

**EXTERNAL DEBT, CAPITAL FORMATION AND ECONOMIC  
GROWTH IN ECOWAS COUNTRIES**

**By**

**AKPAH, JONATHAN OMEKACHI  
PG/MSc/16/82387**

**DEPARTMENT OF ECONOMICS,  
FACULTY OF SOCIAL SCIENCES  
UNIVERSITY OF NIGERIA, NSUKKA**

**SUPERVISOR: DR. F.O. ASOGWA**

**AUGUST, 2019**

**TITLE PAGE**

**EXTERNAL DEBT, CAPITAL FORMATION AND ECONOMIC GROWTH IN  
ECOWAS COUNTRIES**

**APPROVAL**

This research work titled “External Debt, Capital Formation and Economic Growth in ECOWAS Countries” has followed due process and has been approved to have met the requirement for the award of Master of Science (M.sc) degree in Economics, University of Nigeria, Nsukka.

.....

Date.....

Dr. F. O. Asogwa  
Supervisor

.....

Date.....

Prof. Chukwu Jude  
Head of Department

.....

Date.....

Prof. Leonard, Ugwu  
Dean, Faculty of social sciences

.....

Date.....

External Examiner

**CERTIFICATION**

This is to certify that Akpah, Jonathan Omekachi - an M.sc student of the University of Nigeria, Nsukka with registration number PG/MSc/16/82387 has successfully completed the research required for the award of Master of Science (M.sc) degree in Economics in the afore-mentioned institution. The work covered in this project is original and has not been submitted in part or full for any other degree of this university or any other university.

.....

Date.....

Dr. F. O. Asogwa

Supervisor

.....

Date.....

Prof. Chukwu Jude

Head of Department

## **DEDICATION**

This research work is dedicated to GOD ALMIGHTY and the HOLY SPIRIT who inspired and enlightened my thoughts.

## ACKNOWLEDGEMENTS

I express my profound gratitude to my supervisor Dr. F. O. Asogwa, for his tutorship, mentorship and intellectual advice and contributions that he made, which make this work come out better. I also use this medium to thank Dr. Jonathan E. Ogbuabor, Dr. Innocent Ifelunini, Dr. Anthony Orji, and other academic and non-academic staff of the department of economics for their assistance, guidance, encouragement and advice.

My deepest and immeasurable gratitude as well goes to my parents, Mr. & Mrs John Akpah and siblings for the encouragement, support and sacrifice through the period of the study. God bless you.

Finally, I must in all sincerity thank Mr. Aduku E. B., and Mr. Ben Ozougwu, for their immense contributions to this thesis. Also, I wish to say thank you to Mr. Godfrey Ihedimma and all my class mates in the department of economics for their love, cooperation, and togetherness. May the good Lord continue to guide and protect each and every one of you in your various endeavours in life. Once again, thank you all.

## TABLE OF CONTENTS

Title page	i
Approval	ii
Certification	iii
Dedication	iv
Acknowledgements	v
Table of contents	vi
Appendices	ix
List of tables	x
Abstract	xi
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
1.1 Background to the study	1
1.2 Statement of the Problem	4
1.3 Research Question	10
1.4 Research Objectives	10
1.5 Research Hypotheses	11
1.6 Significance of the Study	11
1.7 Scope and Limitations of the Study	12
1.8 Organization of the Study	12
<b>CHAPTER TWO: LITERATURE REVIEW</b>	<b>14</b>
2.1 Conceptual Framework	14
2.1.1 External Debt	14
2.1.2 Capital Formation	17
2.1.3 Economic Growth	16
2.2 Theoretical Literature	17
2.2.1 Theories of External Debt	17

2.2.1.1 The Classical View	17
2.2.1.2 The Keynesian View	19
2.2.1.3 Neoliberal Economists View	22
2.2.1.4 The Conventional View	23
2.2.1.5 The Debt Overhang Theory	24
2.2.2 Theories of Economic Growth	25
2.2.2.1 Harrod-Domar Growth Model	25
2.2.2.2 The Solow's Growth Model	26
2.2.2.3 Traditional Neoclassical Growth Theory	27
2.2.2.4 Endogenous Growth Theory	28
2.2.2.5 The Cobb-Douglas production Theory	29
2.3 Empirical Literature	29
2.3.1 Empirical Evidences of External Debt-Growth Relationship	29
2.3.2 Causality analysis of external debt and Economic growth Nexus	35
2.3.3 Empirical Evidences of Debt Servicing-Growth Relationship	35
2.4 Identified Gap and Value Addition	37
<b>CHAPTER THREE: RESEARCH METHOD</b>	<b>39</b>
3.1 Theoretical Framework	39
3.1.1 The Cobb-Douglas Production Function Theory	39
3.1.2 The Debt Overhang Theory	40
3.2 Model specification	41
3.3 Definition of variables in the Model	44
3.4 Estimation Technique	45



3.4.1.1 Pre-estimation Test	47
3.4.1.2 Panel Unit Root Test	47
3.4.2.1 Panel Co-integration Test	48
3.4.3 Error Correction Model	48
3.5 Data Source and Econometrics Software	49
<b>CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS</b>	<b>50</b>
4.1 Introduction	50
4.2 Descriptive Statistics of the Variables	50
4.3 Unit Root Test	52
4.4 Pedroni's Cointegration Test	54
4.5 External Debt, Capital Formation and Economic Growth	55
4.6 The Optimal External Debt Threshold	57
4.7 Direction of Causality between External Debt, Capital Formation and Economic Growth	59
<b>CHAPTER FIVE: SUMMARY OF FINDINGS AND CONCLUSION</b>	<b>61</b>
5.1 Introduction	61
5.2 Summary of the Findings	61
5.3 Economic Policy Relevance of the Major Findings	62
5.4 Conclusion	64
5.5 Policy Recommendations	65
5.6 Areas for Further Studies	65
5.7 Contribution to Knowledge	66
<b>REFERENCES</b>	<b>67</b>

**APPENDICES**

APPENDIX A: DATA USED FOR THE STUDY 75

APPENDIX B: ESTIMATION OUTPUT 93

**LIST OF TABLES**

Table 4.1: Mean, standard deviation, maximum values, and minimum values of the variables of the overall panel	51
Table 4.2: Im, Persaran and Shin (IPS) and Breitung unit root test results	53
Table 4.3: Result of Johansen test for cointegration	54
Table 4.4: The impact of external debt and capital formation on economic growth	55
Table 4.5: GMM Result used in computing the optimal external debt threshold	57
Table 4.6: Debt-to-GDP ratio of the ECOWAS countries using the 2018 real GDP and external debt values	58
Table 4.7: Result of causality between external debt and economic growth in ECOWAS Countries	59
Table A1: The panel data set used for the study	75

## ABSTRACT

This study empirically examined the relationship between capital formation, external debt and economic growth in ECOWAS countries from 2000 – 2018 using the Generalized Method of Moments (GMM) estimator. Empirical results showed that capital formation had a positive and significant impact on economic growth, while external debt had a significant negative impact on economic growth. It was also found that the optimal threshold for external debt in the ECOWAS countries is 75.95 percent. In addition, it was found that the debt-to-GDP ratio of the ECOWAS countries were below the threshold value of 75.95 percent except Cape Verde whose threshold value stands at 96.5 and 91.1 percents in 2017 and 2018 respectively has surpassed the turning point value 75.95 percent. The results also showed no significant Granger causality running from capital formation and economic growth to external debt. Uni-directional causal relationship between external debt and capital formation was, however found. On the basis of the above, the study recommended that ECOWAS executives should collaborate with the governments of member countries to pursue adequate governance practices if they are to ensure appropriate and effective external debt management in ways that economic growth will be enhanced instead of economic growth retardation.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the study**

Human wants are insatiable and the means or resources available for the satisfaction of wants are limited in their supply (Olukunmi, 2007). The above assertion is true in individual and national lives. In order to meet nationwide wants among limited resources, countries might resort to borrowing which generates debt. The cumulative of all claims in contradiction of the government which is held by the private sector of the economy or by foreigners, be it interest bearing or not, less which ever claim held by the government in contrast to private sectors and foreigners is debt (Oyejide, Soyede & Kayode, 1985). The nations resort to borrowing as a result of shortfall in domestic savings to finance productive activities (Ezeabasili, 2006 and Momodu, 2012). Debt may well be within a country's boarder (Internal) or outside (External). A repayable debt owed to non-residents of a country in terms of service, food or foreign currency is defined as external debt (World Bank, 2004). Thus, its effect on investment and economic growth of a nation has remained debatable for policy makers and academics alike. There has not been unanimity on the impact of external debt on economic growth. The stimulation of an economy from external debt or borrowing cannot be questioned if used properly but whenever a country amasses considerable debt, a sensible percentage of public expenditure and foreign exchange earnings will be engrossed by debt servicing and repayment with hefty opportunity costs (Albert, Brain and Palitha, 2005).

It is well acknowledged that external debt can be harmful to economic growth if it gets too high. But how high is too high? 60% was indicated as a threshold beyond which growth will decline by 2% (Reinhart & Rogoff, 2010). The debate still goes on as to the possible impact of public debt accumulation on economic growth. When debt is accumulated over long periods, it lowers the levels of economic activity and hurts economic performance by crowding out private investment and leading to higher long term interest rates and more aggressive future taxation (Chudik et al., 2018). This calls for concern especially in developing countries where it is argued that only sustained annual growth at around 7% could ensure a developmental impact. Thus, developing countries cannot afford that their growth efforts be annihilated by excessive external debt.

In 2017, the International Monetary Fund (IMF) raised the alarm over the rising of public sector debt in African countries (IMF, 2017). Indeed, the IMF found that on average, the ratio of public debt to GDP increased by some 10% points since 2014 to an average of 48% of GDP in 2016 and expected to exceed 50% in 2017. In the ECOWAS region, several countries have been identified with high risk of debt distress. They include Togo, Côte d'Ivoire, Niger, Benin, Cabo Verde, The Gambia, Ghana, Senegal and Sierra Leone (IMF, 2018; and AfDB, 2019). The West Africa Economic Outlook 2018 (AfDB, 2018) also underscore the rise of debt to GDP ratio of the region above 40%. The debt to GDP ratio enable the assessment of a country or region's capacity to repay its debt. It therefore provides an indication of credit worthiness. It is thus important that it is monitored closely and the extent to which it is annihilating the growth efforts or not is investigated. In line with this, the Authorities of the ECOWAS Commission set a regional threshold at 70% as part of their agreed convergence criteria<sup>1</sup>(ECOWAS,2001). It is hoped that all the ECOWAS member countries will comply with this threshold among others and pave the way towards the envisaged single currency.

Sustainable economic growth and poverty reduction strategies are being hindered by excessive external debt (Sanusi, 2003; Maghyere & Hashemite, 2003 and Berensmann, 2004). The supporter of external borrowing argue that external debt has positive influence on the economy base on the fact that external debt will upsurge capital inflow and when used for productive projects, fast-tracks the pace of economic growth. The capital inflow could be linked with technical expertise, access to foreign market, technology, as well as managerial know-how. The above statement is in agreement with the views of the Keynesian Theory of capital accumulation as a catalyst for economic growth. However, there may be a negative impact of external debt on investment through debt projection and credit-rationing problem (Eduardo, 1989). The phenomenon debt extension or overhang is a situation in which sizable resources are used for debt overhauling such that it suppresses economic growth. Therefore, it becomes tax on domestic production such that the sum spent hinders meaningful economic growth actions as it reduces resources available to government to implement growth oriented economic policies. Credit allotting effect occurs when a nation is unable to pay her debts. To narrow savings investment gap, the authorities might increase interest rates consequently affecting new investment and creating greater surplus for debt servicing and repayment. However, this may afterward reduce future growth expectations.

In similar vein, Soludo (2003) explains that nations borrow for two broad categories; macroeconomic reasons to either finance higher investment or higher consumption and to

bypass hard budget constraint. This entails that an economy borrow to lift economic growth and assuage poverty. Soludo (2003) in Okonjo-Iweala et al (2013) contends that once an initial stock of debt grows to a certain threshold, servicing them becomes an encumbrance, and nations find themselves on the wrong side of the Debt Laffer Curve, with debt thronging out investment and growth. Conversely, a nation's indebtedness does not necessarily slow growth, rather it is the country's inability to optimally utilize these loans to foster economic growth and development and guarantee operational servicing of such debt that impedes the benefits derivable from borrowed capital resources (Bakare, 2011).

Arguably, one of the key economic challenges facing governments in low income nations is debt due to their insistent budget deficit and this has continued to invite the attention of international financial institutions, and bilateral lenders. This has brought about implementation of several initiatives capable of reducing the debt burden which remains a hindrance to the growth prospects of most Highly Indebted Poor Countries (HIPC) economies (Udeh, 2013). These initiatives range from debt postponement to outright annulment. The debt service burden has militated against ECOWAS countries rapid economic development and worsened the social problems (Audu, 2004).

Elbadawi et al. (1996) maintain that debt servicing was about one third of the public budget spending of ECOWAS nations', having about three times of its spending on education and nine times on their health funds on servicing unsettled debts. They note that ECOWAS nations were only paying little over half its scheduled debt service. Grants from donor nations were then one-hundredth of the value of debt service. The reality is that there was a lattice transfer of funds from ECOWAS nations to the developed nations.

The case of debt burden on emerging nations can be linked to the early 1980's after the oil price increase of the 1970's. It was the outcome of responses by the international community to "oil price shocks". One of the bequests of Economic Community of West African State (ECOWAS) nations from the crisis has been a rising debt stock and debt service payments, which constituted a major -constraint to economic growth and social development (Elbadawi et al., 1996).

Additionally, the opus of the whole foreign debt of the ECOWAS nations was mainly made up by unpaid principal and interest payment, which have directly affected the composition of current principal balance. This might lead to problem of likely debt overhang crisis if not arrested, which may impede efforts made to restore the economy to the alleyway of recovery

and growth. Since African nations had been sovereign and the substantial debt it had incurred given the number of years, coupled with the prevailing institutions, one can argue that the entire spectrum of the economy has not been adequately active, particularly when compared with the economy of parallel or lesser aged emerging countries. The ECOWAS was set-up on 28 May 1975 when fifteen heads of states of West African countries signed the treaty establishing it at Lagos, Nigeria. The creation of this body was considered significant for the economic improvement of the sub-region which is by virtue of their small sizes and markets.

