, such as correlation between *EXD* and variables like *SAV, GEXD* and *DOH* while the correlation among remaining variables falls below 0.05 per cent, savings and *GDP*, are negatively related to *EXD*. Moreover, *CAP, INR* and *EXC* are negatively related to *EXD*. From the correlation matrix table *GEXD* has the highest positive relationship and *GDP*, has the highest negative relationship, 0.98 and -0.60, respectively. Capital formation, on the other hand, has a strong significant correlation with *EXC* and *INR*, weak but statistically significant negative correlation with *EXD* and *EDS* and very low correlations with *DOH* and *COE* with statistically insignificant probability values.

Meanwhile, Table 4.3 shows that the correlation between the dependent variable and the explanatory variables is not of the same pattern as that of Nigeria. Majority of the variables have a very high and strong correlation between them and external debt. Specifically, *GDP, SAV, DOH* and *COE* have strong positive correlation with external debt while *INR* and *BUD* have very strong negative relationships. External debt service series *(EDS*) and *COE* are negatively correlated with statistically significant probability values at 1 per cent. *CAP*, on the other hand, is insignificantly and positively correlated with *EXC*, moderately correlated with explanatory variables like *SAV, EXD, COE* and *DOH* with mixed levels of statistical significance.

Table 4.2
Correlation Analysis of Nigeria

	BUD	**CAP**	**COE**	**DOH**	**EDS**	**EXD**	**EXC**	**GDP**	**GEXD**	**PEXD**	**INR**	**SAV**
BUD	1.00											
	--											
CAP	0.15	1.00										
	(0.41)	--										
COE	0.20	0.13	1.00									
	(0.27)	(0.48)	--									
DOH	0.26	-0.13	0.41	1.00								
	(0.15)	(0.46)	(0.02)	--								
EDS	0.03	-0.12	0.43	0.03	1.00							
	(0.87)	(0.52)	(0.01)	(0.88)	--							
EXD	0.28	-0.33	0.17	0.78	0.07	1.00						
	(0.12)	(0.05)	(0.34)	(0.00)	(0.72)	--						
EXC	-0.16	-0.57	-0.58	-0.49	0.03	-0.12	1.00					
	(0.36)	(0.00)	(0.00)	(0.00)	(0.87)	(0.50)	--					
GDP	-0.50	-0.12	-0.46	-0.64	-0.33	-0.60	0.37	1.00				
	(0.00)	(0.50)	(0.01)	(0.00)	(0.06)	(0.00)	(0.03)	--				
GEXD	0.25	-0.39	0.09	0.75	0.11	0.98	-0.03	-0.57	1.00			
	(0.15)	(0.02)	(0.61)	(0.00)	(0.56)	(0.00)	(0.85)	(0.00)	--			
PEXD	0.14	0.25	0.38	0.19	-0.19	0.16	-0.43	-0.15	-0.05	1.00		
	(0.45)	(0.16)	(0.03)	(0.28)	(0.28)	(0.38)	(0.01)	(0.39)	(0.78)	--		
INR	0.23	0.73	0.36	0.13	0.21	-0.03	-0.62	-0.54	-0.10	0.30	1.00	
	(0.19)	(0.00)	(0.04)	(0.47)	(0.23)	(0.86)	(0.00)	(0.00)	(0.60)	(0.09)	--	
SAV	-0.70	-0.07	-0.44	-0.63	-0.25	-0.59	0.32	0.95	-0.56	-0.19	-0.44	1.00
	(0.00)	(0.70)	(0.01)	(0.00)	(0.16)	(0.00)	(0.06)	(0.00)	(0.00)	(0.28)	(0.01)	--

Note: Figures in parentheses are *p*-values

Table 4.3
Correlation Analysis of South Africa

	BUD	**CAP**	**COE**	**DOH**	**EDS**	**EXC**	**EXD**	**GDP**	**GEXD**	**INR**	**PEXD**	**SAV**
BUD	1.00											
	--											
CAP	-0.53	1.00										
	(0.00)	--										
COE	0.62	-0.13	1.00									
	(0.00)	(0.51)	--									
DOH	-0.55	0.42	0.058	1.00								
	(0.00)	(0.02)	(0.76)	--								
EDS	0.49	-0.03	0.96	0.14	1.00							
	(0.01)	(0.87)	(0.00)	(0.46)	--							
EXC	0.66	-0.25	0.65	-0.44	0.61	1.00						
	(0.00)	(0.18)	(0.00)	(0.02)	(0.00)	--						
EXD	-0.87	0.46	-0.43	0.73	-0.24	-0.49	1.00					
	(0.00)	(0.01)	(0.02)	(0.00)	(0.19)	(0.01)	--					
GDP	-0.92	0.47	-0.59	0.50	-0.41	-0.45	0.94	1.00				
	(0.00)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.00)	--				
GEXD	-0.84	0.42	-0.45	0.69	-0.27	-0.53	0.96	0.89	1.00			
	(0.00)	(0.02)	(0.01)	(0.00)	(0.15)	(0.00)	(0.00)	(0.00)	--			
INR	0.72	-0.42	0.54	-0.39	0.36	0.52	-0.76	-0.80	-0.73	1.00		
	(0.00)	(0.02)	(0.00)	(0.03)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	--		
PEXD	-0.86	0.32	-0.61	0.66	-0.44	-0.72	0.92	0.85	0.90	-0.76	1.00	
	(0.00)	(0.09)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	---	
SAV	-0.84	0.53	-0.48	0.45	-0.32	-0.32	0.87	0.96	0.82	-0.76	0.72	1.00
	(0.00)	(0.00)	(0.01)	(0.02)	(0.09)	(0.08)	(0.00)	(0.00)	(0.00)	(0.00	(0.00)	--

Notes: Figures in parentheses are *p*-values

4.4. Exogeneity test

The null hypothesis of exogeneity is rejected if the residual is found to be significant as detailed in section 3.8.3 Thus, it has been determined from Table 4.4 that all the independent variables are free from exogeneity problems.

Table 4.4
Block exogeneity test

DV: ***EXD***	**Nigeria**		**South Africa**	
Excluded	$\mathbf{X^2}$	***P*-value**	$\mathbf{X^2}$	***P*-value**
CAP	1.565	0.457	2.466	0.292
COE	1.078	0.583	3.137	0.208
DOH	0.234	0.890	1.802	0.406
BUD	0.429	0.807	4.939	0.085
EDS	3.935	0.140	2.832	0.243
EXC	1.268	0.531	4.014	0.134
GDP	0.945	0.624	1.816	0.403
INR	1.370	0.504	3.634	0.163
PEXD	2.324	0.313	1.315	0.518
GEXD	0.419	0.811	0.577	0.749
SAV	2.591	0.274	5.063	0.080

Note: Columns 2 and column 4 present the chi-square values of the block exogeneity Wald test for Nigeria and South Africa respectively. The *P*-values attached to the values indicate the significance of the test statistics.

4.5 Unit Root Tests

Table 4.5 presents the unit root test output for Nigeria and South Africa's series based on the ADF approach. The null hypotheses of non-stationarity failed to be rejected in all cases. In the case of Nigeria; *EDS*, *CAP*, *INR* and *BUD* attained stationarity at level. Others were stationary at I(1). It is thus established that the series are integrated at different levels; meaning that some of the series are stationary at I(0) and others at I(1). These results have validated the adoption of ARDL bounds test. Of the 12 variables under consideration for South Africa, *INR*, *BUD* and *COE* were found to be stationary at level I(0), and the remaining variables established stationarity after first differencing, I(1). The various mixes of

equations in the six models however have warranted the use of ARDL. All variables have established stationarity at least at five per cent level of significance employing the ADF unit root test.

Table 4.5
The Augmented Dickey Fuller Stationarity Test Results

	Constant Without Trend		Constant With Trend	
Variables	Level	First Difference	Level	First Difference
Nigeria:				
EXD	-2.05(1)	-4.12(1)*	-2.37(1)	-4.35(0)
EDS	-3.99(1)*	-5.81(1)	-4.13(1)	-5.76(1)
CAP	-3.01(0)*	-4.85(1)	-2.29(0)	-5.64(1)*
INR	-3.87(1)	-3.79(2)	-5.88(1)*	-3.68(2)
LSAV	-1.73(0)	-7.87(0)*	-2.81(0)	-8.20(0)
GDP	3.76(3)	3.08(5)	3.83(4)	-7.47(0)*
BUD	1.04(5)	-6.65(4)	-5.41(2)*	-6.99(4)
EXC	-1.12(0)	-4.62(0)*	-0.72(0)	-4.66(0)
GEXD	-2.05(1)	-3.68(0)*	-2.33(1)	-3.81(0)
PEXD	-2.22(0)	-5.28(0)*	-2.19(0)	-5.25(0)
DOH	-1.20(0)	-5.29(0)*	-2.12(0)	-5.55(0)
COE	-1.91(1)	-5.59(0)*	-3.48(0)	-5.85(0)
South Africa:				
EXD	2.17(0)	-4.53(0)	-0.51(0)	-6.20(0)*
EDS	-2.30(0)	-6.33(0)*	-2.19(0)	-6.67(7)
CAP	-2.50(0)	-5.18(0)*	-2.93(1)	-5.12(0)
INR	-0.47(2)	-6.37(1)	-4.42(1)*	-6.52(1)
LSAV	0.07(2)	-5.91(1)	-1.32(2)	-6.00(1)*
GDP	0.36(2)	-4.50(1)	-2.46(7)	-4.66(1)*
BUD	0.13(0)	-2.55(4)	-4.43(0)*	-2.12(6)
EXC	-2.51(7)	-4.79(0)	-3.11(1)	-4.71(0)*
LGEXD	0.65(0)	-4.97(0)	-2.50(0)	-3.97(5)*
LPEXD	-0.25(0)	-4.66(2)	-3.02(1)	-4.52(2)*
DOH	-2.01(0)	-5.12(0)*	-3.85(0)	-4.04(2)
COE	-3.82(0)*	-5.74(0)	-3.37(0)	-4.00(2)

Notes: Figures are the *t*-statistics for testing the null hypothesis that the series are non-stationary. * denote significance at 5 per cent. Figures in parentheses are lag lengths.

4.6 Determinants of External Debts

Majorly, this section is aimed at investigating the long run and short run relationships between external debts and some identified variables as entailed in objective one. This is in addition to investigating the long and short run relationships and causal relationships between external debt and capital formation in order to achieve objective two. Objective three is targeted towards investigating the causal relationship between capital formation and the twin effects of external debt in form of debt overhang and crowding out effects in Nigeria and South Africa.

Like Nigeria, South Africa's data was also estimated and analyzed using same tools and similar variables in order to establish the major determining factors of external debt accumulation in that country which has reached an alarming proportion (Murwirapachena, & Kapingura, 2015). At the same time same approach was employed in examining the effects of external debt on capital formation in that country. A detailed description of the process and the major findings is what will follow in subsequent sections.

4.6.1 Optimum ARDL Models Selection

This section deals with the selection of the optimum ARDL models for the purpose of the analysis. The respective models selected for external debt models for Nigeria are as depicted in Table 4.6. Following Pesaran *et al*. (2001), the optimal ARDL models levels order ARDL (2,1,0,0,0,1) for Model 1, ARDL (1,2,0,0,0,0) for Model 2 and ARDL (2,1,0,0,2,1) for Model 3 were selected for further estimations.

Table 4.6
Optimal ARDL Model Selection: External Debt Model for Nigeria

Variables	Coefficients	Standard Error	*t*-statistics	*p-Value*
Model 1: ARDL (2,1,0,0,0,1)				
LEXD(-1)	0.415	0.142	2.922	0.008*
LEXD(-2)	0.455	0.147	3.090	0.006*
EDS	0.000	0.000	-2.427	0.024*
EDS(-1)	0.000	*0.000*	-5.938	0.000*
LINR	-0.477	0.137	-3.498	0.002*
EXC	0.001	0.001	1.202	0.243
LSAV	-0.023	0.043	-0.526	0.604
LBUD	-0.003	0.037	-0.075	0.941
LBUD(-1)	-0.065	0.037	-1.763	0.092**
C	7.406	2.882	2.570	0.018*
T	-0.045	0.009	-4.731	0.000*
Model 2: ARDL (2,1,0,0,2,1)				
LGEXD(-1)	0.425	0.183	2.327	0.031*
LGEXD(-2)	0.340	0.173	1.959	0.065
EDS	0.000	0.000	-1.401	0.177
EDS(-1)	0.000	0.000	-4.338	0.000*
LINR	-0.428	0.195	-2.201	0.040*
LEXC	0.142	0.106	1.342	0.195
LSAV	0.045	0.056	0.795	0.437
LSAV(-1)	0.033	0.057	0.570	0.575
LSAV(-2)	-0.103	0.062	-1.675	0.110
LBUD	-0.033	0.048	-0.689	0.499
LBUD(-1)	-0.097	0.053	-1.831	0.083**
C	11.399	5.234	2.178	0.042*
T	-0.070	0.023	-2.992	0.007*
Model 3: ARDL (1,2,0,0,0,0)				
LPEXD(-1)	0.429	0.118	3.624	0.001*
EDS	0.000	0.000	-4.158	0.000*
EDS(-1)	0.000	0.000	1.902	0.070**
EDS(-2)	0.000	0.000	-3.352	0.003*
LINR	-1.214	0.380	-3.194	0.004*
LEXC	-0.291	0.076	-3.854	0.001*
LSAV	-0.418	0.113	-3.709	0.001*
LBUD	0.001	0.121	0.006	0.996
C	25.974	6.203	4.188	0.000*

Note: * and ** represents 5 per cent and 10 per cent significance level, respectively.

South Africa's optimum models selection was undertaken as depicted by Table 4.7. The selected models are ARDL (1,1,1,0,0,2), ARDL (1,0,0,0,0,1), and ARDL (1,1,0,1,0,0) for Model 4, Model 5 and Model 6, accordingly.

Table 4.7
Optimal ARDL Model Selection: External Debt Model for South Africa

Variable	Coefficient	Standard Error	t-Statistic	*p*-Value
Model 4: ARDL (1,1,1,0,0,2)				
LEXD(-1)	0.357	0.172	2.072	0.054**
LEDS	0.088	0.046	1.927	0.071**
LEDS(-1)	-0.167	0.056	-2.989	0.008*
LINR	-0.226	0.188	-1.204	0.245
LINR(-1)	-0.788	0.325	-2.429	0.027*
LEXC	1.048	0.472	2.219	0.040*
LSAV	-0.311	0.247	-1.256	0.226
LBUD	-1.043	0.517	-2.017	0.060**
LBUD(-1)	1.543	0.577	2.672	0.016*
LBUD(-2)	0.951	0.555	1.713	0.105
C	-13.141	5.902	-2.226	0.040*
Model 5: ARDL (1,0,0,0,0,1)				
LGEXD(-1)	0.496	0.189	2.622	0.016*
LEDS	-0.124	0.089	-1.385	0.181
LINR	-0.760	0.433	-1.757	0.093**
LEXC	-0.310	0.834	-0.372	0.714
LSAV	-0.014	0.533	-0.027	0.979
BUD	0.000	0.000	-0.710	0.485
BUD(-1)	0.000	0.000	2.058	0.052**
C	16.924	10.905	1.552	0.136
Model 6: ARDL (1,1,0,1,0,0)				
LPEXD(-1)	0.474	0.170	2.791	0.012*
LEDS	0.061	0.049	1.257	0.224
LEDS(-1)	-0.115	0.047	-2.458	0.024*
LINR	0.020	0.169	0.118	0.907
LEXC	-1.178	0.385	-3.064	0.006*
LEXC(-1)	1.136	0.307	3.703	0.002*
LSAV	0.045	0.206	0.218	0.830
LBUD	-0.720	0.368	-1.957	0.065**
C	22.405	8.271	2.709	0.014*
T	0.069	0.021	3.214	0.005*

Note: * and ** represents 5 per cent and 10 per cent level of significance, respectively.

4.6.2 The ARDL Bounds Tests: External debt models

The ARDL bounds test is aimed at establishing the existence of co-integration between and amongst the dependent and independent variables as discussed in Section 3.7.2. Table 4.8 represents the *F*-statistics bounds test for Nigeria in the three external debt models.

Table 4.8
The ARDL Bounds Test Results: External Debt Model for Nigeria

				Critical values	
Variables	F-stat.	Lag	Sig.		
Model 1: External Debt			Level	**I(0)**	**I(1)**
F_{EXD}(EXD|EDS,INR,EXC,BUD,SAV)	5.461*	3	1%	4.537	6.370
F_{EDS}(EDS|EXD,INR,EXC,BUD,SAV)	4.350	3	5%	3.125	4.608
F_{INR}(INR|EXD,EDS,EXC,BUD,SAV)	1.394	3	10%	2.578	3.858
F_{EXC}(EXC|EXD,EDS,INR,BUD,SAV)	1.488	3			
F_{BUD}(BUD|EXD,EDS,INR,EXCSAV)	5.088*	3			
F_{SAV}(SAV|EXD,EDS,INR,EXC,BUD)	0.678	3			
Model 2: Public External Debt				**I(0)**	**I(1)**
F_{EXD}(GEXD|EDS,INR,EXC,BUD,SAV)	4.988*	3	1%	4.537	6.370
F_{EDS}(EDS|GEXD,INR,EXC,BUD,SAV)	4.479	3	5%	3.125	4.608
F_{INR}(INR|GEXD,EDS,EXC,BUD,SAV)	1.787	3	10%	2.578	3.858
F_{EXC}(EXC|GEXD,EDS,INR,BUD,SAV)	1.443	3			
F_{BUD}(BUD|GEXD,EDS,INR,EXC,SAV)	4.586	3			
F_{SAV}(SAV|GEXD,EDS,INR,EXC,BUD)	2.234	3			
Model 3: Private External Debt				**I(0)**	**I(1)**
F_{EXD}(PEXD|EDS,INR,EXC,BUD,SAV)	22.626*	3	1%	4.537	6.370
F_{EDS}(EDS|PEXD,INR,EXC,BUD,SAV)	3.405	3	5%	3.125	4.608
F_{INR}(INR|PEXD,EDS,EXC,BUD,SAV)	2.077	3	10%	2.578	3.858
F_{EXC}(EXC|PEXD,EDS,INR,BUD,SAV)	0.308	3			
F_{BUD}(BUD|PEXD,EDS,INR,EXC,SAV)	0.565	3			
F_{SAV}(SAV|PEXD,EDS,INR,EXC,BUD)	0.249	3			

Note: These "*" conclusions are based on Narayan (2005) table case III.
*Signifies that at 5% significance level of the critical bounds values, the *F*-statistics is greater than the upper bound values which confirms the presence of a strong coitegrating relationship.

All the dependent variables of *EXD*, GEXD and PEXD have proved to have a co-integrating relationship with independent variables in all models. Since the calculated *F*-statistics of 5.46, 4.99 and 22.63 are respectively higher than the Narayan (2005) upper critical values at 5 per cent significance level. Therefore, conclusively there is a long run relationship between external debt (in all its forms) and its determinants. The South Africa's external debts determinants were also established to have had cointegrating relationships with all the three forms of external debts in the three models as shown in Table 4.9.

Table 4.9
The ARDL Bounds Test Results: External Debt Model for South Africa

Models	F-sta.	Lag	Level of sig.	Bounds test critical values Unrestricted intercept and no trend	
Model 4:Total external debt, *EXD* as DV				**I(0)**	**I(1)**
F_{EXD}(EXD/EDS,BUD,INR,SAV,EXC)	6.060*	3	1%	4.537	6.370
F_{EDS}(EDS/EXD,BUD,INR,SAV,EXC)	1.372	2	5%	3.125	4.608
F_{BUD}(BUD/EXD,EDS,INR,SAV,EXC)	1.261	2	10%	2.578	3.858
F_{INR}(INR/EXD,EDS,BUD,SAV,EXC)	2.356	2			
F_{SAV}(SAV/EXD,EDS,BUD,INR,EXC)	1.647	2			
F_{EXC}(EXC/EXD,EDS,BUD,INR,SAV)	1.634	2			
Model 5: Public external debt, GEXD as DV				**I(0)**	**I(1)**
F_{EXD}(GEXD/EDS,BUD,INR,SAV,EXC)	4.788*	2	1%	4.537	6.370
F_{EDS}(EDS/GEXD,BUD,INR,SAV,EXC)	0.586	2	5%	3.125	4.608
F_{BUD}(BUD/GEXD,EDS,INR,SAV,EXC)	3.246	2	10%	2.578	3.858
F_{INR}(INR/GEXD,EDS,BUD,SAV,EXC)	5.173*	2			
F_{SAV}(SAV/GEXD,EDS,BUD,INR,EXC)	5.650*	2			
F_{EXC}(EXC/GEXD,EDS,BUD,INR,SAV)	3.002	2			
Model 6: Private external debt PEXD as DV				**I(0)**	**I(1)**
F_{EXD}(PEXD/EDS,BUD,INR,SAV,EXC)	39.214*	2	1%	4.537	6.370
F_{EDS}(EDS/PEXD,BUD,INR,SAV,EXC)	0.718	3	5%	3.125	4.608
F_{BUD}(BUD/PEXD,EDS,INR,SAV,EXC)	2.067	3	10%	2.578	3.858
F_{INR}(INR/PEXD,EDS,BUD,SAV,EXC)	4.738	3			
F_{SAV}(SAV/PEXD,EDS,BUD,INR,EXC)	8.005	3			
F_{EXC}(EXC/PEXD,EDS,BUD,INR,SAV)	1.377	3			

Note: these "*" conclusions are based on Narayan (2005) table case III. *Signifies that at 5% significance level of the critical bounds values, the F-statistics is greater than the upper bound values which confirms the presence of a strong coitegrating relationship.

The general determinants of external debts in both Nigeria and South Africa are external debt services *(EDS*), exchange rate, (*EXC*), interest rate (*INR*), savings (*SAV),* and budget deficits *(BUD).*

4.6.3 Estimation of the Long Run Relationships

Table 4.10 depicts the long run estimation results of the three equations of the external debt model for Nigeria. Only *EDS* and *INR* reported negative and statistically significant outputs in Model 1 with EDS indicating a very minute negative contribution.

Table 4.10
Long Run Elasticity Estimates: External Debt Results for Nigeria

Variables	Coefficient	Standard Error	*t*-stat	*p*-value
Model 1: ARDL (2,1,0,0,0,1), *EXD*				
EDS	-0.1632E-8	0.7761E-9	-2.103	0.048*
LINR	-3.688	1.930	-1.911	0.070**
EXC	0.010	0.008	1.181	0.251
LSAV	-0.174	0.295	-0.592	0.560
LBUD	-0.526	0.459	-1.147	0.264
C	57.201	16.182	3.535	0.002*
T	-0.346	0.162	-2.140	0.044*
Model 2: ARDL (2,1,0,0,2,1), GEXD				
EDS	-7.800	4.270	-1.828	0.083**
LINR	-1.820	0.978	-1.862	0.078**
LEXC	0.605	0.344	1.761	0.094**
LSAV	-0.112	0.393	-0.285	0.779
LBUD	-0.552	0.314	-1.756	0.095**
C	48.443	13.186	3.674	0.002*
T	-0.299	0.107	-2.792	0.012*
Model 3: ARDL (1,2,0,0,0,0), PEXD				
EDS	-5.850	1.530	-3.822	0.001*
LINR	-2.127	0.850	-2.503	0.020*
LEXC	-0.511	0.151	-3.391	0.003*
LSAV	-0.733	0.202	-3.630	0.001*
LBUD	0.001	0.213	0.006	0.996
C	45.520	8.411	5.412	0.000*

Note: * and ** represent 5 per cent and 10 per cent significance levels, respectively.

In the public external debt model; Model 2, the *P*-values of *EDS*, *INR*, and *BUD* show significant results with negative coefficients. *EXC* on the other hand reported a positive output with statistically significant result. Model 3, EDS, *INR*, *EXC* and *SAV* were all negatively signed and statistically significant in their relationship with *EXD*. From the results it can be concluded that only EDS and INR had significant contribution in explaining external debt in the long run in Model 1; while in the public external debt (Model 2), *EDS*, *INR* and *BUD*, have negatively contributed in explaining *EXD* in the long run. Also *EXC* contributed positively in explaining *EXD* in the long run.

Table 4.11 represents South Africa's estimated long run relationships on external debt Model 4 to Model 6. The results have shown that *INR, EXC* and *BUD* reported statistically significant *p*-values in Model 1. *INR* and *BUD* reported statistically significant results in Model 5; while only *BUD* had negative coefficient with significant *p*-value at 10 per cent in Model 6. It follows therefore that *INR*, *EXC* and *BUD* significantly explained *EXD* in South Africa, in the long run, while *INR* and *BUD* explained *GEXD*, and *BUD* significantly explained *PEXD* all in the long run.

Table 4.11
Long Run Elasticity Estimates: External Debt Results for South Africa

Variables	Coefficient	Standard Error	*t*-statistics	*p*-values
Model 1: ARDL (1,1,1,0,0,2)				
LEDS	-0.122	0.082	-1.493	0.154
LINR	-1.577	0.378	-4.176	0.001*
LEXC	1.629	0.632	2.576	0.020*
LSAV	-0.483	0.361	-1.339	0.198
LBUD	2.258	0.433	5.221	0.000*
C	-20.438	6.980	-2.928	0.009*
Model 2: ARDL (1,0,0,0,0,1)				
LEDS	-0.246	0.169	-1.451	0.161
LINR	-1.507	0.819	-1.840	0.080**
LEXC	-0.614	1.624	-0.378	0.709
LSAV	-0.028	1.058	-0.027	0.979
BUD	0.000	0.000	2.010	0.057**
C	33.549	21.927	1.530	0.141
Model 3: ARDL (1,1,0,1,0,0)				
LEDS	-0.102	0.086	-1.180	0.253
LINR	0.038	0.322	0.118	0.907
LEXC	-0.081	0.622	-0.130	0.898
LSAV	0.085	0.403	0.212	0.834
LBUD	-1.370	0.789	-1.736	0.099**
C	42.607	13.725	3.104	0.006*
T	0.131	0.024	5.572	0.000*

Note: * and ** represents 5 per cent and 10 per cent level of significance respectively.

4.6.4 Estimating the Short Run Relationships

With the successful estimations of the long run relationships of the three external debt models, the study further estimates the dynamic (short run) relationships for these

models. The results are presented in Table 4.12. It is clear from the results that total external debt (*EXD*) is negatively determined by external debt service *(EDS)* and interest rate *(INR)* for Model 1. The result indicates that a one per cent increase in *INR* leads to a 0.48 per cent increase in total external debt at a 5 per cent level of significance, while a one per cent change in external debt service leads to a -0.122 per cent increase in external debt. On the other hand budget deficit was found to be negatively signed with a strong statistical significance.

In Model 2 *(GEXD)*, a one per cent increase in *INR* results into a negative change in external debt at 5 per cent level of significance. Other variables like *SAV* and *BUD* have negative signs but were not statistically significant. On the other hand however Model 3 *(PEXD)*; *EDS*, *INR*, *EXC*, and *SAV* carried negative coefficient values with 5 per cent significance levels. From the results in the same table, a one per cent increase in *EDS*, *INR*, *EXC* and *SAV* lead to significant negative changes in *PEXD* accordingly. Results from the error correction estimates in table depict that all the coefficients of the three lagged *ECTs* are correctly signed and statistically significant at 5 per cent in the short run.

The adjustment mechanism in Model 1 *(EXD)* and Model 2 *(GEXD)* turn out to be very slow with 13 and 24 per cent speed of adjustment within the current period. The Model 3 *(PEXD)*, $ECTt_{-1}$ however reported a higher adjustment rate of 53 per cent and properly signed. It means therefore that, 53 of the disequilibrium in the model will be corrected within a period of one year. It is thus confirmed that the Error correction term (ECT_{t-1}) or adjustment mechanism is very slow in *EXD* and *GEXD* while it is moderate in the *PEXD* external debt models in Nigeria.

Table 4.12
Short run Elasticity Estimates: External Debts for Nigeria

Variables	Coefficient	Standard Error	t-statistics	*p*-values
Model 1: ARDL (2,1,0,0,0,1)				
$dLEXD_{t-1}$	-0.455	0.147	-3.090	0.005*
dEDS	-0.000	0.000	-2.427	0.023*
dLINR	-0.477	0.137	-3.498	0.002*
dEXC	0.001	0.001	1.202	0.242
dLSAV	-0.023	0.043	-0.526	0.604
dLBUD	-0.003	0.037	-0.075	0.941
dC	7.406	2.882	2.570	0.017*
dT	-0.045	0.009	-4.731	0.000*
ECT_{t-1}	-0.129	0.055	-2.373	0.026*
Model 2: ARDL (2,1,0,0,2,1)				
$dLGEXD_{t-1}$	-0.340	0.173	-1.959	0.063**
dEDS	-0.000	0.000	-1.401	0.175
dLINR	-0.428	0.195	-2.201	0.039*
dLEXC	0.142	0.106	1.342	0.193
dLSAV	0.045	0.056	0.795	0.435
$dLSAV_{t-1}$	0.103	0.062	1.675	0.108
dLBUD	-0.033	0.048	-0.689	0.498
dC	11.399	5.234	2.178	0.040*
dT	-0.070	0.023	-2.992	0.007*
ECT_{t-1}	-0.235	0.102	-2.299	0.031*
Model 3: ARDL (1,2,0,0,0,0)				
dEDS	-2.6E-10	0.000	-4.158	0.000*
$dEDS_{t-1}$	2.E-10	0.000	3.352	0.003*
dLINR	-1.214	0.380	-3.194	0.004*
dLEXC	-0.291	0.076	-3.854	0.001*
dLSAV	-0.418	0.113	-3.709	0.001*
dLBUD	0.001	0.121	0.006	0.996
dC	25.974	6.203	4.188	0.000*
ECT_{t-1}	-0.571	0.118	-4.816	0.000*

Note: *, **, represent 5 and 10 per cent significance levels respectively.

Table 4.13 shows the short run elasticities estimates for the three South African external debt models. From the result sit is confirmed that *EDS*, *EXC* and *BUD* were statistically significant for Model 4 with the *EDS* and *BUD* reporting 10 per cent significance in their *p-values* and 5 per cent for *EXC* in the same model. In Model 5 (*GEXD*) only *INR* had a negative coefficient with a weak statistical significance of 10 per cent. Model 6 *(PEXD), EXC has* a negative sign and statistically significant at 5

per cent while *BUD* reported negative coefficient with 10 per cent level of significance.

Table 4.13
Short run elasticity estimates: External Debts for South Africa

Variable	Coefficient	Standard Error	*t*-statistics	*p*-values
Model 4: ARDL (1,1,1,0,0,2)				
dLEDS	0.088	0.046	1.927	0.068**
dLINR	-0.226	0.188	-1.204	0.243
dLEXC	1.048	0.472	2.219	0.038*
dLSAV	-0.311	0.247	-1.256	0.224
dLBUD	-1.043	0.517	-2.017	0.057**
dLBUD1	-0.951	0.555	-1.713	0.102
dC	-13.141	5.902	-2.226	0.038*
ECT_{t-1}	-0.643	0.172	-3.732	0.001*
Model 5: ARDL (1,0,0,0,0,1)				
dLEDS	-0.124	0.089	-1.385	0.180
dLINR	-0.760	0.433	-1.757	0.093**
dLEXC	-0.310	0.834	-0.372	0.714
dLSAV	-0.014	0.533	-0.027	0.979
dBUD	0.000	0.000	-0.710	0.485
dC	16.924	10.905	1.552	0.135
ECT_{t-1}	-0.504	0.189	-2.669	0.014*
Model 6: ARDL (1,1,0,1,0,0)				
dLEDS	0.061	0.049	1.257	0.222
dLINR	0.020	0.169	0.119	0.907
dLEXC	-1.178	0.385	-3.063	0.006*
dLSAV	0.045	0.207	0.218	0.830
dLBUD	-0.720	0.368	-1.957	0.064**
dC	22.405	8.271	2.709	0.013*
dT	0.069	0.022	3.214	0.004*
ECT_{t-1}	-0.526	0.170	-3.095	0.005*

Note: * and ** signifies 5 per cent and 10 per cent level of significance respectively.

It is important however, to further observe that while *EDS* had a weak statistical relation *EXC* and *SAV* were of very insignificant statistical relations. In the three models, few variables of interest were found to have depicted statistically significant relationships. The results in the external debt model however more importantly reported negative lagged values of the coefficients of the *ECT* with very strong statistical significance. It also recorded strong adjustment mechanism rates of 64, 50 and 52 per cent accordingly for Model 4, Model 5 and Model 6; implying that in all

cases over half of the distortions in previous period would be corrected or adjusted within the current period.

Previous studies like Were (2001) established that, interest rate and budget deficit were among the major determinants of external debt for both short run and long run considerations. This finding coincided with the findings of many other studies, while budget deficit appeared contrary. Murwirapachena, and Kapingura (2015) also established a strong relationship between budget deficit and increases in external debt stock for South Africa. Awan *et al*. (2011), Ngassan (1991), Ferraro and Rosser (1994), Stambuli (1998), Tiruneh (2004), Pankaj, Varun, and Vishakha (2011) were of the same results.

4.6.5 The Granger Causality Test

Table 4.14 shows the Wald test results for Granger causality for the external debt models of Nigeria. The results inferred that *EDS* and *INR* series Granger causes each other with *EXD* with a very strong statistical significance in Model 1. In Model 2, no causal relation between *EDS* to *GEXD*, *GEXD* to *INR*, *GEXD* to *EXC*, *GEXD*, *SAV* and *BUD* to *GEXD* but there were causal relations between *GEXD* to *EDS*, *INR* to *GEXD*, *GEXD* to *EXC* and *GEXD* to *BUD*. *GEXD* and *SAV* reported zero causal relation.