The fifteen member states, though were members of different colonies, have strong historical and cultural relationships. Most of the nations in the sub-region have very low income per capita, and bears the load of hefty external debts. These nations have diverse levels of economic growth and resources. Also, the ECOWAS economies represent 25 percent of Africa's land area, which covers a surface area of about 6,142,000 sq. km. 34 percent of Africa's total population is within the shores of ECOWAS nations, and stretches from the southern boundaries of the Sahara desert to the Atlantic Ocean along the Gulf of Guinea to Biafra and from the eastern shores of the Atlantic from Senegal to Lake Chad. The climatic and geographical conditions of these nations range from equatorial rain to hot desert belt (Jones, 2002). The Economic Community of West African States (ECOWAS), in French it is called Communauté économique des États de l'Ouest, (CEDEAO) comprises of Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. ECOWAS has two regional economic groupings'. West Africa Monetary Zone (WAMZ) her members are Gambia, Ghana, Guinea, Nigeria, Sierra Leone and Liberia ii. West African Economic and Monetary Union (WAEMU) also known as UEMOA from its name in French, Union économique et monétaire ouest-africaine with a member countries of Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo and Guinea-Bissau (ECOWAS, 2015). For the purpose of this study, we are going to concentrate on fifteen ECOWAS countries namely Nigeria, Ghana, Sierra Leone, Gambia, Liberia, Benin, Burkina Faso, Côte d'Ivoire, Niger, Guinea Bissau, Togo, Senegal, Cape Verde, Guinea, Ivory coast and Mali.

## **1.2 Statement of the Problem**

Although a substantial proportion of Sub-Sahara Africa debts and ECOWAS countries inclusive are development related, the ability to service them does not only depend on growth and development in the debtor countries, but also on a healthy and expanding world



economy. Neither of these conditions was obtained during the 1980s (Abbott, 1993). The presumed growth and development did not take place, and instead of promoting the growth and development process, the development loans retarded it by pre-empting a rising share of their restricted foreign exchange resources for debt-service payments.

ECOWAS sub-region has continued to experience worsening economic conditions that encouraged high levels of foreign borrowing to augment deficient domestic savings and capital formation to stimulate domestic investment, production and growth. The growth performance has been very disappointing due mostly to the increased outflow of resources in debt service payments. The acquired loans did not yield a rate of return higher than the cost of borrowing to repay the debt. Moreover, the region's economies have had a history of debt-servicing difficulties due to insufficient domestic resources. This was showed by the fact that on numerous occasions the nations were in debt-service arrears. The high external debt-service has depleted the savings and foreign exchange earnings that could have been used in domestic investments and in the provision of social services for the growing population. All these are symptoms of high debt-to-GDP ratio that is up to or near the optimal threshold. The region's mounting debt stocks have discouraged the inflow of foreign resources in the form of foreign direct investment for fear of high taxation rates and macroeconomic policy distortions. Instead of attracting resources from abroad, domestic resources flee to the developed nations either for safe keeping or to be invested. Domestic capital flees abnormal risks at home or escapes the control of domestic authorities.

Extensive debt-driven capital flight has taken place in ECOWAS Sub-region. For example, in Ghana the rate of capital flight to GNP and capital flight to external debt in 1991 was 25 percent and 41 percent respectively (Valpy & Cobham, 2000). The resources that could have been used to build health care centres, schools and other social infrastructures are being used in debt service payments. Public sector investment, which provides employment for the majority of the population, has fallen considerably as a result of the external debt burden. The overall trend of regional debt to GDP ratio from 1990 to 2016 depicts although it was increasing in the early 90s. Regional debt to GDP ratio (hereafter debt) increased sharply from 138.54% in 1990 to 255.69% in 1994 which was an 84.56% increase in just five years. The year 1994 coincided with the devaluation of the CFA francs, the currency shared among eight of the fifteen ECOWAS countries. From 1994 going forward the debt indicator was downward sloping. This declining trend continued and it was only in 2007 that it reached a

level below 100%. It stood at 80.15%. In 2016, the debt indicator stood at 32.17%. This trend of the debt indicator is in contrast with the trends of per capita GDP and inflation. Indeed, these two indicators were both upward sloping throughout the period of analysis. Per capita GDP rose from US\$ 669.84 (constant 2010 US\$) in 1990 to US\$ 904.52 in 2016 which was an increase of 35% over the period of analysis.

Looking at investment at the regional level, it's observable that it has been very low. Indeed, it was below 20% from 1990 till 2010 where it rose to 21% and remained in the neighborhood of 20% till 2016. The highest investment rate stood at 21.48% of GDP and was achieved in 2012.

Considering individual countries' recent trends of the debt variable and fiscal balance with the view to ascertaining their path towards the regional thresholds set at 70% and 3% for the debt and the fiscal deficit variables respectively.

In Benin republic, public debt stood at 56.1% in 2018 from 49.7% in 2016, a 12.9% increase over just two years. This was a continuous increase over a period of five years. At the same time, the country's external debt which stood at 21.4% in 2016 rose to 26.5% in 2018 which is a 23.8% increase over a period of two years. External debt is expected to continue its rise in 2019 up to 27.3%. The country's external debt is about 48.6% of total public debt. Although country's authorities are projecting a decline of total public debt starting from 2019, ensuring that it remains on that declining path will not be easy since it will require keeping the fiscal deficit<sup>2</sup>, which stood at 4.0% in 2018, below 3% of GDP to be in line with the ECOWAS criterion (IMF 2019a). The risk of debt distress is assessed as moderate.

In Burkina Faso, public debt stood at 42.5% in 2018 and is expected to stabilize around to 42% in 2019 (IMF,2019b). The country's external debt which was at 26.5% in 2016 has fallen to 23.8% in 2018 and it is about 56% of total public debt. The country's fiscal deficit which stood at 4.7% in 2018 is still above the ECOWAS threshold and is expected to be brought down to 3% in 2019.

In Cape Verde, government debt is quite high. Indeed, it stood at 127.7% in 2018 and it is expected to slightly decrease to 125.3% in 2019. The country's external debt is also on the high side. It stood at 91.4% in 2016 and remained at that level in 2018. This is above the regional threshold and the external debt is above the level that Reinhart and Rogoff (2010) considered to be excessive. External debt is about 71.6% of the country's total debt. Despite this high level of government debt, the country's fiscal balance is within the regional

threshold. Indeed, the fiscal deficit stood at 2.7% in 2018 and it is expected to be 2.3% in 2019.

In Cote d'Ivoire, public debt is still on an upward sloping trend. It stood at 53.2 in 2018 up from the 48.4% registered in 2016 (IMF,2019c). This is the highest level since the 2012 HIPC debt restructuring. 2019 is expected to be the turning point to reverse the upward trend of debt. External debt is also on the rise. Indeed, it moved from 27.7% of GDP in 2016 to 35.9% in 2018 which is a 29.6% increase over two years. The country's deficit stood at 4% above the regional threshold. It is expected to be brought back to the regional target of 3%. The country's risk of debt distress is still classified as moderate.

The Gambia's total debt is also on the high side. Indeed, it is above 80% of GDP. In 2018, it stood at 83.2% and expected to fall 78.7% in 2019 still above the regional threshold. The country's external debt stood at 40.9% in 2016 and rose to 44.2% in 2018. It is expected to fall to 42.3% in 2019. It represents about 53% of government's debt. The country's fiscal balance is not encouraging. Indeed, the fiscal deficit has been in the neighbourhood of 6% over the past three years i.e. 2016 to 2018. For 2018, it stood at 6.6%. It is expected to drop to 0.2% in 2019 to comply with the regional target but this looks a bit unrealistic.

In Ghana, the second rebasing of GDP that took place in 2018 brought the Debt to GDP ratio which was at 71.8% in 2017 above the regional threshold to 57.3%. Government debt stood at 59.6% in 2018. External debt dropped slightly from 29.9% in 2016 to 27.9% in 2018. But it is expected to rise again in 2019 to 29.9% its level in 2016. The external debt is about 46.8% of total public debt. The country's fiscal balance is of concern. Indeed, the fiscal deficit stood at 7% in 2018 and is expected to be at 5.5% in 2019 thus missing the set regional threshold. The risk of debt distress remains high for the country (IMF,2019d).

In Guinea, government's outstanding debt stood at 60% of GDP in 2005 and was reduced to 44.2% over the 2010-2015 period and was further brought down to 42 and 40% in 2016 and 2017 respectively. It stood at 38.7% in 2018. External debt stood at 22.2% in 2016 and is down to 21.1 in 2018. Despite this downward trend, both total debt and external debt are expected to climb to 46% and 30.7% respectively in 2019 (IMF,2019e). The risk of overall debt distress is assessed as moderate (IMF,2019f). The country's deficit has remained below the ECOWAS threshold set at 3%. Indeed, it stood at 2% in 2018.

In Guinea Bissau, government debt has been alternating ups and downs. Indeed, it averaged 53.8% over the 2010-2015 period, rose to 57.9% in 2016 and to 53.9% in 2017. It stood in 2018 at 56.1% and it is expected to fall back to 54.9% in 2019. External debt is on the rise. Indeed, from 20.8% in 2017, it stood at 22.7% and expected to rise at 23.4% in 2019. The

country's fiscal deficit is above the ECOWAS threshold. It stood at 5.6% in 2018 although the country authorities have vowed to bring it under control around 2.8% in 2019.

In Liberia, government debt is on the rise. Indeed, from 28.3% in 2016 it stood at 40.5% in 2018, which is a 43.1% increase in two years. The debt is expected to reach 46.7% in 2019. The country's external debt followed similar trend. Indeed from 20.1% in 2016 it rose to 28.7% in 2018 (which is about 43% increase over two years) and represented 70.8% of total debt. At the same time Liberia's fiscal balance is not improving. Indeed, the country is running a fiscal deficit of 5.6% up from the 3.6% registered in 2016. This trend is worrisome because at this pace, the country will not meet the convergence criteria in 2019.

In Mali, government debt stood at 36.6% in 2018. This is a slight increase compared to the 35.4% registered in 2017 and it is not expected to increase much in 2019. The authorities are also trying to contain any rise in external debt. It stood at 23.3% in 2018. On the fiscal balance side, although the fiscal deficit stood at 4.7% in 2018, it is expected to be brought down to 3% in 2019 the ECOWAS threshold.

Niger is one of the country that has experienced a high increase in government debt. Indeed, it move from 43.7% in 2016 to 55.1% in 2018 which is a 26% increase in two years. External debt also moved from 29.4% in 2016 to 36.2% in 2018 and it is expected to fall to 34.8% in 2019. External debt represented 59.2% of the country's total debt in 2018. The fiscal balance situation is not good either. Indeed, it moved from 6.1% in 2016 to 4.9% in 2018. Despite this downward trend, the deficit is still above the Community's threshold.

In Nigeria, government debt is the lowest in the ECOWAS region. It stood at 28.4% in 2018 and is expected to reach 30% in 2019. The country's external debt is also on the lower side. It stood at 8.8% in 2018. The problem in Nigeria could be with the fiscal balance where it has been above the threshold for some years. It stood at 4.5% in 2018 and is expected to be at 5.1% in 2019 a worsening situation.

In Senegal, government debt is also on the rise. Indeed from 47.7% in 2016 it stood at 64.4% in 2018 which is a 35% increase over just two years. The country's external debt is on a similar trend. Indeed, it went from 31.2% in 2016 to 43.6% in 2018, a 39.7% increase over two years and it is expected to reach 44.9% in 2019. External debt represented about 67.7 % of total debt in 2018. The fiscal deficit stood at 3.4% in 2018 and is expected to fall to 3% in 2019.

Sierra Leone is another ECOWAS country with rising government debt. Indeed, from 55.5% in 2016, it jumped to 71.3% in 2018 which is a 28.5% increase in just two years. Similarly, external debt also rose from 36.7% in 2016 to 42.9% in 2018 and represented 60.2% of total

debt in that year. The country's fiscal balance is also of concern given its high level. Indeed, it stood at 6.8% in 2018 and is expected to be at 4.3% in 2019 missing the regional threshold. In Togo, efforts are underway to bring government debt under control. Indeed, it has decreased from 81.1% in 2016 to 74.6% in 2018 which is an 8% reduction. Government debt is expected to be reduced further in 2019 down to the regional threshold. External debt on the other side is on the rise. It went from 19.2% in 2016 to 23.6% in 2018, an increase of 22.9% over two years and is expected to reach 25.9% in 2019. On the fiscal balance, the country has also made efforts to bring the deficit within the acceptable limit of the regional threshold. It is expected to be below that threshold in 2019 at 1.5%.

It results from the above that at the regional level government debt indicator is below the set regional threshold of 70%. This is also true for individual member states with the exception of Cape Verde, The Gambia, Sierra Leone and Togo. Although the level of government debt may appear not to be a concern in light of the threshold, it is the persistent and rapid accumulation of public debt that is of concern as argued by Chudik et al (2018). External debt is also on the rise at the regional level as well as at the individual country level with the exception of Mali, Ghana and Burkina Faso.

Similarly, human capital and technology as a key factor in promoting growth and development is no longer affordable for similar reasons (Richards, Nwannaet al., 2003). Even though Structural Adjustment Programmes have been implemented since many years ago, the economies are still weak, vulnerable and not sufficiently transformed to maintain hastened growth and development. For example, in many countries of the region, the total debt stock in 1999 was almost equal in size to their GDP and the cost of debt-service relative to export earnings was more than 25 percent of the countries' export earnings. In 2000 for example, an estimated cost of external debt-service by the Ghanaian ministry of finance was found to be equivalent to 55 percent of government's total tax revenues, which implies that the government could no longer meet its domestic expenditures from domestic revenue without additional borrowing from foreign sources. Similarly, Cape Verde's external debt-to-GDP ratio stands at 96.5 and 91.1 percents in 2017 and 2018 respectively (International Monetary Fund, 2019), which could be too high for a developing economy.

Furthermore, since governments could no longer generate enough revenue to service foreign debts due to the deteriorating terms of trade and the narrow tax base, debt-service obligation could only be met by reducing expenditures in priority areas such as education, health care

systems, welfare and social services or by additional foreign borrowing. This has resulted to high fiscal deficits and inflation rates. Moreover, low public investment has resulted to lower overall investment since public investment is a significant proportion of total domestic investment in ECOWAS Sub-Region and may also be complementary to private investment. Lower overall investment means reduced potential for medium and long-term growth. Is there a regional threshold for external debt beyond which any additional borrowing will hamper the region's economic performance?