In Model 3 the result was no different from the previously discussed results of Model 2. Only *PEXD* and *BUD* had zero causality amongst themselves. Tables 4.15 report is for South Africa. From the table, the three external debt models results of the Granger causality test for the South African economy are presented. It shows that there is a

two way causal relationship between *BUD*, *EDS* and *EXD* with a very strong statistical significance in Model 4. The remaining exogenous variables of *EXC*, *INR* and *SAV* reported unidirectional causality. In other words, it can be concluded that *EDS*, *INR*, *SAV* and *BUD*, reported causal relationship with external debt.

Table 4.14
Granger Causality Results: External Debts Model for Nigeria

Null Hypothesis	*F*-statistics	*p*-values	Conclusion
Model 1: Total External debt			
EDS does not Granger cause *EXD*	5.889	0.015*	Bidirectional
EXD does not Granger cause EDS	15.651	0.000*	causality
INR does not Granger cause EXD	12.233	0.000*	Bidirectional
EXD does not Granger cause INR	10.554	0.001*	causality
EXC does not Granger cause EXD	1.445	0.229	Zero
EXD does not Granger cause EXC	0.298	0.585	causality
SAV does not Granger cause EXD	0.277	0.599	Unidirectional
EXD does not Granger cause SAV	3.241	0.072**	causality
BUD does not Granger cause EXD	0.006	0.9401	Zero
EXD does not Granger cause BUD	1.137	0.286	causality
Model 2: Government External Debt			
EDS does not Granger cause GEXD	2.195	0.138	Unidirectional
GEXD does not Granger cause EDS	12.934	0.000*	causality
INR does not Granger cause GEXD	2.232	0.072**	Unidirectional
GEXD does not Granger cause INR	1.724	0.189	causality
EXC does not Granger cause GEXD	2.947	0.086**	Unidirectional
GEXD does not Granger cause EXC	0.282	0.596	causality
SAV does not Granger cause GEXD	0.904	0.342	Zero
GEXD does not Granger cause SAV	0.008	0.927	causality
BUD does not Granger cause GEXD	0.359	0.549	Unidirectional
GEXD does not Granger cause BUD	4.152	0.042*	causality
Model 3: Private External Debt			
EDS does not Granger cause PEXD	0.329	0.566	Unidirectional
PEXD does not Granger cause EDS	17.327	0.000*	causality
INR does not Granger cause PEXD	12.202	0.000*	Unidirectional
PEXD does not Granger cause INR	1.902	0.168	causality
EXC does not Granger cause PEXD	14.850	0.000*	Unidirectional
PEXD does not Granger cause EXC	0.488	0.485	causality
SAV does not Granger cause PEXD	13.759	0.000*	Unidirectional
PEXD does not Granger cause SAV	0.402	0.526	causality
BUD does not Granger cause PEXD	0.303	0.996	Zero
PEXD does not Granger cause BUD	1.040	0.308	causality

Note: * and ** represents 5 per cent and 10 per cent level of significance, respectively, while ≠> denotes, "does not Granger cause".

In Model 5 however public external debt reported a unidirectional causality with only external debt service and interest rate. The remaining variables reported zero causal

relationship. With public external debt as the dependent variable, however, only *EDS* and *INR* reported causality on public external debt with a one way causality result while remaining variables reported zero causal relationship. Finally for the private external debt equation in Model 6 causality runs From *EXC* and *BUD* to *EXD* and vice versa.

Table 4.15
Granger Causality Results: External Debts Model for South Africa

Null hypothesis	*F*-Statistics	*p*-Values	Conclusion
Model 4: Total External Debt			
EXD does not Granger cause EDS	3.713	0.054**	Bidirectional
EDS does not Granger cause *EXD*	6.362	0.012*	causality
EXD does not Granger cause INR	1.449	0.229	Unidirectional
INR does not Granger cause *EXD*	12.500	0.000*	causality
EXD does not Granger cause EXC	4.925	0.026*	Unidirectional
EXC does not Granger cause *EXD*	0.008	0.927	causality
EXD does not Granger cause SAV	1.578	0.209	Unidirectional
SAV does not Granger cause *EXD*	19.428	0.000*	causality
EXD does not Granger cause BUD	4.069	0.044*	Bidirectional
BUD does not Granger cause *EXD*	8.682	0.003*	causality
Model 5: Public External Debt			
GEXD does not Granger cause EDS	1.918	0.166	Unidirectional
EDS does not Granger cause GEXD	3.149	0.076*	causality
GEXD does not Granger cause INR	3.088	0.079	Unidirectional
INR does not Granger cause GEXD	7.425	0.006*	causality
GEXD does not Granger cause EXC	0.138	0.710	Zero causal
EXC does not Granger cause GEXD	0.039	0.844	relation
GEXD does not Granger cause SAV	0.722	0.979	Zero causal
SAV does not Granger cause GEXD	0.200	0.989	relation
GEXD does not Granger cause BUD	0.504	0.478	Zero causal
BUD does not Granger cause GEXD	0.892	0.345	relation
Model 6: Private External Debt			
PEXD does not Granger cause EDS	1.581	0.209	Zero causal
EDS does not Granger cause PEXD	0.833	0.361	relation
PEXD does not Granger cause INR	0.014	0.906	Zero causal
INR does not Granger cause PEXD	0.109	0.742	relation
PEXD does not Granger cause EXC	9.386	0.002*	Bidirectional
EXC does not Granger cause PEXD	5.807	0.016*	causality
PEXD does not Granger cause SAV	0.047	0.828	Zero causal
SAV does not Granger cause PEXD	0.019	0.890	relation
PEXD does not Granger cause BUD	3.830	0.050**	Bidirectional
BUD does not Granger cause PEXD	8.171	0.004*	causality

Note: *, **, depicts rejection of the Null hypothesis at 5 and 10 per cent level of significance, accordingly while $\neq>$ denotes "does not Granger cause".

Unlike in Model 5, Model 6 reported exchange rate and budget deficit having bidirectional causality with public external debt. Policies on public external debt will directly affect budget deficit and exchange rate and vice visa, just as government policies on total external debt sock will have a causal relation on external debt service and budget deficit, while the policies on the two will also cause the existence of external debt stock accumulation.

4.7 Examining the Effects of External Debt on Capital Formation

This section explores the existing relationship between external debt and capital formation in the two countries as in the previous section. The analysis is based on the division of the external debt models into three represented as Model 7, Model 8 and Model 9 with total external debt, public external debt and private external debts as variables of interest, respectively for Nigeria, while Model 10, Model 11 and Model 12, represents the capital formation analysis modeling for South Africa.

4.7.1 Optimum ARDL Model Selection, Capital formation: Nigeria

This section discusses the result of the optimum ARDL models that give the best results and also gives the outcome of the diagnostics test. The respective optimum ARDL models are given in Tables 4.16 for the three capital formation models for Nigeria. The ARDL models chosen were, (1,0,0,0,0,1,0,1), (1,0,0,0,1,1,0,1) and (1,0,1,0,0,1,1) as represented by the variables of interest, namely, *EXD*, *GEXD* and *PEXD*.

Table 4.16

Optimal ARDL Model selection: Capital Formation Models for Nigeria

Variable	Coefficient	Standard Error	t-Statistics	*p*-Values
Model 7: ARDL(1,0,0,0,0,1,0,1)				
LCAP(-1)	0.285	0.158	1.804	0.086**
LEXD	-0.157	0.077	-2.041	0.055**
LEDS	-0.138	0.064	-2.143	0.045*
LGDP	-0.226	0.154	-1.470	0.157
INR	-0.031	0.024	-1.324	0.200
EXC	0.008	0.004	2.161	0.043*
EXC(-1)	-0.008	0.004	-2.006	0.059**
LBUD	0.005	0.043	0.127	0.900
LSAV	0.197	0.101	1.956	0.065**
LSAV(-1)	0.145	0.055	2.613	0.017*
C	6.722	3.982	1.688	0.107
T	-0.036	0.017	-2.075	0.051**
Model 8: ARDL (1,0,0,0,1,1,0,1)				
LCAP(-1)	0.407	0.121	3.376	0.003*
LGEXD	-0.148	0.075	-1.980	0.062**
LEDS	-0.064	0.062	-1.039	0.311
LGDP	-0.372	0.144	-2.587	0.018*
INR	-0.049	0.030	-1.620	0.121
INR(-1)	0.041	0.022	1.856	0.078**
EXC	0.007	0.004	1.877	0.075**
EXC(-1)	-0.009	0.004	-2.170	0.042*
LBUD	0.003	0.044	0.077	0.940
LSAV	0.229	0.103	2.213	0.039*
LSAV(-1)	0.120	0.057	2.097	0.049*
C	7.408	4.081	1.815	0.085**
Model 9: ARDL (1,0,1,0,0,1,1)				
LCAP(-1)	0.544	0.123	4.406	0.000*
LPEXD	0.017	0.050	0.328	0.746
LEDS	-0.152	0.070	-2.166	0.042*
LEDS(-1)	0.163	0.073	2.241	0.036*
LGDP	-0.249	0.126	-1.974	0.062**
LINR	-0.059	0.163	-0.359	0.723
EXC	0.007	0.004	1.814	0.084**
EXC(-1)	-0.009	0.004	-2.047	0.053**
LSAV	0.207	0.101	2.039	0.054**
LSAV(-1)	0.146	0.064	2.257	0.035*
C	-1.335	3.215	-0.415	0.682

Note: * and ** represents 5 per cent and 10 per cent level of significance, respectively.

For the three models of the South African series (Model 10, Model 11, and Model 12) in respect of the relationship between external debt and capital formation the ARDL

models selected are (2,0,0,2,1,1), (2,2,2,2,1,0) and (1,0,1,1,1,0) represented by *EXD*, *GEXD*, and *PEXD*, respectively. The selected results are as presented in Table 4.17.

Table 4.17
Optimal ARDL Model selection: Capital Formation for South Africa

Variable	Coefficient	Standard Error	t-statistics	*p*-value
Model 10: ARDL (2,0,0,2,1,1)				
LCAP(-2)	0.287	0.135	2.135	0.049*
LEXD	-0.209	0.053	-3.936	0.001*
LEDS	-0.037	0.019	-1.921	0.073**
LINR(-1)	-0.323	0.108	-2.996	0.009*
LINR(-2)	-0.130	0.090	-1.447	0.167
LEXC	-0.413	0.139	-2.970	0.009*
LEXC(-1)	0.500	0.136	3.674	0.002*
LSAV	0.459	0.085	5.428	0.000*
LSAV(-1)	-0.187	0.090	-2.079	0.054**
C	2.051	1.438	1.426	0.173
Model 11: ARDL (2,2,2,2,1,0)				
LCAP(-2)	0.242	0.103	2.353	0.035*
LGEXD	-0.102	0.024	-4.288	0.001*
LGEXD(-2)	-0.068	0.024	-2.858	0.013*
LEDS	-0.073	0.016	-4.636	0.000*
LEDS(-2)	0.042	0.013	3.302	0.006*
LINR	-0.046	0.062	-0.743	0.471
LINR(-1)	-0.240	0.083	-2.889	0.013*
LINR(-2)	-0.171	0.070	-2.433	0.030*
LEXC	-0.547	0.123	-4.459	0.001*
LEXC(-1)	0.213	0.070	3.034	0.010*
LSAV	0.413	0.063	6.559	0.000*
C	0.540	1.133	0.477	0.642
Model 12: ARDL (1,0,1,1,1,0)				
LCAP(-1)	0.407	0.152	2.675	0.015*
PEXD	-0.2017E-5	0 .1131E-5	-1.783	0.091**
INR	0.002	0.005	0.483	0.635
INR(-1)	-0.020	0.005	-4.282	0.000*
EXC	-0.005	0.002	-2.847	0.011*
EXC(-1)	0.006	0.002	3.277	0.004*
LSAV	0.315	0.100	3.148	0.006*
LEDS	-0.015	0.017	-0.879	0.391
C	-0.071	1.622	-0.044	0.965

Note: * and ** signifies 5 per cent and 10 per cent level of significance respectively.

4.7.2 The ARDL Bounds Tests of Capital Formation

Table 4.18 depicts the ARDL bounds test results for the three Models for Nigeria. In Model 7, the calculated *F*-statistics was 7.183 as against the Narayan (2005) critical value of 6.151 at one per cent level of significance. Capital formation therefore has long run relationship with *EXD, GEXD, PEXD, EDS, GDP, INR, EXC, BUD* and *SAV*.

Table 4.18
The ARDL Bounds Test Result: Capital Formation for Nigeria

	F-statistics	Lag	Level of sig.	Bounds test critical values	
Model 7: Capital Formation *EXD*				**I(0)**	**I(1)**
F_{CAP}(CAP/EXD,EDS,GDP,INR,EXC,BUD,SAV)	7.183*	2	1%	4.104	6.151
F_{EXD}(EXD/CAP,EDS,GDP,INR,EXC,BUD,SAV)	1.512	2	5%	2.875	4.445
F_{EDS}(EDS/CAP,EXD,GDP,INR,EXC,BUD,SAV)	0.929	2	10%	2.384	3.728
F_{GDP}(GDP/CAP,EXD,EDS,INR,EXC,BUD,SAV)	27.638*	2			
F_{INR}(INR/CAP,EXD,EDS,GDP,EXC,BUD,SAV)	3.744	2			
F_{EXC}(EXC/CAP,EXD,EDS,GDP,EXC,BUD,SAV)	1.669	2			
F_{BUD}(BUD/CAP,EXD,EDS,GDP,EXC,BUD,SAV)	3.195	2			
F_{SAV}(SAV/CAP,EXD,EDS,GDP,EXC,BUD,SAV)	0.784	2			
Model 8: Capital Formation GEXD					
F_{CAP}(CAP/GEXD,EDS,GDP,INR,EXC,BUD,SAV)	10.212*	2	1%	4.104	6.151
F_{EXD}(GEXD/CAP,EDS,GDP,INR,EXC,BUD,SAV)	1.192	2	5%	2.875	4.445
F_{EDS}(EDS/CAP,GEXD,GDP,INR,EXC,BUD,SAV)	1.286	2	10%	2.384	3.728
F_{GDP}(GDP/CAP,GEXD,EDS,INR,EXC,BUD,SAV)	33.359*	2			
F_{INR}(INR/CAP,EDS,GEXD,GDP,EXC,BUD,SAV)	3.315	2			
F_{EXC}(EXC/CAP,GEXD,EDS,GDP,EXC,BUD,SAV)	1.764	2			
F_{BUD}(BUD/CAP,GEXD,EDS,GDP,EXC,BUD,SAV)	2.474	2			
F_{SAV}(SAV/CAP,GEXD,EDS,GDP,EXC,BUD,SAV)	0.807	2			
Model 9: Capital Formation PEXD					
F_{CAP}(CAP/PEXD,EDS,GDP,INR,EXC,BUD,SAV)	7.344*	2	1%	4.104	6.151
F_{EXD}(PEXD/CAP,EDS,GDP,INR,EXC,BUD,SAV)	1.507	2	5%	2.875	4.445
F_{EDS}(EDS/CAP,PEXD,GDP,INR,EXC,BUD,SAV)	1.009	2	10%	2.384	3.728
F_{GDP}(GDP/CAP,PEXD,EDS,INR,EXC,BUD,SAV)	11.807*	2			
F_{INR}(INR/CAP,PEXD,EDS,GDP,EXC,BUD,SAV)	4.040	2			
F_{EXC}(EXC/CAP,PEXD,EDS,GDP,EXC,BUD,SAV)	1.524	2			
F_{BUD}(BUD/CAP,PEXD,EDS,GDP,EXC,BUD,SAV)	1.561	2			
F_{SAV}(SAV/CAP,PEXD,EDS,GDP,EXC,BUD,SAV)	1.660	2			

Note: the results are based on Narayan (2005) table case III where "*" Signifies that at 5% significance level the critical bounds values, the calculated *F*-statistics is greater than the upper bound values which confirms the presence of a strong cointegrating relationship.

Likewise for Models 8 and Model 9, the results confirmed long run relationships among the variables with calculated *F*-statistics values of 10.212 and 7.344 as against Narayan's upper bounds values of 6.151 at one per cent level of significance accordingly. The results have, therefore, confirmed that these variables move together in the long run, hence can be said to be co-integrated.

The bounds test results for South Africa's capital formation models is presented in Table 4.19. The three models fall under the capital formation models divided into three, disaggregated into *EXD*, *GEXD* and *PEXD* with *CAP* as the dependent variable. From table the calculated *F*-statistics for the three sub models, model 10, Model 11 and Model 12 have all fallen above Narayan's (2005) upper critical bounds values, and have therefore, fulfilled the cointegration requirement conditions of the ARDL bound test of a long run relationship.

Table 4.19
The ARDL Bounds Test Result: Capital Formation for South Africa

	F-statistics	Lag	Level of sig.	Bounds test critical values Unrestricted intercept and no trend	
Model 10: Capital Formation *EXD*				I(0)	I(1)
F_{CAP}(CAP/EXD,EDS,INR,EXC,SAV)	4.903*	3	1%	4.537	6.370
F_{EXD}(EXD/CAP,EDS,INR,EXC,SAV)	2.469	3	5%	3.125	4.608
F_{EDS}(EDS/CAP,EXD,INR,EXC,SAV)	3.593	3	10%	2.578	3.858
F_{INR}(INR/CAP,EXD,EDS,EXC,SAV)	2.418	3			
F_{EXC}(EXC/CAP,EXD,EDS,INR,SAV)	1.513	3			
F_{SAV}(SAV/CAP,EXD,EDS,INR,EXC)	10.270*	3			
Model 11: Capital Formation *GEXD*				I(0)	I(1)
F_{CAP}(CAP/GEXD,EDS,INR,EXC,SAV)	8.000*	3	1%	4.537	6.370
$_{FGEXD}$(GEXD/CAP,EDS,INR,EXC,SAV)	2.645	3	5%	3.125	4.608
F_{EDS}(EDS/CAP,GEXD,INR,EXC,SAV)	1.085	3	10%	2.578	3.858
F_{INR}(INR/CAP,GEXD,EDS,EXC,SAV)	4.798*	2			
F_{EXC}(EXC/CAP,GEXD,EDS,INR,SAV)	1.548	3			
F_{SAV}(SAV/CAP,GEXD,EDS,INR,EXC)	1.844	3			
Model 12: Capital Formation *PEXD*				I(0)	I(1)
F_{CAP}(CAP/PEXD,EDS,INR,EXC,SAV)	5.938*	3	1%	4.537	6.370
F_{PEXD}(PEXD/CAP,EDS,INR,EXC,SAV)	13.353*	3	5%	3.125	4.608
F_{EDS}(EDS/CAP,PEXD,INR,EXC,SAV)	0.950	3	10%	2.578	3.858
F_{INR}(INR/CAP,PEXD,EDS,EXC,SAV)	5.556	3			
F_{EXC}(EXC/CAP,PEXD,EDS,INR,SAV)	0.758	3			
F_{SAV}(SAV/CAP,PEXD,EDS,INR,EXC)	1.399	3			

Note: Based on Narayan (2005) table case III. *Signifies that at 5% significance level of the critical bounds values, the F-statistics is greater than the upper bound values which confirms the presence of a strong coitegrating relationship.

For example in Model 10, the calculated *F*-statistics was 4.903 as against the Narayan (2005) critical values that are much lower. Likewise when government external debt and private external debts were made the variables of interest in Model 11 and Model 12 their respective results confirmed a long run relationship amongst the variables with calculated *F*-statistics values of 8.000 and 5.938, respectively, thus fulfilling the cointegration conditionality of the ARDL bounds test approach. Capital formation therefore has long run relationship with *EXD*, *GEXD*, *PEXD*, *EDS*, *GDP*, *INR*, *EXC* and *SAV* in South Africa as represented by the models.

4.7.3 Estimation of Long Run Relationships of Capital Formation

The long run relationship between capital formation in Nigeria with *EXD*, *GEXD*, and *PEXD* as variables of interest in the three models, is presented in Table 4.20. The total external debt and public external debts series were found to be negatively related to capital formation with a statistical significance of 10 per cent in the long run. Results indicate *EDS* and *SAV* also reported statistically significant relationship in the long run with expected signs, at five per cent while others like *GDP*, *INR*, *EXC* and *BUD* had insignificant relationships even with appropriate signs of the coefficient for Model 7. In Model 8 *GEXD*, *GDP*, and *SAV* were found to have had statistically significant relationships with only *SAV* having a positive coefficient since coefficients of these variables are statistically significant at five per cent.

In Model 9, only *GDP* and *SAV* were found to be statistically significant with savings having a positive coefficient. *PEXD* reported a non significant positive relationship. Conclusively, therefore, *EXD* and *GEXD* were found to have negative coefficient in the *CAP* in the long run as against *PEXD* which reported a positive relationship on

CAP in the long run. It has been noted that in all the three models, *SAV* has consistently shown a positive relation with capital formation at 5 percent level of significance.

With the successful estimations of the three capital formation models in the long run, the study will further estimate the dynamic (short run) relationships for these models. The insignificant result of *PEXD* in the long run may not be unrelated with the smaller contribution of the variable in forming the total debt stock especially in the late 2000s. Most of the foreign loans were in form of assistance meant for infrastructural development managed by the public sectoc, hence the statistically significant contribution of GEXD in explaining CAP in the long run.

Table 4.20
Long Run Elasticity Estimates: Capital Formation for Nigeria

Variables	Coefficient	Standard Error	t-Statistics	*p*-Values
Model 7: ARDL (1,0,0,0,0,1,0,1)				
LEXD	-0.220	0.125	-1.767	0.092**
LEDS	-0.193	0.083	-2.332	0.030*
LGDP	-0.316	0.250	-1.263	0.221
INR	-0.044	0.033	-1.311	0.205
EXC	0.000	0.002	0.100	0.921
LBUD	0.008	0.060	0.127	0.900
LSAV	0.479	0.181	2.640	0.016*
C	9.407	6.326	1.487	0.153
T	-0.050	0.018	-2.765	0.012*
Model 8: ARDL (1,0,0,0,1,1,0,1)				
LGEXD	-0.250	0.138	-1.813	0.085**
LEDS	-0.108	0.104	-1.039	0.311
LGDP	-0.628	0.279	-2.251	0.036*
INR	-0.013	0.036	-0.369	0.716
EXC	-0.003	0.002	-1.321	0.201
LBUD	0.006	0.074	0.077	0.940
LSAV	0.588	0.216	2.723	0.013*
C	12.494	7.444	1.678	0.109
Model 9: ARDL (1,0,1,0,0,1,1)				
LPEXD	0.036	0.108	0.337	0.740
LEDS	0.025	0.177	0.141	0.889
LGDP	-0.546	0.299	-1.825	0.082**
LINR	-0.129	0.371	-0.347	0.732
EXC	-0.003	0.003	-1.126	0.273
LSAV	0.772	0.295	2.623	0.016*
C	-2.929	7.027	-0.417	0.681

Note: * and ** represents 5 per cent and 10 per cent level of significance, respectively.

Table 4.21 represents the long run estimates for South Africa's capital formation models. The dependent variable of *CAP* has a long run relationship with the variables of interest in the three models represented by *EXD*, *GEXD* and *PEXD* at five per cent level of significance. The table is explicit on this and other variables. *SAV* was found statistically significant in only total external debt and public external debt models.

Table 4.21
Long Run Elasticity Estimates: Capital Formation for South Africa

Variables	Coefficient	Standard Error	t-statistics	*p*-value
Model 10: ARDL (2,0,0,2,1,1)				
LEXD	-0.324	0.084	-3.836	0.001*
LEDS	-0.057	0.041	-1.404	0.180
LINR	-0.679	0.235	-2.889	0.011*
LEXC	0.134	0.212	0.633	0.535
LSAV	0.420	0.110	3.814	0.002*
C	3.171	2.639	1.201	0.247
Model 11: ARDL (2,2,2,2,1,0)				
LGEXD	-0.237	0.035	-6.802	0.000*
LEDS	-0.051	0.024	-2.130	0.053**
LINR	-0.560	0.130	-4.326	0.001*
LEXC	-0.410	0.108	-3.790	0.002*
LSAV	0.505	0.061	8.229	0.000*
C	0.661	1.427	0.463	0.651
Model 12: ARDL (1,0,1,1,1,0)				
PEXD	-3E-06	2E-06	-2.095	0.051**
INR	-0.029	0.012	-2.411	0.027*
EXC	0.001	0.003	0.409	0.687
LSAV	0.166	0.100	1.653	0.116
LEDS	-0.025	0.032	-0.786	0.442
C	-0.120	2.720	-0.044	0.965

Note: * and ** signifies 5 per cent and 10 per cent level of significance respectively.

4.7.4 Short Run Relationship of Capital Formation Models

The results from the three capital formation models estimated for the short run period in order to capture the long run dynamics of the models are as presented in Table 4.22. The ECT_{t-1} results in the three models have negatives values as required with statistically significant *p*-values at five per cent (Kremers, Ericsson, & Dolado, 1992). The values of the coefficients of the *ECT*s were -0.715, -0.593 and -0.456 accordingly for Model 7, Model 8 and Model 9. From the foregoing therefore it is affirmed that Model 7 reported an adjustment rate of 72 per cent, Model 8 reported a moderate rate of 60 per cent as against a rate of 46 per cent in Model 9. Of the three models, Model 7 has the highest adjustment rate, meaning that any change in capital formation resulting from shocks in external debt will be adjusted by 72 per cent at the end of the period or the disequilibrium will be adjusted in less than two years.

Table 4.22
Short run Elasticity Estimates: Capital Formation for Nigeria

Variables	Coefficient	Standard Error	t-statistic	*p*-values
Model 7: ARDL (1,0,0,0,0,1,0,1)				
dLEXD	-0.157	0.077	-2.041	0.053**
dLEDS	-0.138	0.064	-2.143	0.043*
dLGDP	-0.226	0.154	-1.470	0.156
dINR	-0.031	0.024	-1.324	0.199
dEXC	0.008	0.004	2.161	0.042*
dLBUD	0.005	0.043	0.127	0.900
dLSAV	0.197	0.101	1.956	0.063**
dC	6.722	3.982	1.688	0.106
dT	-0.036	0.017	-2.075	0.050**
ECT_{t-1}	-0.715	0.158	-4.516	0.000*
Model 8: ARDL (1,0,0,0,1,1,0,1)				
dLGEXD	-0.148	0.075	-1.980	0.060**
dLEDS	-0.064	0.062	-1.039	0.310
dLGDP	-0.372	0.144	-2.587	0.016*
dINR	-0.049	0.030	-1.620	0.119
dEXC	0.007	0.004	1.877	0.073**
dLBUD	0.003	0.044	0.077	0.940
dLSAV	0.229	0.103	2.213	0.037*
dC	7.408	4.081	1.815	0.083**
ECT_{t-1}	-0.593	0.121	-4.917	0.000*
Model 9: ARDL (1,0,1,0,0,1,1)				
dLPEXD	0.017	0.050	0.328	0.746
dLEDS	-0.152	0.070	-2.166	0.040*
dLGDP	-0.249	0.126	-1.974	0.060**
dLINR	-0.059	0.163	-0.359	0.723
dEXC	0.007	0.004	1.814	0.082**
dLSAV	0.207	0.101	2.039	0.053**
dC	-1.335	3.215	-0.415	0.682
ECT_{t-1}	-0.456	0.123	-3.692	0.001*

Note: * and ** represents 5 per cent and 10 per cent level of significance, respectively.

The coefficient of *EXD* and *GEXD* variables were negative with 10 per cent statistical significance, *PEXD* had a positive coefficient with no significance. *EDS*, *GDP*, and *INR* have negative coefficients in the three models. On the other hand, *EXC*, *BUD* and *SAV* were of positive coefficients with weak statistical significance in all the three models. Results from the error correction estimates in Table 4.22 signifies that all the coefficients of the three *ECTs* in the models were of negative values as expected and statistically significant at five per cent in the short run analysis. It is very clear;

therefore, from the findings that capital formation is negatively explained by *EXD* and *GEXD*. The result indicates that a one per cent increase in *EXD* leads to a 0.16 per cent decrease in capital formation with a statistical significance of 10 per cent, while a one per cent age change in external debt service leads to a very small decrease in capital formation with a statistical significance of 10 per cent.

It therefore means that with *EXD* as the variable of interest, *EXD, EDS, EXC* and *SAV* had a significant role in explaining capital formation. When *GEXD* took the place of variable of interest, *GEXD, GDP, EXC,* and *SAV* were the variables with significant role in explaining capital formation negatively. *PEXD* contributes to explaining capital formation positively. An increase of *PEXD* by one unit leads to a positive increase in capital formation by 0.017 per cent with no statistical significance.

The foregoing findings have been affirmed in the literature as in Deshpande (1997) which confirmed that external debt and external debt services discourage investment, through the negative effects of debt overhang. Other studies that reported similar results were Ahmed and Shakur (2011), Nawaz, Qureshi and Awan (2012), Malik *et al*. and Hameed *et al*. (2008). Additional studies were Ezikwe and Mojekwu (2011), and Ezeabasili *et al*. (2011), which were also of the conclusion that there is a negative relationship between external debt and investment. In the same perspective were the results of Iyaho (1997) and Onwioduoki (1996). More strongly were the results of Edo (2002) and Fosu (2007), which show that external debt service and external debt stocks affected investments negatively through the debt overhang effects.

Table 4.23 on the other hand, presents the error correction representations for the selected ARDL models for capital formation using three external debt variables interchangeably in form of independent variables of interest for the South African economy. With coefficients of -0.209, -0.413 and 0.459 and statistical significance at five per cent , the *EXD*, *EXC* and *SAV* series have depicted a very strong short term relations with *CAP* in Model 10 with *SAV* reporting a positive contribution towards explaining capital formation.

When *GEXD* took the position of the variable of interest *GEXD, EDS*, *INR* and *EXC* were statistically and negatively related or negatively contributed in explaining capital formation for the model while *SAV* reported a positive contribution at five per cent. In Model 12 the variable of interest *PEXD* and *EXC* show a negatively significant contribution to capital formation while *SAV* like in the previous instances shows a positive and statistically strong significance in its contribution to explaining capital formation in South Africa. The *ECT t*erms were 65 per cent, 82 per cent and 59 per cent, respectively for all the three models under capital formation thus exhibiting a very high adjustment mechanism process in case of a disequilibrium from the previous period in the current period or in the short run.

In all the models, the coefficients of the *ECT* have depicted negative values as expected and the *t*-statistics are greater than two while they are all statistically significant at five per cent. Hence, the significant *ECT* implied causal relations amongst total external debt, government external debt and private external debt on capital formation.

Table 4.23
Short run Elasticity Estimates: Capital Formation for South Africa

Variables	Coefficient	Standard Error	t-statistics	*p*-value
Model 10 ARDL (2,0,0,2,1,1)				
dLCAP1	-0.287	0.135	-2.135	0.046*
dLEXD	-0.209	0.053	-3.936	0.001*
dLEDS	-0.037	0.019	-1.921	0.070**
dLINR	0.013	0.079	0.168	0.868
dLINR1	0.130	0.090	1.447	0.164
dLEXC	-0.413	0.139	-2.970	0.008*
dLSAV	0.459	0.085	5.428	0.000*
dC	2.051	1.438	1.426	0.170
ECT_{t-1}	-0.647	0.163	-3.972	0.001*
Model 11, ARDL (2,2,2,2,1,0)				
dLCAP1	-0.242	0.103	-2.353	0.031*
dLGEXD	-0.102	0.024	-4.288	0.000*
dLGEXD1	0.068	0.024	2.858	0.011*
dLEDS	-0.073	0.016	-4.636	0.000*
dLEDS1	-0.042	0.013	-3.302	0.004*
dLINR	-0.046	0.062	-0.743	0.468
dLINR1	0.171	0.070	2.433	0.026*
dLEXC	-0.547	0.123	-4.459	0.000*
dLSAV	0.413	0.063	6.559	0.000*
dC	0.540	1.133	0.477	0.640
ECT_{t-1}	-0.817	0.116	-7.041	0.000*
Model 12, ARDL (1,0,1,1,1,0)				
dPEXD	-2E-06	1E-06	-1.783	0.089**
dINR	0.002	0.005	0.483	0.634
dEXC	-0.005	0.002	-2.847	0.010*
dLSAV	0.315	0.100	3.148	0.005*
dLEDS	-0.015	0.017	-0.879	0.390
dC	-0.071	1.622	-0.044	0.965
ECT_{t-1}	-0.593	0.152	-3.892	0.001*

Note: * and ** signifies 5 per cent and 10 per cent levels of significance respectively.

Deshpande (1997) established that external debt and external debt services discourages investment. This is in line with this study's findings. Other studies like Ahmed and Shakur (2011), Nawaz, Qureshi and Awan (2012), Malik *et al*. (2008) and Hameed *et al* (2008) were of the same conclusion. Others with similar outcome and conclusions were Ezikwe and Mojekwu (2011) and Ezeabasili *et al*. (2011). They were also of the opinion that there is a negative relationship between external debt and

investment. In the same perspective were the results of Iyaho (1997) and Onwioduoki (1996). More strongly were the results of Edo (2002), for Nigeria and Morocco which shows that external debt service and external debt stocks affected investments negatively through the debt overhang effects just as in Fosu (2007). The findings of this study were contrary to the findings of Shrestha and Chowdhury (2005) which established that there is a negative relationship between interest and investment.

4.7.5 The Granger Causality Test of Capital formation Model

From Table 4.24, it is established that, the null hypothesis, "*EXD* does not Granger cause *CAP*" is rejected at five per cent level of significance. The causal relationship is however unidirectional between *EXD* and *CAP*; while external debt Granger causes capital formation, capital formation does not Granger cause external debt. Same explanation applies to *GEXD* and *CAP* in Model 8. On Model 9, however, there is bidirectional causality between *CAP* and *PEXD*, whereby they Granger cause each other.

The causality effect of *EDS*, *EXC* and *SAV* on *CAP* has statistical significance in explaining the causal effect on performance of *CAP*. This is explained by the results of the probability values of *F*-statistic being greater than five per cent critical value. On the other hand, there is no causality running from *CAP* to *EXD* and *INR*. While there is bidirectional causal relation between *CAP* and *EDS*, *CAP* and *EXC* and *CAP* and *SAV*, there is zero causality between *CAP* and *INR*. These signifies that there is no long run relationship existing between *INR* and *CAP* which further affirms its insignificant relationship with *CAP* formation in both short and long run analysis.