Iyoha (1996), Fosu, (1996) and Milton, (1999) are some of the studies that have examined the relationship between external debt and economic growth in the Sub-Saharan African Countries. Amoatag and Amoako (1996) concentrated on some selected African countries. Babu et al (2014), did a study on external debt and economic growth but his focus was on East African Countries while Suma (2007) who did a study on ECOWAS Sub-Saharan African Countries, concentrated equally on external debt crisis, investment and economic growth. This study, therefore, complements previous studies by investigating the impact of external debt, capital formation and economic growth in ECOWAS countries.

### **1.3 Research Question**

The following research questions will guide the study:

- i. What is the Impact of external debt and capital formation on economic growth in ECOWAS Countries?
- ii. What is the optimal external debt threshold for ECOWAS Countries?
- iii. What is the direction of causality between external debt, capital formation and economic growth in ECOWAS Countries?

### **1.4 Research Objectives**

The broad objective of this study is to examine the relationship between external debt, capital formation and economic growth in ECOWAS Countries. However, specifically the study intends:

- i. To ascertain the impact of external debt and capital formation on economic growth in ECOWAS Countries
- ii. To ascertain the optimal external debt threshold for ECOWAS Countries

- iii. To find out the direction of causality between external debt, capital formation and economic growth in ECOWAS Countries.

## **1.5 Research Hypotheses**

The following hypothesis guides the study:

H<sub>01</sub>: External debt and capital formation have no significant impact on economic growth in ECOWAS Countries

H<sub>02</sub>: There exists no optimal external public debt threshold for ECOWAS Countries

H<sub>03</sub>: There is no causal relationship between external debt, capital formation and economic growth

## **1.6 Significance of the Study**

This research work will be beneficial in abundant ways; first, the paper adds marginally to the empirical literature by providing the basic understanding of the concept of external debt, capital formation and its bearing on economic growth in the selected countries. Secondly, the study will be relevant to policy makers especially in the area of economic planning. More so, to firms, it will help them to know empirically the condition of the economic environment that they will invest their resources. It will equally aid the foreign investor to know whether our economic system is friendly for foreign establishment. On the part of government and its agencies, it will help them to make an informed decision based on whether it is profitable and growth sustaining to incur public external debt, corporate bodies and individuals will enjoy it most since it will help them to know how government and its agencies manage their economy. This work will also help economic managers to better understand the extent to which external debt and economic growth correlate so as to adopt efficient policy instruments towards achieving set targets that are germane to growth and development. It will also be useful to international development partners and donors to better appreciate external debt and growth nexus for control and regulation purposes in order to minimize any adverse effect that may accompany external debt in ECOWAS Countries.

## **1.7 Scope and Limitations of the Study**

This work focuses on the relationship between external debt, capital formation and economic growth in ECOWAS countries (Nigeria, Ghana, Sierra Leone, Senegal, Cape Verde, Gambia, Liberia, Benin, Burkina Faso, Cote d'Ivoire, Niger, Guinea Bissau, Ivory Coast, Togo and Mali), they are selected on the premise of being ECOWAS member States (they belong to the same economic block) and also on the availability of data. Furthermore, these countries share basic structural characteristics via GDP per capita as well as GDP to debt ratio are within a specific threshold. The period 2000 – 2018 will be covered in this study for the ECOWAS countries. The study undertakes a panel analysis, since a panel model allows us to control for individual heterogeneity, gives more informative data, more variability, less collinearity among variables, and more efficiency (Baltagi, 2008). The variables of interest are capital formation, external debt, external debt services and economic growth. Capital formation was proxied by gross fixed capital formation, while external debt and external debt services are direct variables, and economic growth was proxied by GDP growth rate.

One of the limitations of the study is the fact that it focused on ECOWAS countries, therefore, may not provide findings that may be peculiar to any particular country, or may not be generalized to other regions such as the East African Countries. Also, this study focused on the relationship between capital formation, external debt, and economic growth. Therefore, empirical evidence on the relationship between domestic debt and economic growth is not within the scope of this study. Notwithstanding, this study provided empirical evidence on the relationship between external debt, capital formation and economic growth of ECOWAS countries as a group. The study informed us of the optimal threshold for external debt in the ECOWAS countries.

## **1.8 Organization of the Study**

This research work consists of five chapters. Chapter one introduces the core variables in the topic and reveals the problems that have arisen which the study seeks to address. The objectives, research hypotheses, scope and significance of the study are also in this chapter. Chapter two covers discussions about the concept of external debt, capital formation and economic growth. Debt theories, capital formation and economic growth theories are reviewed under theoretical literature with the aim of identifying potential mechanism by which external debt cum capital formation affect economic growth. Also chapter three provides econometric investigation of the impact of external debt on economic growth and



the impact of capital formation on economic growth using the system GMM estimation technique. Moreso, chapter four details presentation and discussion of result, the descriptive statistics of the variable, preestimation test, estimation and post estimation test. The various model were subjects to various econometric test and the optimal external debt threshold was established for ECOWAS countries and the long run causal relationship of the economic variables were equally discussed. In chapter five, the summary of findings and conclusions of the study was discussed and economic policy relevance of the major findings were equally established. Areas for further studies focusing on the optimal external debt threshold for ECOWAS subregions were equally itemized and the contribution to knowledge established for the study.

## CHAPTER TWO

### LITERATURE REVIEW

#### INTRODUCTION

In economics as a discipline, many scholars had propounded a lot of theories on public external borrowing, capital formation and economic growth in Nigeria and Diaspora. In this chapter, most of these theories and empirical literatures will be reviewed. This chapter will be broken down into four sections namely: conceptual framework, theoretical literature, empirical literature and identified gap and value addition.

#### 2.1 Conceptual Framework

The concept of external debt, gross fixed capital formation and economic growth like others in the field of human endeavor has received various definitions and descriptions. This is because human beings view things from different perspectives. Therefore, this sub-section is meant to review some conceptual definitions of public external debt, capital formation and economic growth as given by scholars and then try to agree on a working definition for the work.

##### 2.1.1 External Debt

Arnone, Bandiera and Presbitero (2005) defined external debt as that part of a nation's debt that was borrowed from foreign lenders comprising loans from commercial banks, governments or international financial institutions. The need for external debt becomes essential when domestic financial resources are inadequate to finance public goods that upsurge welfare and bring about economic growth. External debts can also be viewed as funds obtained outside the country's boarder especially in foreign currency and are interest-bearing to finance precise project(s). The consequence of external debt on a country's economy has been a theme of debate among academics. Some view external debt as an accelerator of economic growth (Hameed, Ashraf & Chandhary, 2008). The stated view above is in agreement with neoclassical model of economic growth –the Keynesian theory in which capital accumulation is viewed as a catalyst to economic growth. This was established by the substantial growth in the Asian Tigers- Malaysia, Indonesia, Singapore and Taiwan and South American nation, Brazil. These countries were able to transmute their economy with external debt (Momodu, 2012). The advocates that external debt has undesirable impact

on the economy stalk from the fact that at certain level, debt buildup becomes a load and will no longer stimulate the economic growth (Elbadawi, Ndulu & Ndungu, 1996). Moreover, the liquidity constraint referred to as 'crowding out' effect of debt decreases funds accessible for investment and growth. The act of servicing debt is like the snout of mosquito for slurping out blood from its victim. The supervisory rubrics to debt to be taken into account in debts management are debt to GDP ratio, with a global maximum ratio of 40%; total debt to total revenue ratio and debt to debt service ratio. Well-organized debt management strategy should result in debt service ratio between 20-25% of GDP (Omoruyi, 1996).

Public external debt is then described as the portion of a nation's debt that was borrowed from foreign lenders which include the ones from governments, commercial banks or international financial institutions and the loans/interest are being paid in the currency in which the loan was made. However, to earn the required currency, the borrowing nation may sell and export goods to the giver's nation. Meanwhile, a debt watershed can arise if a nation with a feeble economy is not able to produce and sell goods and make gainful return. The track of the nation's external debt is being kept by different agencies like the International Monetary Fund (IMF). Normally these sorts of debts are in the form of tied loans, implying that these loans have to be used for a predefined purpose as specified by an agreement of the borrower and the lender.

### **2.1.2 Capital Formation**

Nurkse (1953) reveal that capital formation requires that society does not use the entire of its current productive activity to the needs and desires of instant consumption, but directs some share of it to the tools and making of capital goods: machines and transport facilities, tools and instruments, plant and equipment all the various forms of real capital that can so greatly upsurge the efficiency of productive effort. The initial spirit of the process was the diversion of some shares of society's presently available resources to the purpose of growing the stock of capital goods so as to make likely enlargement of consumable output in the future.

Capital formation speak of all the fashioned means of additional production, such as railways, roads, bridges, canals, factories, dams, seeds, fertilizers, etc. The role of saving and investment are indispensable for capital formation. By Marshall, saving is the outcome of waiting or self-denial. When an individual postpones his consumption to the future, he set aside his wealth which he utilizes for more production and if everyone save like this, the

overall savings increases which are utilized for investment purposes in real capital assets like machines, tools, plants, roads, canals, fertilizers, seeds, etc.

Capital formation plays a prime role in all forms of economics whether they are of the American or the British form, or the Chinese form and so development is not feasible without capital formation. But very importantly, one should know that savings are different from hoardings, for savings to be used for investment motives; they must be mobilized in banks and financial institutions. And the entrepreneurs, the businessmen and the farmers invest these community savings on capital goods by taking loans from these banks and financial institutions.

### **2.1.3 Economic Growth**

Todaro (1977) described economic growth simply as overtime increase of an economy's capacity to produce those goods and services required to increase the well-being of the citizens in growing numbers and diversity. It is a sustain process by which the productive capacity of the economy is augmented overtime to bring about rising levels of national income. Hence growth is a continuous process of snowballing the productive capacity of the economy and therefore increasing national income and characterized by the high rates of increase of per capita output and total factor productivity especially labor productivity (Anyanwu and Oaikhenan: 1995).

Ajayi (2000) observed economic growth as the rise overtime of a nation's real output of goods and services. Schumpeter in Todaro and Smith look at economic growth as slow but sure and steady variation in the long-run which comes about by a gradual upsurge in the rate of savings and population. Freedman also in Todaro and Smith observed economic growth as an enlargement of the system in one or more dimensions without a change in its structure. Thus economic growth is connected to the quantifiable and continual increase in the countries per capita output or income supplemented by expansion in its labuor force, consumption level, capital and volume of trade. It means an increase in a country's real gross domestic product over a period of time usually one fiscal year.

Therefore, economic growth entails the annual increase in real per capita income of a country over the long period. Arthur (1958) says that economic growth means the growth of output per head of population. Since the main aim of economic growth is to raise the standards of living of the people, therefore economic growth can be viewed in terms of per capita income

or output. Also, the upsurge in national income or more correctly rise in per capita income or output, must be a ‘sustained upsurge’ if it is to be called economic growth. By maintained increase in per capita income we imply the upward trend in per capita income over a long period of time. A mere short-period rise in per capita income, such as that occurs over a business cycle, cannot be validly called economic growth.

## **2.2 Theoretical Literature**

### **2.2.1 Theories of External Debt**

#### **2.2.1.1 The Classical View**

The Economists favoured public debt in the 18th century when there was an impact of Mercantilist doctrine. But in the 19<sup>th</sup> century, the role of the state was restricted within the limit of some minimum functions. This was the view of classical economists who believed in “Laissez Faire” policy. These economists had the view that the State functions should minimum and the government had to maintain only internal law and order, defence from external aggression and look after some public works. They believed that full employment existing in the economy and there is a perfect competition and mobility of factors for production in the market. They had more belief in individualism and felt that self-interest leads to national interest. There is no need of government intervention in the smooth going economic activities and if any calamity befalls it will brought to equilibrium point automatically. When the government is performing minimum functions then there arises no question of huge public expenditure and for that no need of large public revenue. Further government did not require raising funds in the form of public debt also.

From the standpoint of the classical doctrine (having as representatives the well-known A. Smith, R. T. Malthus, D. Ricardo, J.S. Mill or J.B. Say) the view point seems to be predominantly unfavorable to public borrowing. Realistic to the principle of “laissez-faire” and the regulatory actions of market forces, the classics credited to the state only the role of ensuring the smooth ongoing of economic relations, public authorities not being allowed to interfere in the economy. Arguing that public expenditure are uncreative, in connection to the traditional responsibilities undertaken by the state (public order, national defense, diplomatic relations, etc.), and the private sector is more conservative than the public sector in terms of resources management, the classics accused state indebtedness considering that it distorts

private capital from its productive function to non-productive uses, thus affecting the accumulation (and hence stock) of capital and the growth and development of the economy.

The vision of Adam Smith is pertinent to this view, one of the urgings he puts forward to support the renunciation of the state's right to incur debt being that indebtedness postpones the natural development of a nation towards affluence and prosperity since, in this way, resources that would accept productive destinations in the private sector are diverted by the state to cover its unproductive expenditure, thus being wasted without any hope of future reproduction. The effects of constricting public loans in terms of capital accumulation (and thus, long-term economic growth) are deliberated to be even more damaging than those of taxes, since public borrowing leads to the decrease of existing production capacities through "the distortion of some share of the annual produce which had before been destined for the maintenance of productive labour towards that of unproductive labour" (Smith, 1904). The negative influences on the accumulation of productive capital in the economy are also affirmed by David Ricardo, who states that "when, for the expenditures of a year's war, twenty millions are raised by ways of a loan, it is the twenty millions which are withdrawn from the productive capital of the nation" (Ricardo, 2005).

However, a diverse tactic can be found as Thomas Malthus who, expecting the likelihood of imbalances under the type of overproduction of goods (implying a gap between the supply and demand of goods), accepts in this situation (subject to the absence of other likely alternatives) to use borrowed resources to upsurge demand for goods and services, hence making up for the economy's botch to self-regulate. Thus, Malthus advocates for preserving "a sufficient level of public debt because if not the generalized overproduction of commodities from a mere likelihood will become a harsh reality" (Tsoulfidis, 2007).