Table 4.24

Granger Causality Result: Capital Formation Model for Nigeria

Capital formation model	F-statistics	*p*-Values	Conclusion
Model 7: Total External Debt			
EXD does not Granger cause CAP	4.165	0.041*	Unidirectional
CAP does not Granger cause *EXD*	2.220	0.136	causality
GDP does not Granger cause CAP	2.161	0.172	Unidirectional
CAP does not Granger cause GDP	3.121	0.077**	causality
EDS does not Granger cause CAP	4.590	0.032*	Bidirectional
CAP does not Granger cause EDS	7.732	0.005*	causality
INR does not Granger cause CAP	1.753	0.185	Unidirectional
CAP does not Granger cause INR	6.370	0.012*	causality
EXC does not Granger cause CAP	4.668	0.031*	Bidirectional
CAP does not Granger cause EXC	3.845	0.050**	causality
SAV does not Granger cause CAP	3.826	0.050**	Bidirectional
CAP does not Granger cause SAV	3.226	0.072**	causality
BUD does not Granger cause CAP	0.016	0.899	Zero
CAP does not Granger cause BUD	0.261	0.610	causality
Model 8: Government External Debt			
EDS does not Granger cause CAP	1.081	0.299	Unidirectional
CAP does not Granger cause EDS	18.612	0.000*	causality
CAP does not Granger cause GEXD	3.921	0.048*	Unidirectional
GEXD does not Granger cause CAP	10.986	0.321	causality
EXC does not Granger cause CAP	3.523	0.061**	Unidirectional
CAP does not Granger cause EXC	0.994	0.319	causality
SAV does not Granger cause CAP	4.897	0.027*	Bidirectional
CAP does not Granger cause SAV	6.725	0.010*	causality
BUD does not Granger cause CAP	0.006	0.939	Unidirectional
CAP does not Granger cause BUD	4.089	0.043*	causality
GDP does not Granger cause CAP	6.690	0.010*	Bidirectional
CAP does not Granger cause GDP	7.413	0.006*	causality
INR does not Granger cause CAP	2.626	0.105	Zero
CAP does not Granger cause INR	0.205	0.650	causality
Model 9: Private External Debt			
EDS does not Granger cause CAP	4.693	0.030*	Bidirectional
CAP does not Granger cause EDS	11.164	0.001*	causality
PEXD does not Granger cause CAP	0.108	0.743	Zero
CAP does not Granger cause PEXD	2.010	0.148	causality
EXC does not Granger cause CAP	3.291	0.070**	Unidirectional
CAP does not Granger cause EXC	0.763	0.382	causality
SAV does not Granger cause CAP	4.157	0.041*	Unidirectional
CAP does not Granger cause SAV	0.003	0.956	causality
INR does not Granger cause CAP	0.129	0.720	Zero
CAP does not Granger cause INR	1.556	0.212	causality

Note: * and ** represents 5 per cent and 1 per cent level of significance respectively.

In a situation when government external debt is substituted for the variable of interest from total external debt under the same model, *GEXD* Granger causes *CAP* in a one way causational direction. Just as in the preceding scenario there is also bidirectional causation between *CAP* and *EDS*, *CAP* and *EXC* and *CAP* and *SAV*. There is also zero causal relationship between *CAP* and *INR*. Contrary to these findings however, when private external debt replaced the variable of interest the *CAP* and *PEXD* had no causal relations between them, while *EDS* Granger causes *CAP*, *CAP* did not Granger caused *EDS*. *INR* has remained consistent in having a zero causal relation with capital formation in the *GEXD* and *PEXD* models.

The most important results discussed for South Africa are the unidirectional causations reported *EXD* and *CAP* plus *GEXD* and *CAP* and Zero causal relation when examined with *CAP* variable in the same model. Granger, Causality between *CAP* and *EXD*, *EDS*, *INR* *SAV* have been considered in order to see the direction of causality and which of the variables Granger causes the other in Table 4.25. From the table it can be seen that the null hypothesis that *EXD* does not Granger cause *CAP* is rejected at five per cent level of significance while the null hypothesis that *EDS* does not Granger cause *CAP* was also rejected at five per cent.

The causality effects of *EXD*, *EDS*, *EXC* and *SAV* on *CAP* have statistical significance in explaining the causal effect on performance of *CAP*. This is explained by the results of the probability values of *F*-statistic being greater than 5 per cent critical value. On the other hand, there is no causality running from *CAP* to *EXD* and INR. While there is bidirectional causal relation between *CAP* and *EDS*, *CAP* and *EXC* and *CAP* and *SAV*, there is zero causality between *CAP* and *INR*. These signifies that

there is no long run relationship existing between *INR* and *CAP* which further affirms its insignificant relationship with *CAP* formation in both short and long run analysis. In Model the results established that only the *SAV* variable has bidirectional causation with capital formation amongst the control variables. While interest rate showed zero causal relation with *CAP*, other variables like EDS, and *EXC* reported with a unidirectional causation in their own favour.

In a situation when government external debt is substituted for the variable of interest from total external debt under the same model, *GEXD* Granger causes *CAP* in a one way causational direction. Just as in the preceding scenario there is also bidirectional causation between *CAP* and *EDS*, *CAP* and *EXC* and *CAP* and *SAV*. There is also zero causal relationship between *CAP* and *INR*. Contrary to these findings however, when private external debt replaced the variable of interest the *CAP* and *PEXD* had no causal relations between them, while *EDS* Granger causes *CAP*, *CAP* did not Granger caused *EDS*. *INR* has remained consistent in having a zero causal relation with capital formation.

Policy implication of this findings is that government should give more emphasis on controlling interest rates and external debt services while strongly encouraging savings in the economy. It is also indicative to say that policies by government on external debt, external and debt service can affect capital formation but policies or actions on capital formation cannot in any way affect them. On the other hand, policies on savings and capital formation in the country affect one another.

Table 4.25
Granger Causality Result: Capital Formation Model for South Africa

Null hypothesis	*F*- statistics	*p*-values	Conclusion
Model 10: Capital Formation Model: Total External Debt			
EXD does not Granger cause CAP	4.165	0.041*	Unidirectional
CAP does not Granger cause *EXD*	2.228	0.136	causation
EDS does not Granger cause CAP	4.590	0.032*	Bidirectional
CAP does not Granger cause EDS	7.732	0.005*	causation
INR does not Granger cause CAP	1.753	0.185	Zero
CAP does not Granger cause INR	0.178	0.673	causation
EXC does not Granger cause CAP	4.668	0.031*	Bidirectional
CAP does not Granger cause EXC	3.845	0.050*	causation
SAV does not Granger cause CAP	3.826	0.050*	Bidirectional
CAP does not Granger cause SAV	3.226	0.072**	causation
Model 11: Capital Formation Model: Public External Debt			
GEXD does not Granger cause CAP	3.921	0.048*	Unidirectional
CAP does not Granger cause GEXD	0.986	0.321	causation
EDS does not Granger cause CAP	1.080	0.299	Unidirectional
CAP does not Granger cause EDS	16.643	0.000*	causation
INR does not Granger cause CAP	2.262	0.105	Zero
CAP does not Granger cause INR	0.205	0.650	causation
EXC does not Granger cause CAP	3.523	0.061**	Unidirectional
CAP does not Granger cause EXC	2.631	0.105	causation
SAV does not Granger cause CAP	4.897	0.027*	Bidirectional
CAP does not Granger cause SAV	6.725	0.010*	causation
Model 12: Capital Formation Model: Private External Debt			
PEXD does not Granger cause CAP	0.108	0.743	Zero
CAP does not Granger cause PEXD	2.090	0.143	causation
EDS does not Granger cause CAP	4.693	0.030*	Unidirectional
CAP does not Granger cause EDS	1.492	0.222	causation
INR does not Granger cause CAP	0.129	0.720	Zero
CAP does not Granger cause INR	1.556	0.212	causation
EXC does not Granger cause CAP	3.291	0.070**	Unidirectional
CAP does not Granger cause EXC	0.763	0.382	causation
SAV does not Granger cause CAP	4.157	0.041*	Unidirectional
CAP does not Granger cause SAV	0.003	0.956	causation

Note: **, and * depicts rejection of the Null hypothesis at 10 and 5 per cent level of significance accordingly.

4.7.6 Diagnostics Checks

Diagnostic checks were undertaken and appropriate lags levels determined to ensure better models. Diagnostics checks included serial correlation test, normality test and heteroskedasticity test. The diagnostic tests performed for Nigeria and South Africa

under the six models; three each under external debt and capital formation models all indicated satisfactory outcomes. More importantly, the serial correlation and heteroscedasticity tests as per Lagrange Multiplier test of residual serial correlation, based on the regression of squared residuals on squared fitted values were undertaken and the results are represented by Table 4.26 and Table 4.27. Results from these tests point out that the estimated VAR system is generally free from serial correlation. In other words, the residuals are not correlated. Additionally, no evidence of heteroskadasticity was found on the errors of the estimated system. To put differently, the errors were found to be homeskedestic. On the normality of the errors, it was further confirmed that they are normally distributed.

Tests for serial correlation in all six models for both countries also have shown satisfactory results as detailed in Table 4.26 and Table 4.27 for Nigeria and South Africa's external debt models. Outcome of the test shows that results failed to reject the null hypothesis that the residuals are not serially correlated. It has also been established that the models were well specified and functionally formulated using the Ramsey's Regression Equation Specification Error Test (RESET). Therefore, it can be concluded that there is no evidence that any of the assumptions of classical linear regression model is violated.

Furthermore, while the parameters have been found to be efficient and consistent the residuals were normally distributed par test of normality results. Finally the heteroscedasticity test has failed to reject the null hypotheses hence residuals in all models have been established to be homoscedastic from the outcome of the regression of squared residuals on squared fitted values. In summary therefore the diagnostic

tests have confirmed that for all the six models the error correction terms of the ARDL models are serially uncorrelated, normally distributed and homoscedastic and therefore the models are adequate and robust in explaining the relationship between capital formation and the external debt components. The diagnostic tests performed for the external debt and capital formation models for the Nigeria and South Africa's variables all indicated their adequacy and good specifications.

Table 4.26
ARDL Diagnostic Test Results for Nigeria

Diagnostic Tests / Models		A Serial Correlation	B Functional Form	C Normality	D Heteroscedasticity
External debt Models					
Model 1:	LM Version	0.305 (0.581)	7.378 (0.007)	0.835 (0.659)	0.033 (0.856)
	F Version	0.193 (0.665)	5.993 (0.024)	Not applicable	0.031 (0.862)
Model 2:	LM Version	0.548 (0.459)	12.401 (0.000)	1.477 (0.478)	0.111 (0.739)
	F Version	0.314 (0.582)	11.390 (0.003)	Not applicable	0.104 (0.749)
Model 3:	LM Version	0.044 (0.833)	0.0125 (0.911)	1.556 (0.459)	0.161 (0.688)
	F Version	0.031 (0.863)	0.009 (0.927)	Not applicable	0.152 (0.700)
Capital Formation Models					
Model 7:	LM Version	0.620 (0.431)	5.570 (0.018)	0.549 (0.760)	0.428 (0.513)
	F Version	0.375 (0.547)	4.004 (0.060)	Not applicable	0.407 (0.528)
Model 8:	LM Version	0.262 (0.608)	4.497 (0.034)	4.616 (0.099)	0.475 (0.491)
	F Version	0.157 (0.696)	3.106 (0.094)	Not applicable	0.452 (0.506)
Model 9:	LM Version	1.843 (0.175)	6.102 (0.014)	1.124 (0.570)	0.164 (0.686)
	F Version	1.222 (0.282)	4.712 (0.042)	Not applicable	0.155 (0.697)

Note: A: Lagrange multiplier test of residual serial correlation
B: Ramsey's RESET test using the square of the fitted value
C: Based on a test of skewness and kurtosis of residuals
D: Based on the regression of squared residuals on squared fitted values
The figures in parentheses represent *p*-values.

The Lagrange multiplier test of residual serial correlation in all the six models as detailed by Table 4.27 failed to reject the null hypothesis that the residuals are not serially correlated.

Table 4.27
ARDL Diagnostic Test Results for South Africa

Models		A Serial Correlation	B Functional Form	C Normality	D Heteroscedasticity
External Debt Models					
Model 4 EXD	LM Version	0.276 (0.996)	1.198 (0.274)	1.980 (0.372)	0.327 (0.372)
	F Version	0.158 (0.997)	0.715 (0.410)	Not applicable	0.307 (0.584)
Model 5 GEXD	LM Version	0.314 (0.575)	0.338 (0.561)	1.386 (0.500)	0.828 (0.363)
	F Version	0,219 (0.695)	0.236 (0.633)	Not applicable	0.793 (0.381)
Model 6 PEXD	LM Version	0.221 (0.638)	0.121 (0.728)	1.386 (0.500)	1.133 (0.287)
	F Version	0.138 (0.714)	0.075 (0.787)	Not applicable	1.098 (0.304)
Capital Formation Models					
Model 10 (EXD	LM Version	1.234 (0.267)	0.172 (0.678)	1.774 (0.412)	2.218 (0.136)
	F Version	0.692 (0.419)	0.093 (0.765)	Not applicable	2.237 (0.147)
Model 11 GEXD	LM Version	0.425 (0.514)	3.260 (0.071)	0.289 (0.866)	1.469 (0.226)
	F Version	0.185 (0.675)	1.581 (0.233)	Not applicable	1.439 (0.241)
Model 12 PEXD	LM Version	1.487 (0.223)	0.044 (0.843)	0.572 (0.751)	1.594 (0.207)
	F Version	0.954 (0.343)	0.027 (0.872)	Not applicable	1.569 (0.221)

Note: A: Lagrange multiplier test of residual serial correlation
B: Ramsey's RESET test using the square of the fitted value
C: Based on a test of skewness and kurtosis of residuals
D: Based on the regression of squared residuals on squared fitted values
The figures in Parentheses represent *P*-values.

It has also been established that the models were well specified and functio89nally formulated using the Ramsey's RESET test. Furthermore while the parameters have

been found to be efficient and consistent the residuals were normally distributed as par test of normality results. Finally the heteroscedasticity test has failed to reject the null hypotheses hence residuals in all models were established to be homoscedastic from the outcome of the regression of squared residuals on squared fitted values.

4.7.7 CUSUM and CUSUM-Q Stability Tests

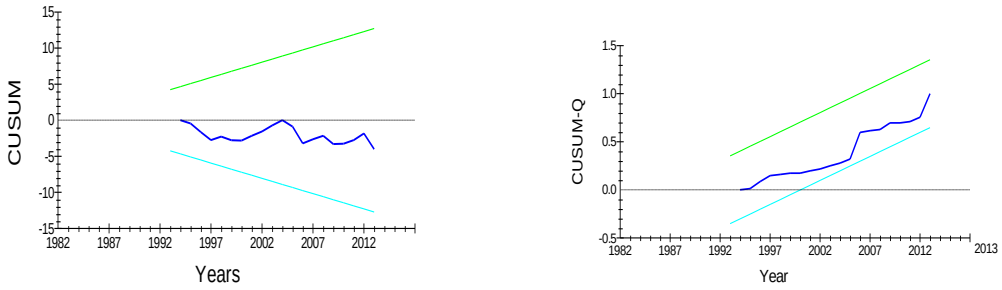
Finally, the stability of the long-run parameters together with the short-run movements for the models have been examined using cumulative sum (CUSUM) and cumulative sum of squares (CUSUMS-Q) tests proposed by Borensztein, *et al*. (1998).

The stability of the long run relationship between external debt and its determinants like exchange rate, interest rate, budget deficit and savings and relationship between external debt and capital formation is measured by applying the CUSUM and CUSUM-squared test as proposed by Brown and Durbin (1975) in testing the constancy of long run parameters. The test is normally applied on the residuals of the models under consideration based on the cumulative sum of recursive residuals on the first set of *n* observations; updated recursively and plotted against break points. These tests of stability were run for both Nigeria's and South Africa's models.

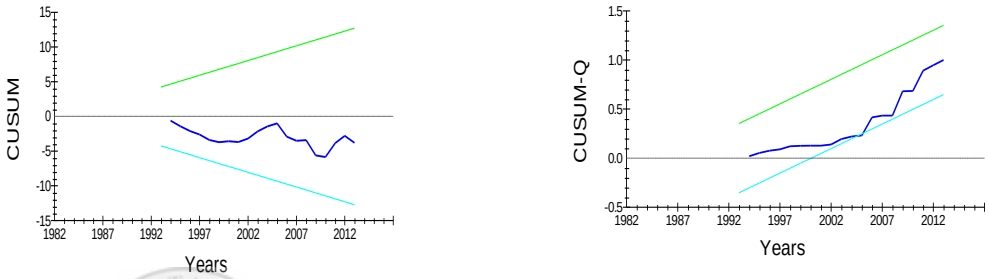
If the plot of the CUSUM statistics stays within a significance level of 5 per cent, the estimates are confirmed to be stable. The same picture applies to the CUSUM-squared statistics which are based on the squared recursive residuals. This scenario is as depicted by Figure 4.1 and Figure 4.2 which cover Model 1 to Model 6. The plotted CUSUM and CUSUM-squared statistics lines stay within the critical bounds limits

represented by a pair of extreme bounds straight lines, thus confirming the stability of both the external debt Model 1 – Model 3 and the capital formation Models 4 –Model 6 for Nigeria. Same approach explained the diagnostic test results for South Africa as presented in Figure 4.3 and Figure 4.4, respectively.