Stilling continuation of his predecessors approach but being worried about a deeper inquiry of the effects of public debt, John Stuart Mill pinpoints circumstances where it does not necessarily act injurious to the accumulation of productive capital, for example when the state diverts, by giving them more beneficial uses, the savings immobilized in unproductive corporations or to be placed outside the nation, or when the borrowed resources come from overseas (Tsoulfidis, 2007). In such situations, Mill admits that rising pressures on interest rates do not happen and, so, public debt is not necessarily complemented by damaging effects on economic growth. Insofar as, by borrowing, public authorities do not bounds themselves to raise in this way unused savings, but contest with the private sector for resources that

would if not be invested productively, Mill believes that public debt becomes injurious for the economy, and so the use of borrowed resources is to be condemned.

Openness to state interference and modernity is expected by some advocates of the German historical school who, unlike classical economists, allocate to the state an expanded role, seeing it an active agent of the socio-economic progress (Todosia, 1994), amendment which is also mirrored in the amended optics on public indebtedness and its likely effects. Though he assimilates classical thoughts, accommodating that public indebtedness can divert capital from its productive uses in the private economy (the upsurge in the interest rate being the condition for assessing the intensity of this effect), Adolph Wagner acknowledges, just like Mill, that public borrowing is nonetheless to be accepted when, in this way, are raised unused resources available in the national economy or resources from abroad.

Wagner's most important contribution to evaluating the economic effects of public debt arises, however, from delimitating diverse public spending forms based on the time framework of their effects, and relating them with suitable funding sources. Accordingly, in the circumstance of public investment expenditure (non-recurrent expenditure) debt financing is not only admitted but even desirable to tax financing, while government borrowing to conceal normal public expenditure (recurrent expenditure) is absolutely forbidden, the discounting of this rule leading to chronic budget deficits, a path towards ruin, because the growing interest burden would throw public finance into the abyss (Holtfrerich, 2013).

### **2.2.1.2 The Keynesian View**

The Economic crisis created by the great depression of 1930's was partly responsible for the development for modern theory of public debt. The traditional view that constant unbalanced budgets and rapidly rising public debt imperil the financial stability of the nations, gradually gave way to the conception which states that a huge public debt is a national asset rather than a liability and that continuous deficit spending is essential to the economic property of the nations (of public debt assumed full employment). The Keynesian attack on the classical principles of budgeting and public finance was logical extension of the Keynesian attack on the view that economy tends to equilibrium at full employment. Keynes assumed that if there were unemployed resources. Which the private sector could not employ, these resources can be put to use by the by unbalancing the budget. Keynes held the views that increase in public debt through the multiple effects would raise the National Income. He linked public borrowing with deficit financing and authorized government to borrow for all purposes so

that effective demand in the economy is increased resulting in increased employment and output. He did not draw any demarcation between productive and unproductive expenditure as the classical. Keynes borrowing for consumption was as desirable as borrowing for investment in productive goods because consumption expenditure induced investment to rise.

Placed at the reverse side of the classical creed, the Keynesian creed alters the very open-minded assumptions and principles that the former relies upon. Precisely, in reaction to the challenges of those times (in particular, the economic downturn), the new creed attaches great significance to the state, whose interferences in economy and society not only are no longer accused, but are called to complement the actions of the market and to correct its defectiveness.

About the economic effects of public indebtedness, the Keynesian view delineates basically from that of the classical economists, as public borrowing ceases to be accused for its harmful consequences, and is evidenced, on the contrary, in the focal point, its contribution to the suave functioning (without major imbalances) of the economy. Two major arguments support this change of perspective.

First, by admitting the expansion of the scope of the state, public expenditure (at the funding of which public indebtedness contributes) stop to represent, in their totality, definitive and unrecoverable consumptions of resources, harmfully affecting the national wealth and the affluence of the nation as a whole. The involvement of public authorities in value adding activities (e.g. public works, as suggested by Keynes) allows, on the contrary, circumventing negative effects as the above ones and contributes to economic growth and development.

Again, the reassessment of the role allotted to public authorities, in the sense of assuming the function of countering disturbing economic and social marvels, gives new meanings to public borrowing, as ways of involvement to correct imbalances and ensure an upward progress of the economy.

From this viewpoint, it seems pertinent to highlight the role allotted to public indebtedness by certain adepts of the Keynesianism (A.H. Hansen, J. Hicks, P. Samuelson, etc.) in planning demand-side fiscal policies for re-launching the economy in recession or inspiring balanced economic growth. Motivated by the realities of the international economic crisis of 1929-1933 and based on the widespread theoretical construction of Keynes, such policies suggest



the engaging of the state, through its financial means, in supporting economic reclamation and combating unemployment, in times of downturn, or in fast-tracking the pace of economic growth, when it is too slow or the economy is stagnant. More specifically, measures are adopted aimed primarily at increasing public consumption or investment spending, without excluding, however, tax measures – tax cuts, tax exemptions, etc. (Filip, 2010). Such measures help increase overall demand and, in this way, stimulate the increasing of the supply of goods and services, the GDP growth and employment.

Frequently, such measures involve acquiescent (as intentionally produced/ premeditated) imbalances between a lower level of ordinary budget resources (comprising mainly of taxes) and a higher level of budget expenditure, that is, accepting budget deficits which are funded, along with other astonishing resources, by means of public borrowing resulting to greater public debt. Base on some Keynesians view, inflationary currency issue is not to be circumvented; public indebtedness would permit, in addition, bringing in this manner into the economic circulation the redundant revenue of certain social categories, such as those savings not materialized in investments, in order to finance public spending. On these grounds, public indebtedness seems in the Keynesian view as an indispensable instrument to ensure the balanced growth of the economy.

Even though, in general, the Keynesian view ascribes positive meanings to public indebtedness, its application is subject to stringent limits. Such restrictions result from the “controlled” campaign of negative budget balances, solely in periods of economic recession or stagnation, without acknowledging them in periods of expansion (to become perpetual). In this admiration, it seems to be important the systematic deficit theory developed by W. Beveridge, based on Keynes's view that although it should be acknowledged that “getting out of the crisis is based specifically on public loans to finance arise in public spending, and thus a budget deficit”, after the deteriorating or declining economy is re-launched the public budget should return to symmetry (Filip, 2010). At his turn, Duverger (1975) held that the budget deficit (A/N and so the creation of new public debt) must stop as soon as the full employment is attained.

Plummeting budget deficits and returning to budget balances are, in fact, probable precisely because of state's actions, bring about in increased production, incomes and thus fiscal resources. In a positive manner, Keynes held in this regard that it is sufficient “to deal with

unemployment, because the budget will take care of itself (A/N and debt will reduce by itself) (Keynes, 1982).

### **2.2.1.3 Neoliberal Economists View**

The powerful renaissance of economic liberalism in the 1970s, through the advocate representatives of the neoliberal creed, marked a new change of perspective revitalizing, based on the precepts of the “good” classical liberal creed, the condemnation of state’s indebtedness. According to them, whatsoever the relative position of the country in question, rising deficits (A/N and public debt) express the promise of future economic difficulties and decrease welfare (Landais, 1998).

From the standpoint of monetarist economists, as a counterbalance to Keynesian way out and therapies, they are deprived of the positive results of any budgetary measure directed at stabilizing the economy, specially from the viewpoint of a longer period of time, and is consequently contested the ability of public authorities to deed, by encouraging budget deficits and financing them by ways of borrowing, with the objective to relaunch the deteriorating economy or in decline. In this respect, referring to the function of the public budget, Milton Friedman held that “far from being a balancing mechanism to counterweigh other forces that ease instabilities it was itself a key disruptive factor and creator of instability” (Friedman, 1995).

The core argument to validate the condemnation of state’s indebtedness arises from the emergence, when public authorities turn to public loans to finance budget deficits, of a damaging effect called the “crowding-out effect”. Watching at the market for loanable funds, the crowding-out effect generally assumes that, when public authorities indebt themselves by raising public loans, the request for loanable funds rises while the offer remains the same, which results in an upsurge in the interest rate on this market. This in turn decreases private investment (delicate to interest rate changes), and so private capital funds “take flight” towards the public sector to serve public expenditure financing. Global, the monetarists stress that, in this manner, it is likely that the expected positive effect on GDP growth created on the account of promoting debt-financed budget deficits turn out to be very low, even valueless.

From the Keynesian viewpoint, this effect was, nevertheless, strongly argued. Keynesians specifically invoked that, given the circumstances of an economy that is not functioning at

full capacity and where there is a substantial amount of unused resources (as can be categorized the context of the Keynesian analysis), the debt financing of budget deficits, by ways of public loans placed on the financial markets, helps draw these resources into the economic circuit. In this fashion, the offer for loanable funds grows alike to the demand and so, the interest rate may remain the same.

A divergent opinion on the economic effects of public borrowing is uttered by the advocates of the school of rational expectations, in particular by R. J. Barro who, built on the theoretical grounds put down by Ricardo, gives course to the Ricardian equivalence thesis. Challenging the Keynesian cognitive, Barro claims debt nonalignment on the grounds of the equivalence, in terms of their effects, between the financing of a given amount of public spending through the normal alternative of taxes or by public borrowing. Precisely, he trusts that governments, by deciding to give up some taxes and fall back to borrowing to finance resulting to budget deficits, amass public debt that, just like privates, will have to pay back in the future, and thus will have to resort to future tax upsurges. This future “tax invoice” is considered to be perfectly anticipated by private agents and incorporated into their behavior, so they react by raising their present savings equally to the amount of future additional taxes.

Thus, the additional private revenue generated on the account of tax cuts, instead of being used for increased consumption, investment and demand is found, especially, in amplified savings for precautionary purposes (Caron, 2007). In this manner, the likely positive effect arising, according to the Keynesian opinion, on the account of debt financed budget deficits is annulled, which hence reveals the neutrality of public debt.

#### **2.2.1.4 The Conventional View**

The opinion currently assumed by most economists and even by some public policy makers, consequently called the “conventional” view (Elmendorf and Mankiw, 1998), combines classical (liberal) arguments and Keynesian ones, differentiating between the effects of public debt on economic growth over the short-term and over the medium- and long-term.

From the standpoint of a short period of time, the framework of analysis is deliberated to be Keynesian in nature, so the supply of goods and services and, therefore, the output appear to be determined by the level of demand, which at its turn can be influenced by public borrowing to finance increased budget deficits. Hence, public indebtedness can substantiate to be useful for the economy over the short-term, particularly when the economy is in

recession or faced with feeble growth rates, and when the real GDP is well below its potential level.

Confronted with the “painful” truths of the recent crisis, lots of economists argued for Keynesian therapies. Paul Krugman (2009) highlighted that “they (A/N the economists) have to acknowledge that Keynesian economics is still the best framework we have for making sense of recessions and depressions.” This opinion was fully mirrored into the public indebtedness policies promoted, with the beginning of the international economic crisis, by the public authorities of the European Union Member States, many of them deciding to rise public spending or cut down taxes and thus borrowing to support the economy and guarantee an upward economic trend.

From the perspective of a longer period of time, the framework of analysis is considered to be classical in nature, so the impact of the demand becomes less relevant and what matters for economic growth, on the contrary, is the supply of factors of production. The indebtedness of public authorities, to finance budget deficits, is well thought-out to result in the drop of aggregate (public and private) savings, the upsurge of the interest rate, decrease of investments and the reduction of capital stock. Thus, its effects on economic growth appear to be mostly negative ones.

#### **2.2.1.5 The Debt Overhang Theory**

The debt overhang theory was first developed by Stewart Myers in 1977, which originated from company valuation in corporate finance and the debt-financing effects. He studied the reasons why the activities of companies are not financed with maximum debt financing despite that there clearly exists a tax-advantage because of the interest rates deductibility. In response, he pointed out that high amounts of debt are a distortion of the possibilities for companies to make optimal future investment decisions. Debt causes a behavior such that positive net present value projects are not embarked because parts of future earnings from projects giving to creditors in the form of debt repayment (Sundell and Lemdal, 2011).

The increase in debt defaults especially by most developing countries in the 1980s give birth to further studies of debt overhang. One of such is a paper by Paul Krugman in 1988, which examined if debt forgiveness or debt financing is preferable in the case of a defaulting developing country. The debt overhang theory shows the relationship between high amount

of debt and low growth. This negative relationship is defined by Krugman (1988) as “debt overhang” whereby the outstanding debt repayment potentials fall short of the signed value. He pointed out that the issue of debt overhang is because of the expected current value of potential resources allocation that is below its outstanding loan (Sundell and Lemdal, 2011).

For economies with high debt profile, “debt overhang” is seen to be a major cause of distortion and poor economic growth rates. The growth rate of economies is slow because those economies lose their pull on private investors. Also, debt servicing exhausts up so large amount of the revenue of the indebted country to the point that the potential of going back to economic growth paths is abridged (Abdullahi, Bakar and Hassan, 2016, and Sundell and Lemdal, 2011).

## **2.2.2 Theories of Economic Growth**

### **2.2.2.1 Harrod-Domar Growth Model**

By this theory, investment is considered vital in the course of economic growth. Investment creates income and also increases the capital stock in an economy hence, leading to an increased production capacity of the economy. The theory often referred to as the AK model is based on the liner production function with output given by the capital stock  $K$  times a constant, labelled  $A$ . In order to rise, new investments in place of net additions to the capital stock are essential. And for growth to occur, an economy must be able to save and invest a certain percentage of their GDP. The Harrod-Domar or AK model was individually developed by Evsey Domar (1946) and Roy Harrod (1948). Harrod–Domar model refer toas the economic mechanism by which extra investment leads to extra growth.

Giving the simple Harrod-Domar growth model, the wiles of economic growth and development are simply a substance of increasing savings and investment. The Harrod-Domar growth model portrays the functional economic affiliation in which the growth rate of gross domestic product(GDP) based directly on the national net savings rate and opposite to the national capital output ratio ( $k$ ) i.e.  $G=s/k$ . If an economy can raise the savings ratio in the growth equation, we can also raise the rate of growth of national income. Thus according to the capital bottle-neck theory, the obstacle to development is the relatively low level of capital formation in poor countries. For an economy to grow and develop it must seek to increase domestic saving and obtain external financing. Domestic savings and foreign capital

must be mobilized to generate new investment in fiscal capital goods and services and build up the stock of human capital (managerial skill) through investment in education and training.

In view of the capital fundamentalists, capital formation is the key to growth and this has been found evident in development strategies and plans of many nations both at current and in the past. Capital shortage is widely judged to be the single most important barrier to accelerated economic growth and development and a heavy premium was placed on friendly development plans that mirrored this point of view. It was perceived that the best development plans were the ones that could show initial capital requirement and a need for early injection of foreign capital especially foreign aid. It was thought that large initial contribution of aid would generate new flows of domestic savings and reduce aid requirement in long run.

### 2.2.2.2 The Solow's Growth Model

The growth theory has evolved over the years as a major feature of development economics. One of the earliest attempts to model economic growth is popularly referred to as the 'Harrod-Domar' Model associated with the English economist, Sir Roy Harrod and American Economist, Evsey Domar. The model is an early attempt to show that growth is directly related to savings and indirectly related to the capital/output ratio. According to the model, growth ( $G$ ) can be written symbolically as:

$G = sk$ , where  $k$  - incremental capital-output ratio and;  $s$  - the average propensity to save. The model indicated that saving affect growth directly, while the incremental capital/output ratio affects growth indirectly or inversely.

But Solow's model of economic growth is based on the premise that output in an economy is produced by a combination of labour ( $L$ ) and capital ( $K$ ), under constant returns, so that doubling input results in doubling output. Contemporary versions distinguish between physical and human capital. Thus, the quantity of output ( $Y$ ) is also determined by the efficiency ( $A$ ) with which capital and labour is used. Or mathematically:

$$Y = Af(L, K). \quad (2.1)$$

Solow assumed that this production function exhibits constant returns to scale, that is, if all inputs are increased by a certain multiple, output will increase by exactly the same multiple.

The Solow neoclassical growth model uses a standard aggregate production function in which

$$Y_t = A_t K_t^a L_t^{1-a} \quad (2.2)$$

$$1-a, 0 < a < 1.$$

In this case,  $Y$  is gross domestic product,  $K$  is stock of capital,  $L$  is labour and  $A$  represents the productivity of labour, assumed to grow at exogenous rates  $n$  and  $g$ .

$$L_t = L_0 e^{nt},$$

$$A_t = A_0 e^{gt}.$$

The number of effective units of labor,  $A_t L_t$  grows at rate  $n+g$ . For developed countries, these rates have been estimated at about 2 % per year. For developing countries, it may be smaller or larger depending on whether they are stagnating or catching up with the developed countries.

The Solow Growth model assumes that the marginal product of capital decreases with the amount of capital in the economy. In the long run, as the economy accumulates more and more capital,  $gK$ , approaches zero and the growth rate is determined by technical progress and growth in the labour force. However, in the short run, an economy that accumulates capital faster will enjoy a higher level of output. The above argument relates to the entire economy, but can also be extended to subsectors of the economy.

### 2.2.2.3 Traditional Neoclassical Growth Theory

This theory is an enlargement of the Harrod-Domar formulation. The neoclassical growth model of Solow and Swan (1957) provide a conventional framework for analyzing economic growth as it seeks to understand the determinant of long-term economic growth rate through accumulation of factor inputs such as labour and physical capital.

The traditionalist added a third variable which is technology, to the growth model. In line with this model, the function of technological change is very central, even more essential than the accumulation of capital. Base on the theory, output growth emanates from one or more of three factors; upsurge in labour quantity and quality, upsurge in capital, and advancements in technology. A closed economy with lower saving rates grows sluggishly in short run and attain a lower per capita income. Whereas in an open economy, where returns on investments are bigger, will experience higher income levels as capital flows from economies where capital-labour ratios are lower. Furthermore, openness is held to encourage higher access to

foreign production ideas that can increase the rate of technological progress, while a closed economy will retard growth.

#### 2.2.2.4 Endogenous Growth Theory

The endogenous growth economists emphasize the need for government and private sector institutions to inspire innovation, by generating the right economic environment for individuals and businesses thrive on innovations. The focal points of the endogenous growth theory are that technological progress should not be taken as fixed in growth model. Government policies can raise a country's growth rate by encouraging competition in the markets and helping to stimulate product and process innovation. Safety of private property rights and patents, as ways of incentives to motivate businesses and entrepreneurs involve in research and development. So, Investment in human capital is a crucial ingredient for a long-term growth, government policy should inspire entrepreneurship. It upholds that economic growth is predominantly the outcome of endogenous and not exogenous factors, that is, investment in human capital, innovation, and knowledge are important contributors to economic growth.

This theory is often attributed to Romer (1986) who observed the classical and neoclassical theories as an over simplification of what is really a complex process. Romer in his 1986 paper ignores physical capital but only considers knowledge (human capital) in explaining growth. The broad form of his model can be written as:

$$Y = A(R) f(R_j, K_j, L_j) \quad (2.3)$$

Where:

$R_j$ ,  $K_j$  and  $L_j$  are respectively stock result from research and development expenditure by firm  $j$ ; physical capital of firm  $j$ ; and labuor input of firm  $j$ .  $A(R)$  is the aggregate stock of knowledge.

Any private research exertion will have a spillover effect for the public stock of knowledge  $A(R)$ . This type of model can explain why countries experience different growth rate. A country with initial higher level of (human) capital experiences a higher rate of growth leading to a higher rate of growth of capital income because such a country is more experience through "learning by doing".



### 2.2.2.5 The Cobb-Douglas production Theory

The Cobb-Douglas production function was developed by a mathematician - Charles W. Cobb and an economist - Paul H. Douglas in 1928. The Cobb-Douglas production function, according to Onalan and Basegmez (2018), explains that economic growth is a function of capital and labor. Cobb-Douglas theory is applied using capital input, labor services and technical change. This production function implies that the elasticity of substitution equals one. The function is presented as (Liao, Wu, and Xu, 2010):

$$Q = f(K, L) = AK^\alpha L^\beta \quad (2.4)$$

where:

$Q$  = total production

$A$  = productivity of existing technology. That is, total factor productivity, technical process, economic system etc.

$K$  = capital investment, which is represent by the total investment in fixed assets (the monetary worth of all machinery, equipment and buildings)

$L$  = quantity of the labor input (the total number of person - hours worked in a year)

$\alpha$  and  $\beta$  = the respective output elasticities to capital and labor, which measure the responsiveness of output to a change in levels of either labor or capital used in production

The Cobb-Douglas production theory enables us to vary the magnitude of inputs response to changes in factor price. One of the limitation of Cobb-Douglas production function is that the model uses two factor input to explain the production (Liao, Wu, and Xu, 2010).

## 2.3 Empirical Literature

### 2.3.1 Empirical Evidences of External Debt-Growth Relationship

There have been several attempts to empirically assess the external debt-economic growth link. These studies include the study by Odubuasi, Uzoka and Anichebe (2018) examined the effect of external debt on the economic growth of Nigeria from 1981 - 2017. Granger Causality was used to obtain the cause effect relationship among the variables, while Error

Correction Mechanism (ECM) was used for the short and long run relationships. The finding of the study showed that external debt stock and government capital expenditure have positive and significant effect on economic growth in Nigeria. External debt service on the other hand, was not found to be a significant determinant of economic growth.

The relationship between external debt and economic growth in emerging economies for the period 2006-2016 was examined by Shkolnik and Koilo (2018). Autoregressive Distributed Lag (ARDL) and correlation analysis techniques were employed for the study. The findings of the study were that high level of external debt alongside with macroeconomic instability, impedes economic growth in emerging economies. It was also found that there was a critical level of debt burden for emerging economies, where the marginal impact of external debt on economic growth was found negative.

Impact of external debt on economic growth in Nigeria was studied by Adeniran, Azeez and Aremu (2016) adopting the Ordinary Least Square (OLS) technique. The study spans through the 1980 to 2014 sample periods. The findings of the study showed that external debt and external debt service had a significant negative impact on economic growth.

Ijirshar, Fefa and Godoo (2016) examined the relationship between external debt and economic growth in Nigeria for the period from 1981 - 2014. The Autoregressive Distributed Lag (ARDL) approach was adopted. The results showed a significant relationship between external debt and economic growth in the long and short runs, while external debt servicing was found to have both long run and short run negative effect on economic growth.

The relationship between external debt and economic growth in Nigerian was studied by Olasode and Babatunde (2016). The study covered the 1983 - 2012 sample periods, while the autoregressive Distributed Lag model was employed as the technique of data analysis. The study found that external debt in the long run had positive effect on economic growth, while in the short run; it had negative effect on economic growth.

In Nigeria, the study by Mbah, Umunna and Agu (2016) examined the impact external debt on economic growth from 1970 - 2013. The Autoregressive Distributed Lag (ARDL) bound testing approach and the Granger Causality model was employed by the authors. The findings of the study showed that external debt negatively and significantly impacted on GDP. Also, a unidirectional causality between debt and economic growth was found.

Using Ordinary Least Square technique, Udeh, Ugwu and Onwuka (2016) examined the relationship between external debt and economic growth in Nigeria from 1980 - 2013. The findings showed that external debt had positive and significant impact on gross domestic product growth in short run, but a negative effect on economic growth was found in long run.

The study by Ugwuegbe, Okafor and Azino (2016) examined the effect of external borrowing on economic growth in Nigeria from 1980 to 2013, using OLS technique. It was found that external debt had a positive and significant effect on economic growth.

In a panel study of developing economies, Ayadi and Ayadi (2015) examined the relationship between external debt and economic growth from 1985 - 2013. Common Corrected Effect (CCE) Estimator was employed and the result showed that negative linear existed between external debt and economic growth.

In Ethiopia, Kassu, Mishra and Asfaw (2014) examined the relationship between public external debt, Capital formation and economic growth. The autoregressive distribution technique was employed. The findings showed that external debt had a negative and significant relationship with real GDP in the long run and but no significant effect was found in the short run. On the other hand, external debt had positive and significant effect on capital formation in the long run and negative in the short run.

Using the Ordinary Least Square regression estimation technique, the impact of external debt on the economic growth in Pakistan was examined by Zaman and Arslan (2014). The study covered the 1972-2010 sample periods. The results of the showed that gross capital formation and external debt stock had significant positive effect on GDP, while domestic savings was not found to have significant impact on GDP.

Rifaqat and Mustafa (2012) examined the long run and short run impact of external debt on economic growth in Pakistan. The study covered the 1970 - 2010 sample periods. Using the ARDL approach, the study found a negative impact of external debt on economic growth.

Oke and Sulaiman (2012) examined the relationship between external debt, economic growth and investment in Nigeria for the periods of 1980-2008. The authors employed debt-cum-growth model regression. The results of the study showed that external debt, private investments and debt service ratio had negative effect on GDP, while exchange rate and interest rate were found to have positive effect on GDP.

In Bangladesh, the study by Shah and Pervin (2012) examined the effect of external public debt on economic growth using the Error Correction Mechanism. The sample period covered was between 1974 - 2010. It was found that external public debt service had long run significant negative effect on GDP, whereas external public debt stock had long run positive effect on GDP growth.

The effect of external debt on economic growth in Nigeria was examined by Sulaiman and Azeez (2012). The study covered the 1970-2010 sample period. Gross domestic product was proxied for economic growth, while internal debt, ratio of external debt to exports and exchange as independent variables. Employing the Ordinary Least Square (OLS), the results showed that external debt had positive and insignificant effect on GDP, while inflation rate had negative effect on GDP and exchange rate had a significant positive effect on GDP.

Fosu (1996) verified the relationship between economic growth and external debt in Sub Saharan African countries over the period 1970-1986 applying O.L.S method. The study scrutinized the direct and indirect effect of debt hypothesis using a debt- burden measure; the research discloses that direct effect of debt hypothesis reveals that GDP is negatively influenced through a diminishing marginal productivity of capital. The study also finds that on the average a high debt country faces about one per cent reductions in GDP growth annually.

In 1999 he also employed an augmented production function to investigate the impact of external debt on economic growth in Sub Saharan African countries during the period 1980-1990. The author verified whether external debt has negative effect on economic growth and the findings indicate that debt exhibits a negative coefficient.

Afxentiou and Serietis (1996) in continuance to Afxentiou (1993) scrutinized 55 emerging countries facing debt service problems with the study's objective of finding out the link between foreign borrowing and productivity over the period 1970-1990. The outcomes show that for the period of 1970-1980, the link between indebtedness and national productivity is not negative. They acquiesced that the emerging countries used the foreign loans to absorb the shock from oil price upsurges as effortless as possible. Conversely, for the period 1980-1990 when the debt forgiveness and postponement started, the debt crisis and debt overhang affected some indebted nation's economic growth.

Onwioduokit (1998) investigated the impact of foreign debt on economic growth and they discovered that the degree of responsiveness of growth to external finance in Nigeria is elastic. By insinuation government should only put in place appropriate debt management strategies to improve economic growth. The debt load of a nation and the resultant debt service impose a limit on the economy in terms of inadequate foreign exchange to finance importation of raw materials and capital goods required for economic growth.

Perasso (1992) working with data from twenty middle- income severely indebted nations for the 1982-1989 periods examined the relationship between economic growth and external debt. The result showed that proper domestic policies have stronger impact on increasing investment and growth in extremely indebted nations than reducing debt-servicing responsibility.

The relationship between external debt and investment of emerging countries for 1980's was investigated by Cohen's (1993). The outcome from the study reveals that there is little effect of level of stock of debt on investment. The researcher argued that areal flow of net transfers affects investment. The study further reveals that actual service of debt "crowded out" investment.

Cunningham (1993) examined the link between debt burden and economic growth for sixteen nations for the period of 1971-2007. It was shown that growth of a nation's debt burden has a harmful effect on the economic growth. He also contended that when a nation is importantly to foreigners, this adversely affects both capital productivity and labour.

Chowdhury (1994) studied the relationship between indebtedness and economic growth for Bangladesh, Indonesia, Malaysia, Philippines, South Korea, Sri Lanka and Thailand during the period of 1970-1988. They showed that external debt results to mismanagement in exchange rate. The study in addition reveals that External debt does not affect the GNP growth rate.

Safdari and Mehrizi (2011) discovered the sway of five variables Gross Domestic Product (GDP), private investment, public investment, external debt and imports on each other in Iran for the period of 1974 to 2007. These effects were analysed using the Vector Autoregressive Model (VAR). The outcomes showed that external debt and imports have a negative effect on economic growth. Likewise, variables of private investment and public investment had a positive effect on economic growth.