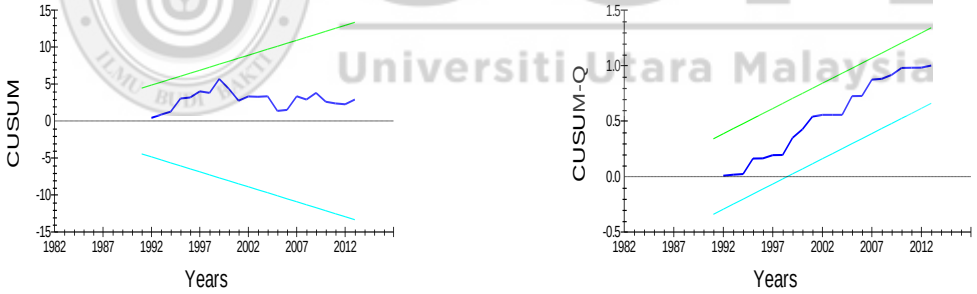
The two plots of cumulative sums of recursive residuals and the cumulative sum of residuals squared have given the desired result thus establishing the stability of the models in the long run in that the graph lines did not cross any of the five per cent critical bounds lines. The same procedure has been utilized by Pesaran and Pesaran (1997), Suleiman (2005) and Mohsen *et al*. (2002) to test the stability of the long-run coefficients. The tests applied to the residuals of the *ECM* model. The critical bounds are graphed in Figure 4.1 and Figure 4.2 for the external debt and capital formation models accordingly. It is confirmed from the figures that the plot CUSUM stay within the critical five percent bound for all equations and CUSUMS-Q statistics does not cross the critical boundaries that confirms the long-run relationships between external debt and the independent variables and between capital formation and its variables of interest especially the disaggregated external debts components.



Model 1

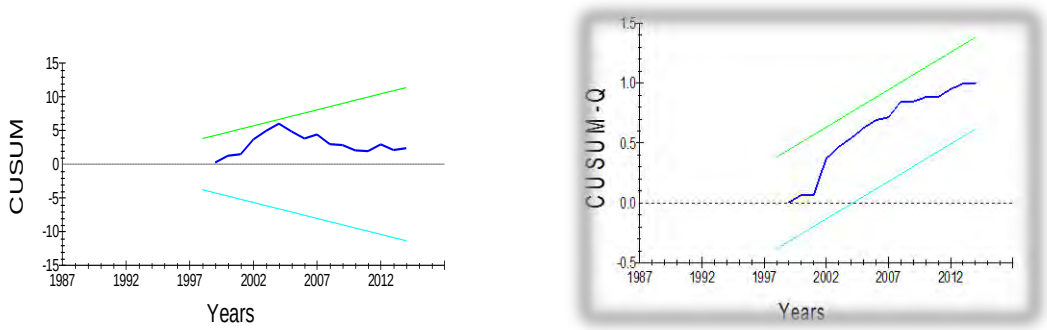


Model 2

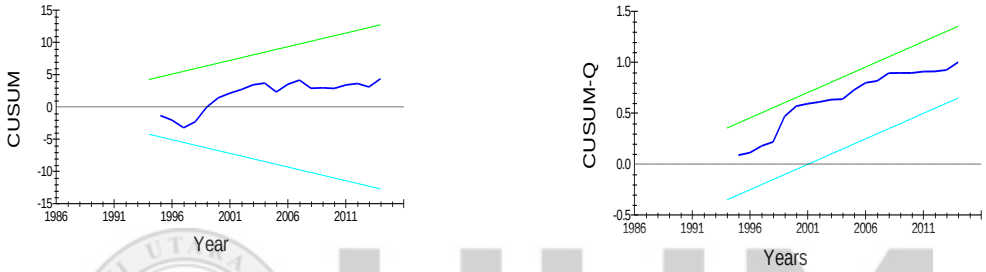


Model 3

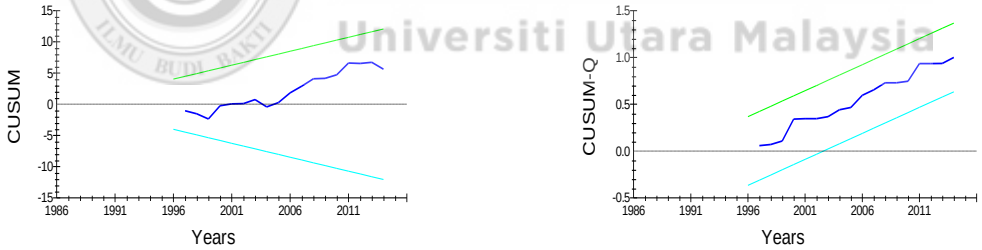
Figure 4.1
CUSUM and CUSUM-Q test under External debt models.
Note: The straight lines represent critical bounds at 5% significance level while Model 1, Model 2 and Model 3 stands for total external debt, public external debt and private external debts Models respectively.



Model 4

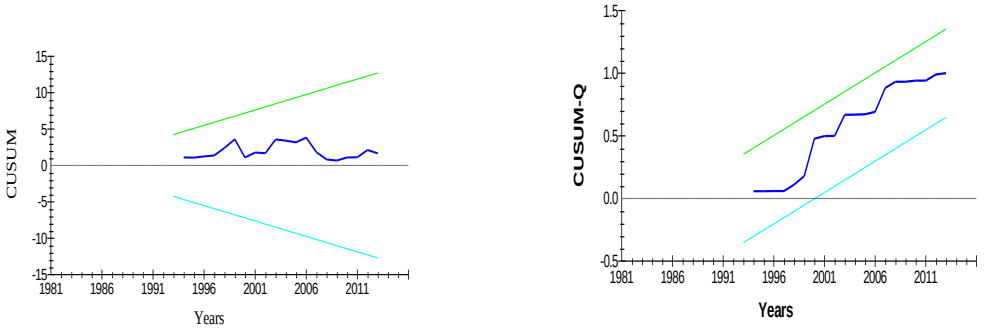


Model 5

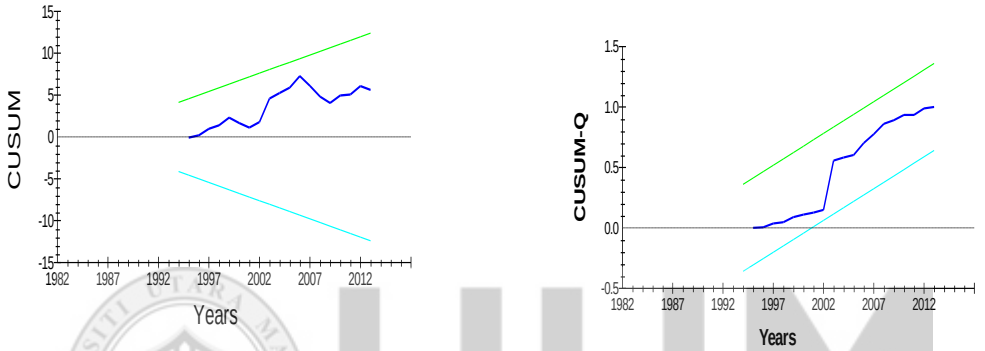


Model 6

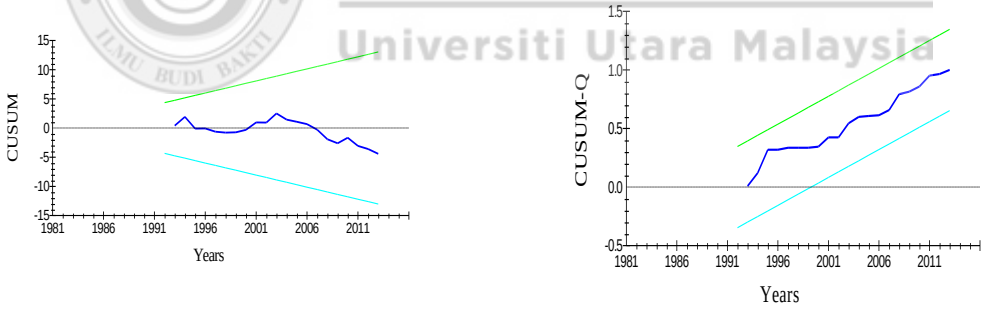
Figure 4.2
CUSUM and CUSUM-Q test under external debt models
Note: The straight lines represent critical bounds at 5% significance level while Model 1, Model 2 and Model 3 stands for total external debt, public external debt and private external debts models respectively.



Model 7

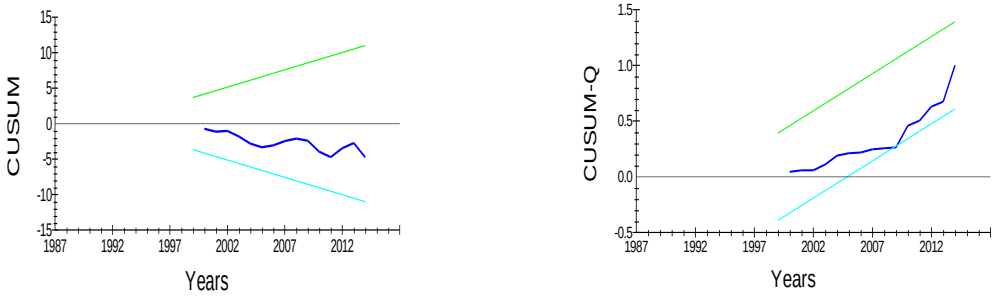


Model 8

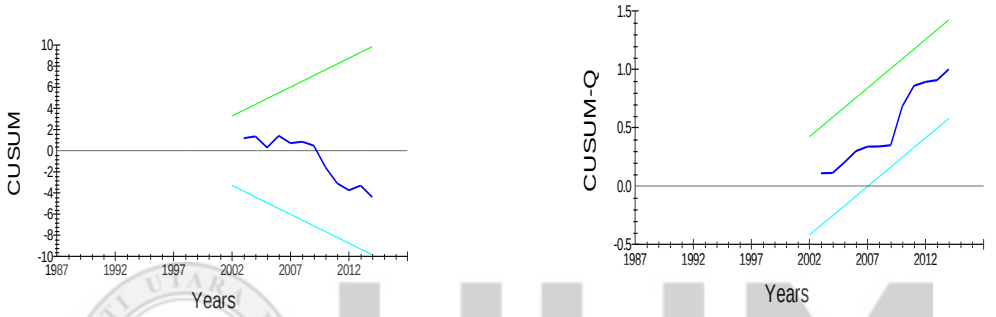


Models 9

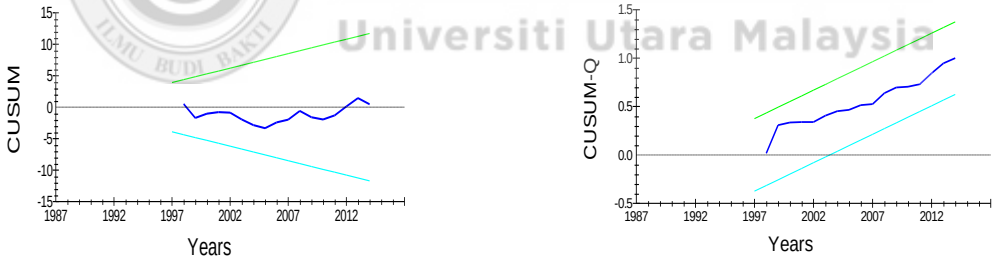
Figure 4.3
CUSUM and CUSUM-Q test under capital formation models.
Note: The straight lines represent critical bounds at 5% significance level while Model 4, Mode 5 and Model 6. stands for total external debt, public external debt and private external debts models respectively.



Model 10



Model 11



Model 12

Figure 4.4
CUSUM and CUSUM-Q test under capital formation models for South Africa
Note: The straight lines represent critical bounds at 5 per cent significance level while Model 10, Model 11 & Model 12 stands for total external debt, public external debt and private external debts respectively

4.8 Impact of Debt Overhang and Crowding out Effects on Capital Formation

The third objective of the study aims at examining the impact of debt overhang and crowding out effects on capital formation in the two countries under review. This will be archived with the results of the VAR estimation of Equation [3.7]. Section 3.8 carries detailed insights of the VAR modeling approach. Employing the Impulse Response Function (IRF) and variance decomposition analysis, the aim of this objective is achieved.

4.8.1 The Lag Length Selection Criteria

The lag length selection criteria results are as presented in Table 4.28.

Table 4.28
VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
Nigeria						
0	154.298	NA	0.000904	10.019	10.294	10.110
1	6.872	251.829*	3.78e-07*	2.196	4.120*	2.833*
2	46.270	46.785	3.94e-07	1.983*	5.556	3.167
South Africa						
0	41.569	NA	3.18e-09	-2.541	-2.255	-2.453
1	166.763	187.791*	5.80e-12*	-8.912	-6.913*	-8.301*
2	207.163	43.285	6.29e-12	-9.226*	-5.515	-8.091

Note: "*" indicates lag order selected by the criterion
LR: Sequential modified LR test statistic (each test at 5 % level of significance)
FPE: Final prediction error
AIC: Akaike information criteri
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

From the table LR, FPE, SC and HQ selected lag 1 as the optimal lag, AIC selected lag 2 as the optimal lag for Nigeria's series. For the optimal lag selection for South Africa also LR, FPE, SC and HQ selected lag one while only AIC selected lag 2.

Thus, for the two nations lag 1 was slated for the estimation procedure as presented in the table.

4.8.2 The Vector Autoregressive Estimates

In the VAR, all variables are treated as basically endogenous while importance is laid on the conditionality that the error terms should be serially uncorrelated as discussed in Section 3.8 in Chapter 3. An extract of the estimates is presented in Table 4.29.

Table 4.29
VAR Estimation results

Dependent Variable LCAP	LCAP	LCAP
	Nigeria	South Africa
LCAP(-1)	0.488	0.441
	(0.155)	(0.130)
LCOE(-1)	-0.215	0.072
	(0.101	(0.050)
LDOH(-1)	0.0331	0.064
	(0.057)	(0.068)
LEDS(-1)	0.248	-0.106
	(0.125)	(0.067)
LEXC(-1)	-0.119	0.260
	(0.053)	(0.144)
LINR(-1)	0.074	-0.327
	(0.138)	(0.085)
C	-3.470	3.406
	(2.520)	(1.382)

Note: Figures in parenthesis are standard errors.
* and ** indicate rejection of the null hypotheses that a parameter estimate is not statistically, significant at 5 per cent and 10 per cent respectively.

The results of the test indicate that there is the presence of long term relationship amongst the variables. These findings have a significant role to play in understanding the dynamics of external debt signing, maintaining and management.

4.8.3 Impulse Response Function

In Figure 4.5, the representation is that of a response to one standard deviation innovation in *EDS* resulting into a positive response or reaction from *CAP*. The highest positive response by capital formation in Nigeria was in period three. From period 1 to period 3, therefore, the positive response was at an increasing rate, after which it changed to decreasing rate up to period 6 after which it started moving on a straight line up to the tenth period with the same positive reaction to innovations in *EDS*. The theoretical expectation has been a negative relation between capital formation and external debt service. Reason for a positive relationship here might not be unconnected with the dearth of investible capital which traditionally is expected to come from local savings known to be scarce in developing countries. The high savings figure in the face of low investment can be explained by lack of strong financial intermediation system. Increase in foreign capital inflow comes with economic activities hence the positive relationship noted in the very short and at a slower pace in the long run.

In the same panel of Figure 4.5 it is shown that successive response or reaction to one standard deviation in *DOH* by capital formation. It can be traced that the response was generally negative for the ten year period under observation. From initial stage the reaction was rapidly negative up to the second period which marked the highest negative reaction before it starts decreasing and reaching a peak at the sixth period. Therefore in the short run a shock on *DOH* leads to a negative reaction in *CAP*. In the long run however thought the response remains negative and relatively constant in subsequent periods, the model was statistically significant. The *DOH* effects on capital formation were more severe on the Nigerian economy in the short run. Due to

debt relief around the seventh period and improved debt management policies put in place the speed of the negative relationship was normalized.

The figure displays the traces of the responses of capital formation as a result of a shock on crowding out effect *(COE)* variable. The results show that capital formation reacted negatively to changes in *COE*. The highest response was seen in periods two and three from which it moves back to zero in period four and ultimately becomes positive in period seven. In the long run, as represented by the last three periods however the response reverts to negative. This is not surprising given the state of the *CAP* status in Nigeria (see Chapter 1, Section 1.2.2). It was so weak that the slightest negative shock effect resulting from innovation in *COE* will have serious consequences on *CAP*. Similar patterns were recorded also resultant effects of innovations in other variables like exchange rate and interest rate.