Ogunmuyiwa (2011) investigated whether external debt truly promotes economic growth in emergent nations using Nigeria as a case study. Time series data from the period of 1970-2007 were used with numerous econometric techniques such as Augmented Dickey Fuller(ADF) test, Granger Causality Test, Johansen Co-integration test and Vector Error Correction Method(VECM). According to this study, external debt only helps to exploit the potentials of a country, it does not enhance it. Empirical results have shown clearly that causation between external debt and growth could not be established in the Nigerian context and external debt could thus not be used to forecast advancement or slowdown in economic growth of Nigeria.

Hassan and Butt (2008) tested the relationship between economic growth, trade, external debt, labour force and education in long run and short run for Pakistan over a period of 1975-2005, applying Autoregressive Distributed Lag Approach (ARDL) to Co-integration. Proof presented suggests that aggregate debt is not a significant determinant of economic growth both in short run or in the long run. This result indicates that the external debt has not been used productively and efficiently in Pakistan which may be one of the reasons behind the slow economic growth.

Malik et al (2010) tried to measure the impact of external debt on economic performance of Pakistan among 1972 to 2005 by using time series econometric techniques. Outcomes revealed that external debt is negatively and significantly connected with economic growth which implies that increase in external debt will result to decline in economic growth. Debt servicing has also negative influence on GDP growth.

Babu et al (2014) working with a panel fixed effect model to evaluation the effect of external debt on economic growth in the East African Community (EAC), found that external debt has a negative substantial effect on per capita GDP growth rate in the EACs.

Iyoha (1996) evaluated a simulation approach to examine the impact of external debt on economic growth of Sub-Saharan African countries within the period 1970-1994. A significant finding of this study was that increasing external debt lowers investment through both a disincentive effect and a crowding out effect. It was found that debt stock reduction would have substantially increased investment and economic growth. He also stressed that debt forgiveness could provide a much needed stimulus to investment recovery and economic growth in Sub-Saharan African countries

### **2.3.2 Causality analysis of external debt and Economic growth Nexus**

Afxentiou and Serletis (1996a) applied Granger Causality test on a sample of 55 severely indebted nations on causality analyses of external debt and growth and the outcomes confirm that no causality exists between debt and income. The tests show that indebtedness is not a specific factor of per capital income growth. Therefore, foreign resources can have a positive effect on economic development if resources are relocated into inputs since borrowing nations require to have these scarce resources.

Amoateng and Amoako (1996) investigated the relationship between external debt and growth for 35 African countries using Granger causality test. The outcomes indicated that there is a unidirectional and positive causal link between debt service and economic growth.

Chowdhury (1994) tried to resolve the Bullock and Rogoff's (1990) suggestion by discovering the cause and effect relationship between external debt and economic slowdown in 7 Asian nations for the period 1970-1988. The outcomes of the Granger causality tests reveal that the Bullock and Rogoff (1990) suggestions that external debt of developing nations is a symptom rather than a cause of economic slowdown were rejected. However, the results affirm a feedback or bi-directional link between debt and growth for Malaysia and Philippines.

Karagol (2002) examined the long run and short run relationship between external debt and economic growth for Turkey for the period 1956-1996 and the Granger causality test outcomes disclosed a unidirectional causality from debt to economic growth.

Essien and Onwioduokit (1998) adopted the Zellner Reformation Error in variable type model, with the conclusion that the high debt burden has been the root cause Nigeria's sluggish growth.

Alfredo and Francisco (2004) also investigated the relationship between external debt and economic growth for some Latin American and Caribbean countries and found that lower aggregate external debt levels were linked with higher growth rates.

### **2.3.3 Empirical Evidences of Debt Servicing-Growth Relationship**

Safia and Shabbir (2009) investigated the external debt effect on economic growth using a relatively small sample of 24 emerging countries in a period of 28 years (1976-2003) and

used random effect and fixed effect estimation. She discovered that debt servicing to GDP does impede economic growth and might leave less funds available to finance private investment in these nations resulting to a crowding out effect.

Alfredo and Francisco (2005) empirically verified the linear or non-linear link of external debt and economic growth for 20 Latin American and Caribbean economies over each of the seven 5-year periods between 1970 and 2002. The study applied a dynamic system Generalize Method of Moments (GMM) panel estimator. The outcome indicates that lower aggregate external debt levels are associated with higher growth rates and there is an unimportant association between debt service ratios and growth rate of the economy. Also, they discover no evidence of non-linear effect on them.

Studies applying variable of external debt service (in contrast to the aggregate debt stock) can also potentially affect growth by crowding out private investment or changing the makeup of public spending. The mechanism is higher debt service can raise the government's interest bill and budget deficit, reducing public saving; this, in turn, may either gain interest rates or crowd out credit available for the private investment, and finally reducing economic growth. Higher debt service payments can likewise have adverse effects on the makeup of public spending by hugging the pool of resources available for infrastructure and human capital spending, with negative effects on growth (Sachs, 1989). This effect arises because highly indebted poor countries tend to frequently switch resources, including foreign aid and other foreign exchange resources to keep off pressing debt service obligations particularly debt owed to multilateral institutions (Iyoha, 1999). In contrast, Fosu (1999) finds no such relationship between debt service and growth for countries in sub Saharan countries.

Pattillo et al. (2002) similarly find no statistically significant link between debt service and growth. Relatively a few empirical studies concerned on external debt service (instead of total external debt stock) for single country analysis using time series data.

Karagol (2002) and Wijeweera et al. (2005) investigated the relationship between external debt service and GNP by applying extended production function model. Karagol (2002) found a long run relationship exists between GNP and debt burden and accepted the debt overhang hypothesis in Turkey. Yet, in the case of Sri Lanka, Wijeweera et al. (2005) discovered conversely that external debt affected GNP positively in the long run equation and negatively in the short run. Both studies followed the model of Cunningham (1993). Study by Mere (2001) and Isa Audu (2004) investigate relationship between external debt service and



growth for Kenya and Nigeria respectively. Both studies find that external debt service has a negative effect on growth. Therefore those studies conclude that debt overhang phenomenon happened to these countries. Some selected studies that analyzed the effect of external debt on growth is shown in this paper differs from the existing debt-growth literature in several points.

Ogiemudia and Ajao (2012) studied the effect of foreign debt management on sustainable economic development with specific emphasis on Nigeria over the period 1979-2009 using ordinary least square method of data analysis and error correction model to ascertain the long-run relationship of established model. Their discoveries revealed that access to external finances strongly sway the economic development process of Nigeria and other nations. The study additionally revealed that there is a substantial relationship between external debt and economic development in Nigeria while debt servicing had a negative but unimportant effect on Nigeria.

Safia and Shabbir (2009) examined the external debt effect on economic growth with a relatively small sample of 24 emerging countries over a period of 28 years (1976-2003) and used random effect and fixed effect estimation. She discovered that debt servicing to GDP does impede economic growth and may leave less funds available to finance private investment in these countries resulting to a crowding out effect. The researcher has taken diverse variables as a proxy to measure economic growth and external debt to GDP ratio as dependent variable.

Adesola (2009) investigated the effect of external debt service payment practices on sustainable economic growth and development with specific emphasis on Nigeria. Data relating to 1981 through 2004 were applied with the ordinary least square multiple regression model. He investigated the impact of external debt with Nigeria's Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF). The empirical results indicated a significant impact of debt services on GDP and GFCF.

## **2.4 Identified Gap and Value Addition**

Empirical investigations have divergent findings in their attempt to unravel the nature of relationship that exist between external debt, capital formation and economic growth. Most of these studies differ in terms of methodology, geographical area monitored, and time period covered. Some of the studies have established negative relationship between external debt

and economic growth, few proffered positive relationship whilst some posit no correlation between debt and growth. Lack of unison in the findings of previous studies clearly suggests ambiguity in existing literature requiring more enquiries into the external debt cum capital formation-growth nexus.

Although, many studies on debt-growth nexus have been conducted on country specific (individual country) and cross-country (group of countries) basis but it is worth mentioning that most of these studies especially the cross-country investigations were done on developed economies. Literature on ECOWAS countries is scanty and few as it regard studies on external debt, capital formation and economic growth of ECOWAS countries as a group.

Previous studies such as Fosu (1996), Iyoha (1996), and Milton (1999) concentrated on Sub-saharan African Countries. Amoatag and Amoako (1996), concentrated on some selected African countries of which some ECOWAS countries were excluded. Moreso, Babu et al (2014), did a study on external debt and economic growth but his focus was on East African Countries while Suma (2007) who did a study on ECOWAS Sub-Saharan African Countries, concentrated equally on external debt crisis, investment and economic growth. To the best of our knowledge, previous studies have not provided empirical evidence on the optimal threshold for external debt in the ECOWAS countries that can instigate economic growth and overall economic performance. Therefore, by empirically ascertaining the optimal threshold for external debt in the ECOWAS countries, the study adds value to the previous literature. Also, by examining the impact of capital formation and external debt on economic growth, of which very few studies are found, this study complements the previous studies on this area with improvements as it uses a more recent data.

## CHAPTER THREE

### RESEARCH METHOD

#### 3.1 Theoretical Framework

This study examines the relationship between external debt, capital formation, and economic growth in ECOWAS countries. The study adopts the Cobb-Douglas production function theory and the debt overhang theory as its framework of analysis. The Cobb-Douglas production function theory is best suited for this study on the basis that a production function is an equation that describes the relationship between input and output, or what goes into making a certain product, and a Cobb-Douglas production function is a particularly standard equation that is applied to describe how much output two or more inputs into a production process make, with capital and labor being the typical inputs described. Developed by economist Paul Douglas and mathematician Charles Cobb, the theory is commonly used in both macroeconomics and microeconomics models because they have a number of convenient and realistic properties. On the other hand, the use of the debt overhang theory is justified on the ground that it would enable us to model the optimal threshold for external debt, at which external debt is detrimental to economic growth. The two theories are discussed briefly in this section.

##### 3.1.1 The Cobb-Douglas Production Function Theory

Following Castejón and Woerz (2005), the Cobb-Douglas production function is presented in equation (3.1) as:

$$Y = AK^{\alpha}L^{\beta} \quad (3.1)$$

where:

Y = output growth

K = capital stock, which is captured by the total investment in fixed assets (the monetary worth of all machinery, equipment and buildings)

L = labour endowment

A = total factor productivity (productivity of existing technology, technical process, economic system etc).

Total factor productivity (A) in equation (3.1) is in turn is determined by previous investments into physical capital as given in equation (3.2):

$$A = (DI) = DI^\varphi \quad . \quad . \quad . \quad (3.2)$$

Where DI is domestic investment. For the purpose of this study, domestic investment is taken to be gross fixed capital formation (that is,  $DI = GFCF$ ). Substituting equation (3.2) into (3.1) and representing the capital stock (K) with external debt stock (EXD) and output growth (Y) with GDP growth rate (GDPG) yields:

$$GDPG = GFCF^\varphi EXD^\alpha L^\beta \quad . \quad . \quad . \quad (3.3)$$

Taking logs of equation (3.3) results to equation (3.4) as:

$$GDPG = \varphi gfcf + \alpha exd + \beta l \quad . \quad . \quad . \quad (3.4)$$

Log transformed variables are presented in small case letters. GDPG is not log transformed since the variable is already taken in rate. Where, GDPG is the economic growth rate. Hence, economic growth is a function of growth of domestic investment, capital (external debt capital) and labour. The parameters,  $\varphi$ ,  $\alpha$ , and  $\beta$  measure the output elasticities of domestic investment, capital and labour respectively.

### 3.1.2 The Debt Overhang Theory

The origin of this theory is traced to the corporate finance literature. The theory posits that if the debt of a country exceeds its payment ability with some probability of future debt services, the debt service anticipated would be an increasing function of the country's output level. This means that when the debt of a country accumulates to a certain level and the sum to repay becomes large, it will be harmful to economic growth (Ugbor, David-Wayas, Chukwuma and Aduku, 2017). Following Sankhayan (1988) and Ugbor, David-Wayas, Chukwuma and Aduku (2017), the following quadratic equation is specified:

$$y = \varphi_0 + \varphi_1 x + \vartheta x^2 + e \quad . \quad . \quad . \quad (3.5)$$

Where

y = economic growth

x = debt stock

e = error term

$\varphi_0$ ,  $\varphi_1$  and  $\vartheta$  = parameters to be estimated

Substituting GDP growth rate (GDPG) for y, and external debt stock (EXD) for x, equation (3.5) is re-specified as:

$$GDPG = \varphi_0 + \varphi_1 EXD + \vartheta EXD^2 + e \quad (3.6)$$

To determine the optimal external debt threshold, equation (3.6) is differentiated partially with respect to EXD and equating the resulting derivative to zero as:

$$\frac{\partial GDPG}{\partial EXD} = 2\vartheta EXD + \varphi_1 = 0 \quad (3.7)$$

By taken  $\varphi_1$  to the right of the equal sign and dividing it by  $2\vartheta$ , equation (3.8) can also be written as:

$$EXD^* = -\frac{\varphi_1}{2\vartheta} \quad (3.8)$$

Equation (3.7) shows that maximum GDP growth (saturation point) is positive as required if  $\vartheta < 0 < \varphi_1$ , which as well satisfy the sufficient condition that:

$$\frac{\partial^2 GDPG}{\partial^2 EXD} = 2\vartheta < 0 \quad (3.9)$$

Since  $\vartheta$  is less than zero, equation (3.9) will be less than zero, indicating the satisfaction of the sufficient condition for a maximum. At this point, any further increase in external debt results to a decrease in economic growth rate. This theory is used because it shows the optimal point at which external debt is detrimental to economic growth, on line with objective two of this study.

## 3.2 Model specification

### Model 1: For objective 1

Objective one is to examine the impact of external debt and capital formation on economic growth. For the purpose of this study, a dynamic panel growth model is used to capture this objective. The functional form of the model is specified as:

$$GDPG_{it} = g(X_{it}, Z_{it}) \quad (3.10)$$

The panel model specification of equation (3.10) is:

$$GDPG_{it} = b + b_x X_{it} + b_z Z_{it} + \gamma_{it} + \varepsilon_{it} \quad . \quad . \quad . \quad (3.11)$$

where

GDPG = GDP growth rate, proxy for economic growth

$X_{it}$  = a set of explanatory variables, which are external debt (EXD), gross fixed capital formation (GFCF), and Population growth (POPG) – proxy for labour force growth.