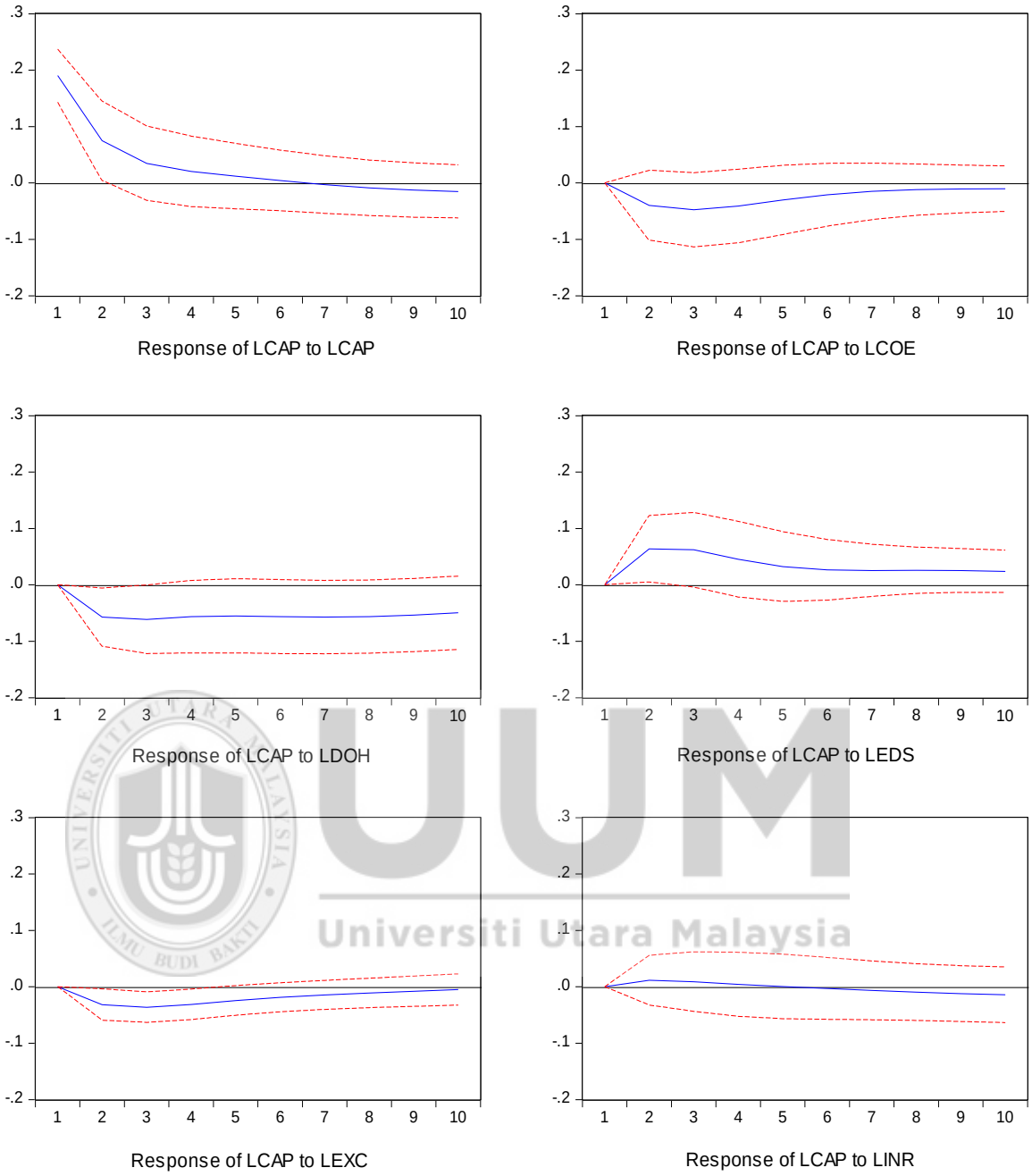


Figure 4.5
Impulse Response Function, Nigeria

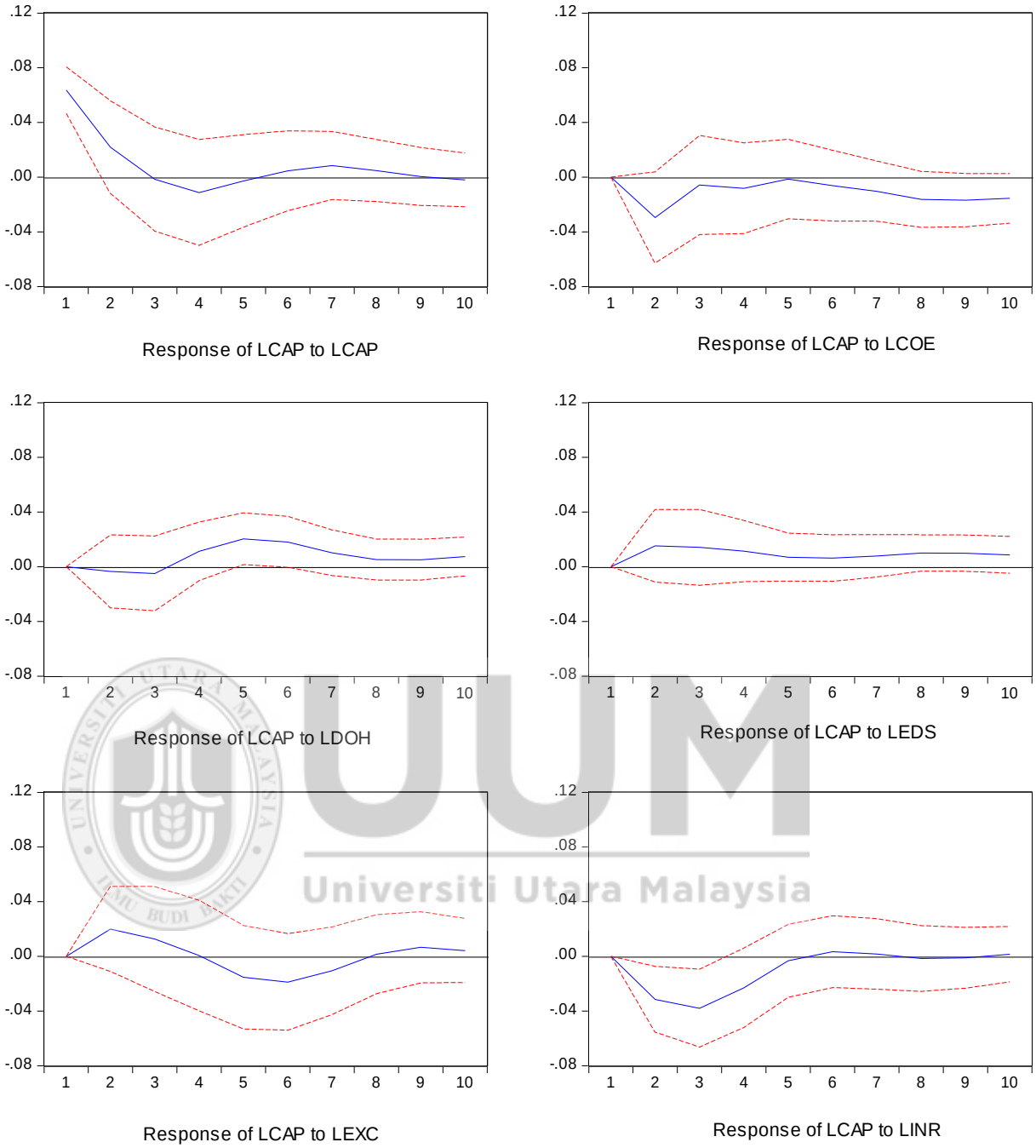


Figure 4.6
Impulse Response Function, South Africa

4.8.4 Variance Decomposition

Variance decomposition, on the other hand, enables researcher to determine the most fluctuating sources of the endogenous variable for the duration of the study while it also permits the estimation of the part of each endogenous variable as explained by the different shocks for different time frames (Helmet, 1990). Table 4.30 shows the variance decomposition results of the effect of *DOH* and *COE* on capital formation. The results in this table plainly show that the *DOH* and *COE* factors have a strong and significant influence on capital formation. the sequence of variables in the VD are arranged based on the Cholesky decomposition order.

The result depicts the variance decomposition in capital formation while explaining the importance of each of the explanatory variable's contribution in influencing capital formation dynamics. In the table results of the variance decomposition is shown, representing the proportion of forecast error variance, in the first instance, in capital formation as depicted by its own innovations and innovations in the independent variables.

Variance decomposition for 10 years was calculated in order to establish the effects of the independent variables on capital formation. In the first year, it is given that all of the variance in capital formation is explained by its own innovations. Capital formation explains about 84 per cent of its innovations in the second year, 73 per cent, and 68 per cent in the third and fourth year respectively. The remaining contribution out of a hundred is explained by the independent variables. The two variables of interest explained in the model (i.e. *DOH* and *COE*) put together contribute much greater proportions than the remaining explanatory variables. Thus it can be

concluded that *DOH* and *COE* contributes much more to the changes in capital formation. As time progresses, it is also established that the contribution of *DOH* and *COE* explains more of the innovations in capital formation.

Table 4.30
Variance Decomposition of LCAP

Period	S.E.	LCAP	LDOH	LCOE	LEDS	LEXC	LINR
Nigeria							
1	0.190280	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.227779	80.55437	7.773745	1.572570	7.890927	1.940329	0.268055
3	0.253704	66.81846	13.61403	3.248337	12.36131	3.613795	0.344066
4	0.269603	59.74418	17.51223	4.108384	13.76720	4.536077	0.331939
5	0.280010	55.56856	20.75929	4.301819	14.10107	4.961275	0.307983
6	0.288245	52.46012	23.78342	4.189728	14.16362	5.101121	0.301985
7	0.295781	49.83085	26.55678	4.000536	14.19735	5.080792	0.333696
8	0.302912	47.59443	28.93607	3.816744	14.26111	4.974924	0.416729
9	0.309448	45.77258	30.84626	3.657765	14.33848	4.830920	0.553994
10	0.315183	44.35315	32.31151	3.526887	14.39147	4.679411	0.737573
South Africa							
1	0.067001	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.084459	74.48152	0.974536	0.005256	4.077855	0.555355	19.90548
3	0.095222	58.89525	0.773882	0.012520	10.42353	0.546670	29.34814
4	0.101602	55.25515	1.359522	0.031969	14.71552	0.486637	28.15121
5	0.105098	53.98319	2.713742	0.056119	16.43078	0.489610	26.32656
6	0.106848	52.63762	3.880744	0.065694	16.89263	0.475697	26.04762
7	0.107689	51.81955	4.567218	0.064690	17.04280	0.499970	26.00577
8	0.108209	51.37666	4.965629	0.081077	17.16818	0.618465	25.78999
9	0.108719	50.90620	5.287205	0.137181	17.30721	0.800220	25.56198
10	0.109315	50.36693	5.658102	0.235722	17.42922	0.992782	25.31724

Note: SE stands for Standard Errors*; LCAP LCOE LDOH, LEDS, LEXC & LINR* represents capital formation, crowding out effects, debt overhang, external debt services, exchange rates and interest rate respectively. All the series are in Natural log form.

Conclusively, therefore, even though the level of contribution to the changes in capital formation increases over successive periods by the other three explanatory variables, the magnitude is not as much as the two variables of interest. Any policy on capital formation should therefore take cognizance of external debt whose consequences results and explains *COE* and *DOH* collectively and individually. Efforts should be geared towards proper and more effective external debt management as to give a

proper guide towards the twin's negative effects of debt overhang and crowding out effects.

4.8.5 Granger Causality Test

Causal relations were investigated between capital formation and the independent variables for Nigeria in Model 7. It is established that while there is causality running from *CAP* to *COE* and *EDS* there is no causality from *COE* and *EDS t*o *CAP*. Also the results have shown that there is no causal relation between *DOH* and *INR* with *CAP* on both sides; hence zero causality in these two cases. On the other hand, however, bilateral or bidirectional causality from *CAP* to *EXC* is confirmed. Any policy on one variable will automatically affect the other variable. This is reported in table 4.31.

Table 4.31
The Granger Causality Estimates

Null Hypothesis	χ^2	*P-Value*	Decision rule
Nigeria			
CAP does not Granger cause COE	4.495	0.034*	Unidirectional
COE does not Granger cause CAP	0.028	0.867	causality
CAP does not Granger cause DOH	0.343	0.558	Zero
DOH does not Granger cause CAP	0.048	0.836	Causality
CAP does not Granger cause EDS	3.951	0.047*	unidirectional
EDS does not Granger cause CAP	0.364	0.546	Causality
CAP does not Granger cause EXC	5.102	0.024*	Bidirectional
EXC does not Granger cause CAP	0.981	0.015*	Causality
CAP does not Granger cause INR	0.287	0.592	Zero
INR does not Granger cause CAP	0.002	0.968	Causality
South Africa			
CAP does not Granger cause COE	4.495	0.034*	Unidirectional
COE does not Granger cause CAP	0.028	0.867	causality
CAP does not Granger cause DOH	0.343	0.558	Zero
DOH does not Granger cause CAP	0.048	0.836	Causality
CAP does not Granger cause EDS	3.951	0.047*	Unidirectional
EDS does not Granger cause CAP	0.364	0.546	causality
CAP does not Granger cause EXC	5.102	0.024*	Bilateral
EXC does not Granger cause CAP	0.981	0.015*	causality
CAP does not Granger cause INR	0.287	0.592	Zero
INR does not Granger cause CAP	0.002	0.968	Causality

From the same result the granger causality for South Africa has also been established. There is a zero causal relation between *CAP* and *DOH* for South African model. The *COE* and *EDS* variables established a weak causality with *CAP*, while *CAP* reported no causal relations with *COE* and *EDS*. Also there is a reported unidirectional relation between *CAP* and *EXC*; while *CAP* and *INR* reported a bilateral causality between themselves with strong statistical significance.

4.8.6 Diagnostic Checks

Diagnostic checks were further applied and appropriate lags levels determined to ensure a better model. Diagnostics tests applied included serial correlation test, normality test and heteroskedasticity test. The results from these tests point out that the estimated VAR system is generally free from serial correlation. In other words the residuals are not correlated. Additionally, no evidence of heteroskadasticity was found on the errors of the estimated system. To put it differently, the errors were found to be homeskedastic. On the normality of the errors, it was confirmed that they are normally distributed. Therefore, it can be concluded that the results are not affected by the white noise distribution process, hence efficient and consisted.

Table 4.32
Diagnostic tests

Types of Tests	Nigeria		South Africa	
	χ^2	*p*-value	χ^2	*p*-value
Exogeneity test	14.946	0.134	5.868	0.319
Serial Correlation test	31.729	0.672	12.313	0.217
Heteroscekasdicity test	500.229	0.539	252.723	0.475
Normality test (Jack-bera)	30.968	0.002	16.959	0.151

Note: Serial correlation test is conducted based on LM statistics values.

4.9 Summary and Conclusion

After successfully explaining the descriptive statistics for the two economies and reviewing the coefficient of variance in the covariance analysis which depicted the characterization of the series of the variables intended for estimation. This chapter is divided into nine sections drawing on the objectives of the studies considered according to the countries and in sequence with the procedural requirements of the estimation techniques. The four objectives of the study are to determine the factors affecting external debt accumulation in Nigeria and South Africa; examining the effects of external debt on capital formation; and investigating the effects of debt overhang and crowding out effects on capital formation in the two countries employing the ARDL and VAR estimation techniques.

This chapter also established that there are mixed levels of stationarity in the two countries series using ADF, while co-integration was further established using the ARDL bounds testing techniques for all the models in the studies for both countries; thus paving way for the analysis. Having established the optimal lags for the models the long and short run estimates of the models were undertaken. Estimations confirmed that there exist long run relationships amongst and between the variables of interest. For example in Nigeria external accumulation was established to have been influenced by *EDS*, *INR*, and partly by *EXC* in case of government external debt while debt accumulation is significantly explained by *EDS*, *INR*, *EXC* and *SAV* in the *PEXD* model. In the short run the *ECT* appeared with the appropriate sign and statistically significant while variables relations were confirmed in the short run for the long run analysis.

In case of South Africa on the other hand in the long run *EDS*, *INR* and *SAV* negatively affected *EXD*, while *EXC* and *BUD* positively affected *EXD*. In the short run only *INR, BUD and SAV* are negatively related with *EXD*. *EDS* and *EXC* are positively and *EXC* significantly. Short run relationship was negatively signed and statistically significant for the three capital formation models for Nigeria. *EXD*, *EDS*, *EXC* and *SAV* played a prominent role in explaining capital formation, while *GEXD*, *GDP*, *EXC*, and *SAV* significantly explained capital formation where *PEXD*, *EDS*, *GDP*, *EXC* and *SAV* also played a significant role in explaining capital formation for Nigeria. In the case of South Africa long run relationship has been established between capital formation and the independent variables especially *SAV*, *EXD* and *EXC*; with *GEXD*, *EDS*, *INR, EXC* and *SAV;* and with *PEXD* and *INR* accordingly in the three models. All the four diagnostic test came with positive results, the Granger causality and CUSUM and CUSUM-Q tests were also under taken in order to confirm to the integrity of the models specification and reliability.