$Z_{it}$  = a set of control variables, which are exchange rate (EXR), real interest rate (INR), and inflation rate (INF)

$\gamma_{it}$  = a between-country error term

$\varepsilon_{it}$  = a within-country error term

i = observational units

t = time

To fit a linear model with one dynamic variable ( $GDPG_{i,t-1}$ ), we take the log of the variables in equation (3.11) and add the dynamic variable as:

$$GDPG_{it} = b_0 + b_1 GDPG_{i,t-1} + b_2 exd_{it} + b_3 gfcf_{it} + b_4 popg_{it} + b_5 EXR_{it} + b_6 INR_{it} + b_7 INF_{it} + \gamma_{it} + \varepsilon_{it} \quad . \quad . \quad . \quad (3.12)$$

Where small lettered variables are log transformed variables. GDPG, EXR, INR and INF are not logged because the variables are already in rate.

### Model 2: for Objective Two

Objective two is to ascertain the optimal external debt threshold. For this purpose, a quadratic production function is used. Following the specification of Ugbor, David-Wayas, Chukwuma and Aduku (2017), but in panel form, the functional form of the model is presented as:

$$GDPG_{it} = g(EXD_{it}, EXD_{it}^2, GFCF_{it}, EDS_{it}) \quad . \quad . \quad . \quad (3.13)$$

Where

GDPG = GDP growth rate

EXD = external debt

EXD<sup>2</sup> = squared term of external debt

GFCF = gross fixed capital formation

EDS = external debt services

The basic equation to be estimated is:

$$GDPG_{it} = a_0 + a_1 GDPG_{i,t-1} + a_2 exd_{it} + a_3 exd_{it}^2 + a_4 eds_{it} + u_{it} + v_{it} \quad \dots \quad (3.14)$$

where small lettered variables are logged variables. GDPG is not logged because the variable is already taken in rate.  $u_{it}$  and  $v_{it}$  are respectively the between-country and within-country disturbance terms, while  $i$  indexes observational units and  $t$  indexes time. External debt ( $exd$ ) and its squared term is the variable of interest.

After estimation of equation (3.14), the optimal external debt threshold would be estimated using the following:

$$EXD^* = -\frac{a_2}{a_3} \quad \dots \quad (3.15)$$

where  $EXD^*$  is the optimal external debt threshold,  $a_2$  is the coefficient of the external debt linear term, and  $a_3$  is the coefficient of the external debt quadratic term.

### Model for Objective Three

Objective three is to examine the direction of causality between external debt, capital formation and economic growth. For this purpose, the study will estimate a time-stationary VAR model adapted to a panel context as shown below (as in Holtz-Eakin, Newey and Rosen, 1988):

$$GDPG_{it} = \vartheta_0 + \sum_{j=1}^m \varphi_j GDPG_{i,t-j} + \sum_{j=1}^n \beta_j exd_{i,t-j} + \sum_{j=1}^n \gamma_j gfcf_{i,t-j} + u_j + u_{jt} \quad \dots \quad (3.16)$$

where

GDPG = GDP growth rate, proxy for economic growth rate

$exd$  = log of external debt

gfcf = log of gross fixed capital formation, proxy for capital formation

i = indexes observational units

t = time period

Country-specific effects  $u_j$  are allowed. The disturbances  $u_{jt}$  are considered to be distributed independently across the studied countries with a zero mean.

### 3.3 Definition of variables in the Model

**Gross Domestic Product growth rate (GDPG):** GDP is the total expenditures for all final goods and services produced within a country in a stipulated period of time. Growth rate of GDP is a common measure of economic growth rate all over the world. It is a basic measure of a country's economic performance in a year.

**External debt (EXD):** This is the amount of a country's total debt that is obtained from foreign sources like foreign corporations, government or financial institutions. It is the amount of debt of a country that is owed to creditors outside the country.

**Gross Fixed Capital Formation (GFCF).** This is the total expenditure on investment by the production units of a county. It refers to changes in the stock of a year and the net acquisition valuables by businesses and households. Since investment is the expenditure incurred on acquisition of capital goods that result in capital formation, the gross fixed capital formation is used as a measure of capital formation - domestic investment in this study.

**Population Growth Rate (POPG):** Population of a country is the number of persons in a particular country. Therefore, population growth rate could be described as the rate at which population of a country (the respective ECOWAS countries) grow. The Solow's growth model postulates labour force as a source of output growth. Therefore, this study uses population growth rate to proxy for the growth of labour force because a growing population is in many cases endured with a growing labour force.

**Exchange Rate (EXR):** Exchange rate is the value of a domestic country's currency relative to other currencies. It shows the number of times more goods and services can be purchased outside the domestic economy than in the domestic market for a given amount.



**Interest Rate (INR):** Interest rate is the rate at which enterprise or firms and other investors borrow investment fund. It is the price to pay in order to have liquid holdings and the compensation to receive for storing savings in less liquid forms.

**Inflation Rate (INF):** Inflation rate is the average of current prices across the entire spectrum of goods and services produced.

**External Debt Services (EDS):** This is the sum of principal repayments and interest actually paid on long-term debt, interest paid on short-term debt and repayments (repurchases and charges) to foreign a creditors like foreign corporations, governments or financial institutions. It is the total debt a country paid back to foreign creditors.

### 3.4 Estimation Technique

The Generalized Method of Moments (GMM) estimator would be employed in this study. This is because several econometric problems could occur from estimating the specified equations under the model specification section. These include:

- i. The presence of the lagged dependent variable,  $GDPG_{i,t-j}$  leads to autocorrelation.
- ii. The gross fixed capital formation (GFCF) and Population growth (POPG) variables in the model for objective one are assumed to be endogenous. Because causality may run in both directions – from these variables to economic growth rate (GDPG) and vice versa – these regressors may be correlated with the error term. Similarly, gross fixed capital formation in the models for objectives two and three is assumed to be endogenous. Because causality may run in both directions – from gross fixed capital formation to economic growth rate and vice versa.
- iii. Time-invariant country characteristics (fixed effects), like that of geography and demographics, may be correlated with the explanatory variables in the respective equations for objectives one, two and three. The fixed effects are contained in the error term in the respective equations, which consists of the unobserved country-specific effects, such as  $\gamma_{it}$  in equation (3.12), and the observation specific errors, such as  $\varepsilon_{it}$  also in equation (3.12).
- iv. The time dimension of the panel dataset may not be long enough ( $T = 34$ ) and a large country dimension ( $N = 15$ )

Fixed-effects instrumental variables estimation (two-stage least squares or 2SLS) can be used, but, the instruments could be weak at the first-stage of the two-stage least square

(2SLS) regressions. With weak instruments the fixed-effects IV estimators could possibly be biased in the way of the Ordinary Least Square (OLS) estimators (known for inconsistency estimates since some explanatory variables as stated above could have causal relationship with the dependent variables). Despite the assumption that, for example,  $\varepsilon_{it}$  is i.i.d, the presence of, say,  $\gamma_{it}$  in the equations for estimation renders both the standard fixed effect and random effect estimators to be inconsistency resulting from the Nickell (1981) bias. Thus, the study uses GMM.

The Generalized Method of Moments estimator fit the equations for estimation. Two types of GMM estimators frequently used are the first-differenced GMM estimator, credited to Arellano and Bond (1991) and the system GMM estimator, developed by Arellano and Bover (1995) and Blundell & Bond (1998). The first-difference GMM estimator makes use of first differenced equations with appropriate lagged levels as instruments, while the system GMM estimator makes use of equations in level form with lagged differences as instruments. Some explanatory variables like real GDP $_{t-1}$  and GFCF are highly persistent, therefore, their lagged levels could be very weak instruments for first differenced equations (Aditya and Roy, 2010). On this basis, the system GMM model is more preferred than the first-differenced GMM estimator.

Therefore, panel random-effects model with system Generalized Method of Moments (system GMM) estimator is used in this study. System GMM is proposed by Arellano & Bond (1991) to estimate regression equation parameters. The System GMM is preferred over other methods of estimation because; it corrects for persistence in the dependent variable, solves the problem of endogeneity bias and takes care of unobserved country-specific effects. Also, System GMM corrects for autocorrelation in panel data models and allows for the inclusion of time-invariant variables as explanatory variables that would be wiped-out in fixed effects or difference GMM estimations (Ugbor, Ugbor and Aduku, 2018 and Ali, 2017).

System GMM makes use of the lagged values of endogenous variables in difference equation and first difference of endogenous variables in the level equation. It is of common practice for any estimation method involving instruments to test for the validity (exogeneity) of instruments. In the GMM framework, the Hansen test proposed by Hansen (1982) is usually used. However, one disadvantage of the Hansen test is that it weakens with the increase in the number of instruments (Ugbor, Ugbor and Aduku, 2018, and Bowsher, 2002). For this

reason, Arellano-Bond test for second-order autocorrelation, AR (2) is also used to test for the validity of instruments in addition to the Hansen test.

Similarly, for the causality model - equation (3.16), estimating with pooled OLS could cause an endogeneity problem because the country-specific effects (dummy variables) affect GDP growth rate in one period and, also, is assumed to be affected in the previous period. A way forward is to take the first difference of all variables and, thereby, eliminating the individual effects. However, despite that, there will still be correlation between the lagged dependent variable, which is now in differences, and the error term. Therefore, system' GMM estimator, as earlier discussed, is also used in estimating equation (3.16). Based on the estimation results, a decision on causality will be reached by running Wald tests on the coefficients of the lagged  $exd_t$ 's and  $gfcf_t$ 's to check if they are jointly statistically different from zero.

### 3.4.1.1 Pre-estimation Test

### 3.4.1.2 Panel Unit Root Test

The causality test requires that the variables be stationary. Therefore, it is important to start the estimation by, first checking the stationarity of the variables using two common panel unit roots tests, the IPS test by Im, Persaran and Shin, (2003) and Breitung and Pesaran (2007) and the Fisher-type test by Maddala and Wu (1999), Choi, (2001) and Chuo (2007). Generally, the test equation of both tests can be specified as:

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + V_{i,t} \quad . \quad . \quad . \quad (3.17)$$

$$\Delta X_{i,t} = \rho_i + \lambda_i X_{i,t-1} + V_{i,t} \quad . \quad . \quad . \quad (3.18)$$

Where

$Y_{i,t}$  = vector of economic growth  $i$ , at time  $t$

$X_{i,t}$  = vector of economic growth indicators

$Y_{i,t-1}$  = lag one of the economic growth rate (RGDP growth rate)

$X_{i,t-1}$  = lag one of the economic growth indicators

$\Delta$  = change in

$\beta$  = Slope coefficient of economic growth rate

$\lambda$  = Slope coefficient of economic growth indicators

$v$  = stochastic error term

For this estimation, the null hypothesis can be defined such that each cross-section series in the panel has a unit root and the alternative hypothesis that at least one cross-section in the

panel is stationary. Additionally, the formulation allows  $\beta_i$  differing across cross-sections so that both tests allow for heterogeneity, in line with the specified models.

$$H_0: \beta_i = 0 \text{ for all } i \quad (3.19)$$

$$H_1: \beta_i < 0, i = 1, 2, \dots, N_1, \beta_i = 0, i = N_1 + 1, N_2 + 1, \dots, N \quad (3.20)$$

Note that the IPS test is a t-bar statistic based on the augmented Dickey-Fuller Statistics (Dickey and Fuller 1979). The test statistics is computed by the sample mean of the individual unit root tests for each of the N cross-section units.

The main idea of the Fisher-type unit root test is to combine p-values from the unit root tests applied to each of the N cross-section units in the panel. While both IPS and the fisher-type test combine information based on individual unit root tests, the crucial difference between the two is that IPS test combines with the test statistics while the Fisher-type test combines with the significance levels of the individual tests.

### 3.4.2.1 Panel Co-integration Test

In case where the panel unit root tests indicate that the variables are integrated, say of order one I(1), then the variable will be tested for cointegration using the panel cointegration test developed by Pedroni (1994, 2004). This test allows for heterogeneity in the panel by permitting heterogeneous slope coefficients, fixed effects and individual specific deterministic trends. The test contains seven cointegrating statistics, the first four based on pooling the residuals along the “within-dimension” which assume a common value for the unit root coefficient, and the subsequent three based on pooling the residuals along the “between dimension” which allow for different values of the unit root coefficient. The common idea of both classes is to first estimate the hypothesized cointegration relationship separately for each group member of the panel and then pool the resulting residuals when constructing the test for the null hypothesis that says there is no cointegration in the model(s). But in the case where cointegration is found, Error Correction Model (ECM) will be estimated which automatically gave rise to Vector Error Correction Model (VECM).

### 3.4.3 Error Correction Model

As shown in Engle and Granger (1987) when the series x and y are cointegrated as standard Granger-causality test should be estimated. However, this does not allow for the destination

between the short-run and the long-run effect. Therefore, vector error correction model (VECM) should be used instead. This will provide a link between the short-run and the long-run effect in the model(s) (Banerjee et al. 1993, 1998).

$$\Delta y_{i,j,t} = (\alpha_1 - 1)\Delta y_{i,j,t-1} + \delta_0 \Delta x_{i,j,t} + (\delta_0 + \delta_1)\Delta x_{i,j,t-1} + \varphi(y_{i,j,t-2} - x_{i,j,t-2}) + \eta x_{i,j,t-2} + f_i + v_{i,j,t} \quad - \quad - \quad - \quad (3.21)$$

$$\Delta x_{i,j,t} = (\beta_1 - 1)\Delta x_{i,j,t-1} + \rho_0 \Delta y_{i,j,t} + (\rho_0 + \rho_1)\Delta y_{i,j,t-1} + \phi(x_{i,j,t-2} - y_{i,j,t-2}) + \gamma y_{i,j,t-2} + \vartheta_i + v_{i,j,t} \quad - \quad - \quad - \quad (3.22)$$

where

y = growth rate of real gross domestic product;

x= vector of regressors;

While the coefficients  $(\alpha_1 - 1)$ ,  $\delta_0$  and  $(\delta_0 + \delta_1)$  as well as  $(\beta_1 - 1)$ ,  $\rho_0$  and  $(\rho_0 + \rho_1)$  measures the short-run effects, the coefficients  $\varphi$  and  $\phi$  for the error correction terms gave the adjustment rates at which short-run dynamics converge to the long-run equilibrium relationship. If  $\rho$  and  $\phi$  are negative and significant a relationship between y and x exist in the long run. The standard error-correction procedure is a two-step method, where in a first step the error correction term is obtained by saving residuals on separate estimation of the long-run equilibrium of y and x. In a second step the ECM with the included error correction term can be estimated.