CHAPTER FIVE

CONCLUSION

5.1 Introduction

This chapter represents the last lap of the study in which a summary of the work is presented in order to avail the reader of a synopsis of the thesis. While a brief of the work is given in Section 5.2, by way of summary of the study and some salient final findings also established, Section 5.3 gives the policy implications while Section 5.4 of the chapter gives some limiting factors that might have hindered some aspects of the research. Section 5.5 of the chapter presents some suggestions for further research Section 6 concludes on the study.

5.2 Summary of Findings

The first objective of the study is the determination of the factors affecting external borrowing and its accumulation. In this regard, results from the study affirmed that in Nigeria, *EDS* and *INR* are the most significant determinants of *EXD* in both the short and long run. This appears in both total external debt (EXD) and public external debt (GEXD). However in the case of private external debt (PEXD) in addition to *EDS* and *INR*, other variables like *EXC* and *SAV* played a very vital role. In case of South Africa on the other hand only *BUD* played a role, even though, very weak, in explaining external debt accumulation in the long run for the private external debt variable. INR, EXC and BUD played vital roles in determining *EXD* in the long run. *BUD* and *INR* lead in determining *PEXD* and *GEXD* in the short run respectively, while *EDS* and *BUD* are the major determinants of *EXD* also in the short run.

Objective one has therefore, been achieved by affirming that external debt in *SSA* in general and in Nigeria and South Africa in particular is majorly determined by *EDS* and *INR* especially for private external debt accumulation; while *EDS*, *INR*, and *EXC* and to some extent *BUD* help in to a lesser extent in external debt determination in the two countries under study. It is worth nothing that Government external debt is not affected by either *INR* or *EDS*, meaning that government borrowings disregard cost implication as against the private sector borrowers who are cost conscious and aversive in both countries.

Secondly on examining the effects of external debt on capital formation the study's outcome depicts that Capital formation in Nigeria is negatively affected by both *EXD* and *GEXD* significantly, while affected positively but not significantly in the case of *PEXD*. In the short run also the results are same as in the long run, *CAP* is negatively and significantly explained by *EXD* and *GEXD* but not *PEXD*. The South Africa's outcome shows that the three models have same relationships with CAP; in other words *CAP* is negatively and significantly explained by *EXD, EXD* and *PEXD* in the long run. In the short run, also *CAP* has been negatively and significantly explained by *EXD*, *GEXD* and *PEXD*. These findings have been re-affirmed by the outcome of the *ECT* being negatively signed and statistically significant in the three models under review.

The investigation of the impact of debt overhang and crowding out effects on capital formation is the subject matter of objective 3 of this study. The examination was undertaken from two perspectives; Impulse Response Function (*IRF)* and Variance Decomposition (*VD*). Using the *VAR* approach, the results of *IRF* show that, a one

standard deviation shock in *DOH l*eads to a substantial negative reaction by *CAP* successively with a statistically significant result over the thirty year period. The trace of the response of capital formation over a period of time, as a result of a shock on crowding out effect variable also reacted negatively as a whole but fluctuates over time from negative to positive. For South Africa, the reaction remains negative throughout the period under study consistently sharp negative reaction by *CAP* resulting from shock in *COE*. But the reaction by capital formation was different for the traces of a standard deviation in debt overhang (DOH) which reported a negative reaction up to the 3rd period and then becoming positive up to the end of the 10th period.

Variance Decomposition (*VD)* using same VAR approach was also calculated in order to establish the effects of the independent variables on the dependent variable. The two variables of interest explained in the model; *DOH* and *COE,* put together contribute much greater proportions than the remaining explanatory variables. Thus it can be concluded that *DOH* and *COE* contributes much more to the changes in capital formation than any of the remaining variables put together. In the case of South Africa the two variables of interest, *COE* and *DOH,* did not contribute as much as contributed by *INR* or *EDS.* Thus we can conclude that shock in *DOH and COE* does not significantly contribute in the explanation of changes on *CAP* in South Africa.

Finally, the fourth objective of the study is that of the determination of the extent and direction of causality amongst, especially the variables of interest. This goes a long a way in paving a planning path for policy formulations. In the study it has been established that *EDS* and *INR* have a bidirectional causal relation with *EXD.* On the

other hand however *GEXD* and *PEXD* did not Granger cause *EDS* and *INR*. Majorly it has been established that when discussing the effects of external debt on capital formation in Nigeria and South Africa, it has been confirmed that, while there is a causal relationship between *EXD* and *CAP* there is no causality running from *CAP* to *EXD*. The *GEXD*, *CAP* causality is also unidirectional running from *CAP* to *GEXD*. There is however zero causal relations between *PEXD* and *CAP*. It is worth nothing however that, there is a bidirectional causality running between *SAV* and *CAP* in Model 10. While there is a causal relation between *COE* and *CAP*, there is no causality between *CAP* and *COE*; just as there is zero causality between *CAP* and *DOH*. In South Africa on the other hand the results present bidirectional causality between *CAP* and *EXC*, unidirectional causality between *CAP* and *COE*, but zero causality between *CAP* and *DOH*.

5.3 Policy Implications and Recommendations

The policy implication of the research findings from the foregoing summary is that the accumulation of foreign debt will continue as far as the external debt services and outrageous interest charges continue by the foreign lenders which further aggravate the borrowing countries inability to service or fully pay up their outstanding facilities. The major determinants of the external debt accumulation are same in the two countries and will continue to aggravate the debt accumulation process if measures are not taken by the governments of these nations in dealing with the problems using specific monetary and fiscal measures geared towards promoting external debt management strategies that are designed towards controlling the menace of debt overhang and crowding out effects, in addition to interest and exchange rate regimes

that are meant to reduce the effect of extrernal debt services and interst charges or general cost of funds on the economy.

On the effects of external debts on capital formation however, and based on our discussed findings it can be easily predicted that the consequences on the economy would be a very slow growth rate due to the retarded speed of the capital formation process. Expect for *PEXD* in case of Nigeria the effects on *EXD, GEXD* and *PEXD* all reported negative relationships between capital formation and external debts. It means therefore that the negative effects of the two nation's foreign borrowing will be on the increase which will be direct and proportionate effects on the economy in general and capital formation in particular. It is thus, significant, for these nations to reconsider their external debts signing and contracting procedure insisting that loans are only taken after a rigorous appraisal in order to determine the needs, desirability and sustainability of the facilities.

The third objective of the study is the examination of the impact of *DOH* and *COE* on capital formation in the two nations under review. The result of *IRF* shows that, a one standard deviation shock in *DOH l*eads to a substantial negative reaction by *CAP*. It can also be observed from the result that the trace of the response of capital formation over a period of time, as a result of a shock on *COE* is significantly negative. South Africas results depicts that, the reaction remains negative throughout the period under study; consistently sharp negative reaction by *CAP* resulting from shock in *COE*. But the reaction by capital formation was different for the traces of a standard deviation in *DOH* which reported a negative reaction up to the third period and then becoming positive up to the end of the tenth period. The policy implication of this

result is that, the stronger the *DOH* the more negative effect on *CAP*. Government policies should therefore be geared towards the reduction of the strength of the the negative effects of *DOH* and *COE*.

Variance decomposition calculated for 10 years indicates that *DOH* and *COE* put together contribute much greater proportions than the remaining explanatory variables in explaining *CAP*. Thus it can be concluded that *DOH* and *COE* contributes much more to the changes in capital formation than the remaining variables. In the case of South Africa, the two variables of interest, *COE* and *DOH,* did not contribute as much as contributed by *INR* or *EDS.* It can thus be concluded that shock in either *DOH or COE* does not significantly contribute in explaining changes in *CAP* in South Africa. It suffice therefore to say that while in Nigeria the focus should be on reduction of the effects of *DOH* and *COE*, South Africa on the other hand should focus towards alleviating the effects of *INR* and *EDS*.

Finally, the question of causality between and among the dependent and independent variables and its extent and direction is addressed in establishing Objective 4. The study has established that *EDS* and *INR* have a bidirectional causal relation between *EXD* with *EDS* and *INR.* Majorly it has been confirmed that when discussing the effects of external debt on capital formation in Nigeria and South Africa it has been confirmed that while there is a causal relationship between *EXD* and *CAP* there is no causality running from *CAP* to *EXD*. The *GEXD, CAP* causality is also unidirectional running from *CAP* to *GEXD.* There is however zero causal relations between *PEXD* and *CAP*. While there is a causal relation between *COE* and *CAP,* there is no causality between *CAP* and *COE*; just as there is zero causality between *CAP* and *DOH*. In South Africa on the other hand the results present bidirectional causality

between *CAP* and *EXC*, unidirectional causality between *CAP* and *COE*, but zero causality between *CAP* and *DOH*. Thus policies on *EDS* and *INR* will directly affect *EXD* and vice versa. In other words where causality is zero policies on one variable will not affect the other but invariably affect one another in case of bilateral causality.

Based on the above policy implications, the study provides some policy recommendations for consideration. In general therefore, it is the view of this study that, apart from government cutting down on its expenditures especially on recurrent and maintaining fiscal discipline, political stability should also be considered paramount, for no investment prospers without conducive and enabling business environment. In addition, since long outstanding facilities contribute to large repayment requirements that ultimately translate to the fact that other resources meant for investments are diverted to loan servicing and repayment. The facilities should not be allowed to go bad or remain outstanding in order to minimize the impact of debt servicing and maintainance cost. In addition also, emphasis should be placed on concessionary aid derivation from multilateral donor agencies and foreign direct investors.

External borrowing, especially from commercial creditors, could be considered only after detailed and comprehensive feasibility studies on the social and commercial viability of the project is undertaken and should not be government guaranteed. As long as investments proved to be viable and has maintained commercial net worth by paying interest and principal regularly borrowing is not expected to pose any problem. Government should curtail its extra budgetary activities and reduce its expenditure. In other words, there should be fiscal discipline. The country should be stabilized

politically in order to attract foreign capital in the form of direct and portfolio investment while at the same time improving its credit worthiness.

The consequence of the study for other debtor countries include proper management of external funds by creating or improving debt management structures and decision making process. External external should be sourced for highest priority projects and must be applied on well-appraised and self-liquidating projects with the utmost priority. Such facilities should signed only on high and direct impact on economic development. There is also the need of cultivating a culture of transparency in the issue of debt management. Governments should make fiscal variations through cuts in expenditures. This could reduce the level of deficit financing which exerts pressure on foreign exchange.

5.4 Research Limitations

This study has developed a framework and methodology than can be generally applied to all economies globally. This is expected to provide empirical findings and subsequently solutions that will stand the test of time with a generalized acceptability. The recommendations from these findings would not only provide empirical solutions but would also go beyond the numbers to give an in-depth explanation of the external debt, capital formation relationship, not only from the standpoint of the government external debt or private external debt, but also the total external debt. Notwithstanding, the empirical estimation is limited by the availability of data especially in the case of South Africa. It is also possible that it suffers from data source bias in the case of the time series data collected. The time period in estimations is only between 1980 and 2013. Such time series data are updated annually. The world is always evolving and hence dynamic; therefore there is always the need for

more studies using much more up-to-dated data. There is also the possibility for changes in regulations and legislations as time progresses. It is therefore assumed that this study always has opportunities for further research in this area in the future. Countries all over are characterised by deficits budgets and fall in domestic revenues and subsequently less savings which in turn necessitates borrowing from outside these nations. The main subject matter of these will not become obsolete any time soon.

This study uses time-series data to examine the determinants of total external debt stocks, public external debt and private external debt in Nigeria and South Africa. It also examined the effects of external debts in its various forms on capital formation in the two nations. The study also examined the causal relationship of debt overhang and crowding out effects in the two economies. The success of all econometric analysis relies ultimately on appropriate data availability. The research utilizes secondary data from various sources. The quality and data available has limited the results of this study. The period was chosen due to published data being available for all variables involved in the model across the entire period. Some important variables are either missing or limited as a result of which sources are used jointly. These limitations arise from the difficulty of finding consistent data that is reported by several institutions. Data from a single institution can at some instances give different figures for the same year.

5.5 Recommendations for Future Research

So many problems have been raised in the literature review chapter of the study which were in no way exhaustive. These were problems revolving around the SSA countries inability to raise capital in order to create a strong economy through a viable and

sustainable capital formation that guarantees economic development. This emanates from the countries inability to raise enough savings that will provide the required capital, and hence resort to external borrowing which has been confirmed to have a number of negative effects. These attempts however have not completely addressed all the problems of previous studies as pertains to the area under study.

The first objective of the study adopted the ARDL model in examining the determinants of external debt accumulation in Nigeria and South Africa. Based on the need for larger sample and greater coverage, the need to increase the number of observations and sample size cannot be over emphasized. Further studies may therefore be conducted using other external debt frown economies from different geographical regions of Africa. Panel ARDL may be considered in order to give room for wider coverage and thus greater understanding of the external debt phenomenon.

Future studies should consider new set of information to further identify the factors that determine capital formation in Nigeria and South Africa. Moreover, in the small open economies, like the sub-Saharan African countries confronted with macroeconomic instability and rampant policy changes, such factors like, exchange rate and inflation volatility, country risk index, political instability and structural breaks among others should also be considered in the estimation process. The methods include but not limited to; Gregory and Hansen (1996); Lütkepohl, Saikkonen and Trenkler (2001) for analyzing co-integration and VAR vector autoregressive modeling which were of course outside the scope of the current study.

Other important variables to be considered should include institutional variables such as corruption. This is due to the prevalence of high level of corruption in the sub-Saharan African economies. The institutional quality variables also play a role in leading to building investors' confidence and encourage investment into the domestic economy. This will lead to increase in capital formation (Yartey, 2007).

Objective 4 dealt with causal relationship between capital formation and external debt in Nigeria and South Africa. However, this is limited to a few combinations, of variables and determining factors. It is recommended that further studies should investigate the causality among the other possible combinations in order to prove some other hypotheses like good governance in relation to external debt and capital formation. This study employed asymptotic Granger causality to determine the causal relationship among the variables. Therefore, it is recommended that future studies should compare between the asymptotic Granger causality and other econometrics methods like the Toda and Yamamoto (1996) causality approach to allow for more general conclusions in the sampled countries.

5.6 Conclusion

In conclusion, this work has seen the interaction between external debts, capital formation and other micro economic variables like exchange rate, interest rate, external debt services, and budget deficits and on a general note, the gross domestic product in the two nations under consideration. It has also been acknowledged that Nigeria and South Africa are developing countries with great potentials for rapid growth. However, it has been realized that these potentials could not be maximized without adequate and sound capital formation process. Thus, given the capital

inadequacy of the nations both in terms of foreign exchange and domestic savings, one option is to obtain foreign financing to bridge these gaps. But, if foreign borrowing is to be resorted to, such funds must be invested in productive activities; that is the marginal efficiency of investment or internal rate of return must be higher than the cost of capital. Finally, external debt problems can be overcome in these countries, when they cultivate the right policies such as trade liberalization, tax reforms and favorable investment climate. Reducing the external debts burden will enable the country to use the lean foreign exchange earnings to procure the needed inputs for industries and infrastructures; this would help in restoring investment, financial solvency and promoting economic growth and domestic savings.

From the findings of this study the negative consequences of external debt to capital formation is eminent. The nations efforts interms of fiscal policies should be enhanced towards reducing to the bearset minimum the cost of external debt servicing and maintainance, while its diversification should draw from the major determinants of external debts in both Nigeria and South Africa. The exchange rates regimes should be closely monitored and guided to forestall inflationary trends while budgetary controls are put in place to sanitize those conditions that warrants budgets deficits. This can be approached through fiscal adjustments and cuts in expenditures and subsequent reduction in deficit financing that normally exerts pressure on the scarce foreign exchange for SSA countries.

The heavy burden of debt servicing that confronts Nigeria and the South African economies has adversely affected their level of economic performance. The levels of debt service payments were considerably significant translating into the fact that

resources meant for investment and subsequent improvement of capital formation in the two nations were lost in debt servicing. In form of trickledown effect of the external debt burden, the adjustment policies and the cost of maintenance of the debt could aggravate the already poor social welfare services in such diverse areas like education, health and so on. A very important side effect of the debt overhang phenomenon can also be seen in the eroding of the foreign exchange availability. It is also pertinent to note that the availability or otherwise of foreign exchange can in turn affects the rate at which an economy performs.

The most serious implication of debt overhang is that, it has reduced the amount of foreign exchange available to finance the importation of raw materials and capital goods needed for rapid economic development. This will mean that burden of the external debt accumulation will deny other significant sectors of the economy the desired raw materials and factor inputs, thus retarding the progress in new investments and possibly capital stocks maintenance which can directly mean retarding or slowing down capital formation. Essentially policies had to be devised in order to improve the macro economic performance which was slowed down by excessive external debt service costs which exacts extreme pressure on the foreign reserves and the foreign exchange rates. This study also established that accumulation of unpaid portion of the debt coupled with the non-provision of debt service have contributed to the fall in the countries credit ratings.

The derived lessons from the findings of this study for other borrowing nations include amongst others, prudent and professional management of externally sourced loans facilities by building and refining the external loans administration

organizations and decision making bodies. External financing should be solely based on needs and highly prioritized for highest developmental projects.

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