The long-run multiplier is restricted to being homogeneous  $\Omega = 1$ . Using the one-step ECM which allows the study to calculate the true long-run relationship between y and x, given as  $1 - (\hat{\eta} / \hat{\phi})$  and  $1 - (\hat{\gamma} / \hat{\phi})$  respectively.

However, a crucial preliminary step in the estimation procedure consists in classifying the regressors as strictly exogenous, predetermined or endogenous variables. This classification has important implications in terms of the proper choice of instruments.

### 3.5 Data Source and Econometrics Software

The data set used in this study is a panel of fifteen ECOWAS countries covering the period of 2000 – 2018. The data used for the study are drawn from the World Development Indicators of the World Bank. The variables included for the study include the real GDP growth rate external debt sock, external debt servicing, gross fixed capital formation, real exchange rate and real interest rate. The models specified in this study will be estimated using Stata 13, which is efficient and suitable for estimations of the models specified.

## CHAPTER FOUR

### PRESENTATION AND DISCUSSION OF RESULTS

#### 4.1 Introduction

Equation (3.12) was estimated to examine the impact of external debt and capital formation on economic growth using the Generalized Method of Moments (GMM) estimator. On the other hand, to ascertain the optimal external debt threshold – as specified in objective two, equation (3.14) was estimated using the GMM estimator and the coefficients of the external debt linear and quadratic terms were substituted into equation (3.15) to ascertain the external debt threshold. To examine the direction of causality between external debt, capital formation and economic growth (in line with objective three), we estimated the time-stationary VAR model – equation (3.16) adapted to a panel context. However, before the estimation of the equations for the respective objectives, the descriptive statistics of the variables were examined. Also, the variables were subjected to unit root and cointegration tests. In this chapter, the estimation results are presented and the findings are discussed. The chapter begins with presentation and discussion of the descriptive statistics and rounded off with the results and discussion of findings of the respective objectives.

#### 4.2 Descriptive Statistics of the Variables

In order to have a glimpse of the time series behaviour of the pooled panel data set, the descriptive statistics of the variables were examined and the result is shown in Table 4.1 below.

Table 4.1: Mean, standard deviation, maximum values, and minimum values of the variables of the overall panel

Variables	Obs.	Mean	Standard Deviation	Minimum value	Maximum value
GDPG	N = 285 n = 15 T = 19	4.5798	4.4169	-28.3556	26.5392
exd	N = 285 n = 15 T = 19	21.3981	1.1853	16.1469	24.2414
exd2	N = 285 n = 15 T = 19	42.7962	2.3706	32.2937	48.4827
gfcf	N = 285 n = 15 T = 19	20.5958	1.5073	17.2129	25.1068
eds	N = 285 n = 15 T = 19	21.8301	1.4360	19.1912	25.6847
POPG	N = 285 n = 15 T = 19	2.7409	0.7116	0.5290	5.4787
EXR	N = 285 n = 15 T = 19	346.0799	621.4554	0.1304	3302.458

INR	N = 285	8.6989	7.2853	2.4556	34.9583
	n = 15				
	T = 19				
INF	N = 285	5.7484	6.5149	6.5149	34.7023
	n = 15				
	T = 19				

Source: Author's Computation

The descriptive statistics presented in Table 4.1 showed that the values of the growth rate of GDP, population growth, interest rate, and inflation rate centered around their respective mean values, as revealed by the respective small standard deviation values (close to their mean values). However, the values of the rest of the variables – external debt and its square term, external debt service and exchange rate are farther away from their respective mean values as indicated by the high standard deviation values, which are far greater than their mean values respectively. All the minimum values of the variables under investigation are less than their respective mean values, while the maximum values are all greater than their respective mean values.

### 4.3 Unit Root Test

Before estimating the models specified in chapter three, the variables in the models were tested for unit root using the Im, Persaran and Shin (IPS) and Breitung tests and the results are reported in Table 4.2 below:



Table 4.2: Im, Persaran and Shin (IPS) and Breitung unit root test results

Variable	Im, Persaran and Shin (IPS) Test Result		Breitung Test Result		~I(d)
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference	
Exd	-1.3672 (0.0858)	-8.4214* (0.0000)	-1.3630 (0.3091)	-6.1374* (0.0000)	I(1)
exd <sup>2</sup>	-1.3672 (0.0858)	-8.4214* (0.0000)	-1.3630 (0.3091)	-6.1374* (0.0000)	I(1)
Gfcf	-0.9924 (0.9811)	-8.9771* (0.0000)	-1.9256 (0.0571)	-8.8238* (0.0000)	I(1)
POPG	-1.1382 (0.1275)	-3.3877* (0.0026)	-0.1478 (0.4412)	3.2067* (0.0093)	I(1)
EXR	10.0271 (1.0000)	-7.3351* (0.0000)	1.5889 (1.0000)	-5.1903* (0.0000)	I(1)
INR	-1.8189 (1.0024)	-6.5291* (0.0000)	-1.2876 (0.0111)	-8.5420 (0.0000)*	I(1)
INF	-1.7965 (1.0211)	-9.1202* (0.0000)	-1.2220 (0.2024)	-7.5950 (0.0000)*	I(1)
eds	-1.6046 (0.0543)	-6.1590* (0.0000)	1.7596 (0.9608)	-5.9988* (0.0000)	I(1)
GDPG	-1.6181 (1.1031)	-10.0404* (0.0000)	-1.5932 (0.5133)	-7.6030* (0.0000)	I(1)

) P-values are in parenthesis

) \* denotes significant at 5% and the rejection of the null hypothesis of the panels containing unit roots.

) The IPS 5% critical values at levels and at 1<sup>st</sup> difference are -1.910. On the other hand, the Breitung p-values are presented in parenthesis.

Note: Variables in small case letters are logged variables. POPG, EXR, INR INF and GDPG are not logged because the variables were already (taken) in rates.

Cross-sectional means were removed to help control for possible correlation of panels.

Source: Author's Computation

At their level forms, none of the variables is significant at the 5 percent level in the Im, Persaran and Shin (IPS) and the Breitung tests. The respective p-values (presented in

parenthesis) were all greater than the 5 percent critical values. For this reason, all the variables were differenced once and the test was again, conducted at their 1<sup>st</sup> differenced form. The Persaran and Shin (IPS), and the Breitung tests indicated significant for all the variables. The respective p-values became less than the 5 percent critical values. For this reason, the null hypothesis of presence of unit root is clearly rejected at the 5 percent level. It is therefore, concluded that the variables are all integrated of order 1, I(1). Since all the variables became stationary at the same order, a cointegration test was conducted and presented in the next section.

#### 4.4 Pedroni's Cointegration Test

Cointegration is a test to show the existence of long run relationship between variables in a regression equation. The Pedroni's cointegration test was conducted and the result is reported in Table 4.3 below.

Table 4.3: Result of Johansen test for cointegration

Test Statistics	Panel	Group
V	-4.182	-
Rho	3.376	4.706
T	-9.103	-12.7
ADF	5.585	9.114
p = 0.000085		
t = 2.07471		

Source: Author's Computation

All the test statistics clearly reject the null hypothesis of no cointegration in favor of the alternative hypothesis that GDP growth rate, external debt, gross fixed capital formation, Population growth, exchange rate, real interest rate and inflation rate are cointegrated in all panels with a panel-specific cointegrating vector.

The model underlying the reported statistics includes panel-specific means and panel-specific AR parameters and does not include a time trend. Bartlett kernel with 2 lags was used, as selected by the Newey–West methods, to adjust for serial correlation.

#### 4.5 External Debt, Capital Formation and Economic Growth

Objective one is to examine the impact of external debt and capital formation on economic growth in ECOWAS Countries. Thus, equation (3.12), specified to capture objective one was estimated using the system GMM technique and the result is presented in Table 4.4 below.

Table 4.4: The impact of external debt and capital formation on economic growth

<b>GDPG</b>	<b>Coefficients</b>	<b>Standard Errors</b>	<b>z-stat</b>	<b>P-value</b>
GDPG <sub>t-1</sub>	0.1315	0.0503	2.61	0.009
gfcf	1.0240	0.4040	2.53	0.011
POPG	6.3399	3.1000	2.05	0.041
exd	-0.7551	0.3408	-2.22	0.027
EXR	0.0003	0.0006	0.50	0.620
INR	0.0695	0.0505	1.38	0.169
INF	-0.0034	0.0528	-0.07	0.948
Constant	2.4638	8.7056	0.28	0.777
Wald chi2(11)		96.51 (p = 0.0000)		
Sargan test of over identifying restrictions		289.9979 (0.0208)		

Source: Author's computation

All the variables had a positive coefficient except external debt and inflation rate that showed negative coefficients. The coefficient of the lagged GDP growth rate is positive, with a t-value of 2.61. This means that there was positive lag effect of GDP growth rate. The GDP growth rate in one period (quarter) lag had positive impact on GDP growth rate in ECOWAS countries. In specific terms, GDP growth rate in one period lag leads to 0.13 percent additional increase in the growth rate of GDP. The significant t-value of 2.61 suggests that the lag impact is significant at the 5 percent level. This is also confirmed by the significant probability value (0.009), indicating that there is insignificant error in rejecting the null hypothesis at the first lag. Therefore, the hypothesis that GDP growth rate at the lag period has no significant impact on the current period GDP growth rate in ECOWAS countries is clearly rejected at the 5 percent level.

Also, the result showed a positive coefficient of domestic investment (GFCF) of 1.0240 with a t-value of 2.53. Since the t-value of 2.53 is greater than 2 in absolute sense, the null hypothesis of domestic investment having no significant impact on economic growth in

ECOWAS countries is clearly rejected at the 5 percent level. In specific terms, a percentage increase in domestic investment in ECOWAS countries leads to an increase in economic growth in ECOWAS countries by 1.02 percent.

Also, population growth rate had positive impact on economic growth in ECOWAS countries such that additional increase in population growth leads to 6.34 percent increase in economic growth. The significant t-value of 2.05 and a p-value of 0.041 showed that the impact of population growth on economic growth is significant at the 5 percent level. Thus, the null hypothesis of no significant impact of population growth on economic growth is significantly rejected at the 5 percent level. Thus, population growth has positive and significant impact on economic growth in ECOWAS countries.

On the other hand, external debt had a coefficient of -0.7551 with a t-value of -2.22. Since the t-value of -2.22 is greater than 2 in absolute sense, the null hypothesis of external debt having no significant impact on economic growth in ECOWAS countries is rejected at the 5 percent level. The significant p-value of 0.027 also confirms that there is an insignificant error in rejecting the null hypothesis at the 5 percent level. In specific terms, a percentage increase in external debt in ECOWAS countries leads to a reduction in economic growth in ECOWAS countries by 0.76 percent.

The coefficient of exchange rate is 0.0003 with a t-value of 0.50. This means that exchange rate depreciation leads to an increase in economic growth in ECOWAS countries. However, the insignificant t-value means that the impact of exchange rate on economic growth is insignificant at the 5 percent level. This finding is inline with the rational behind the implementation of devaluation policies in most of the ECOWAS countries. Currency devaluation encourages international demand for local goods since devaluation reduces the cost of local goods and makes the local goods cheaper.

An increase in interest rate leads to 0.07 percent increase in economic growth. This is in line with the Mackinnon and Shaw financial liberalization theory. The t-value of 1.38 means an insignificant impact of interest rate on economic growth in ECOWAS countries. The p-value of 0.169 also means that there is a significant error in rejecting the null hypothesis of interest rate having no significant impact on economic growth in ECOWAS countries.

Inflation rate, on the other hand, has a coefficient of -0.0034 with t-value of -0.07. Since the t-value of -0.07 is less than 2 in absolute sense; the null hypothesis of inflation rate having no significant impact on economic growth in ECOWAS countries is clearly accepted at the 5

percent level. In specific terms, a percentage increase in inflation rate in ECOWAS countries leads to an insignificant increase in economic growth in ECOWAS countries.

#### 4.6 The Optimal External Debt Threshold

Objective two is to ascertain the optimal external debt threshold for ECOWAS Countries. Equation (3.14) was estimated using the system GMM technique and the result is presented in Table 4.5 below.

Table 4.5: GMM Result used in computing the optimal external debt threshold

GDPG	Coefficients	Standard Errors	z-stat	P-value
GDPG <sub>t-1</sub>	0.1134	0.0488	2.33	0.020
exd	0.0199	0.0421	0.47	0.635
exd <sup>2</sup>	-0.0131	0.0205	0.76	0.445
eds	-107.5519	4.7494	-22.65	0.000
Constant	-0.4881	0.9268	-0.53	0.598
Wald chi2(11)		32143.44 (p = 0.0000)		
Sargan test of overidentifying restrictions		204.0199 (0.0000)		
<b>Note: For the purpose of computing the optimal external debt threshold, the coefficients of external debt (exd) and its squared term (exd<sup>2</sup>) are the coefficients of interest.</b>				

Source: Author's Computation

Thereafter, the optimal external debt threshold was estimated as:

$$EXD^* = -\frac{a_2}{2a_3} \quad (\text{See equation 3.15})$$

where  $EXD^*$  is the optimal external debt threshold,  $a_2$  (0.0199) is the coefficient of the external debt linear term, and  $a_3$  (-0.0131) is the coefficient of the external debt quadratic term.

Substituting the values of 0.0199 and -0.0131 for  $a_2$  and  $a_3$  in the above equation results to:

$$EXD^* = -\frac{0.0199}{2(-0.0131)}$$

$$EXD^* = \frac{-0.0199}{-0.0262}$$

$$EXD^* = 0.7595$$

$$\therefore EXD^* = 75.95\%$$

The optimal threshold for external debt is 75.95%. It is the point at which external debt is detrimental to economic growth. This means that after this point has been reached, further increases in public debt would result to a decrease in economic growth rate in ECOWAS countries.

Using the 2018 real GDP and external debt values, we estimated the debt-to-GDP ratio of the ECOWAS countries to examine if it has reached the optimal threshold point at which economic growth is negatively affected. This is as shown below:

Table 4.6: Debt-to-GDP ratio of the ECOWAS countries using the 2018 real GDP and external debt values

		<b>Ratio of External debt to GDP (%)</b>													
	<b>Benin</b>	<b>Burkina Faso</b>	<b>Cape Verde</b>	<b>Cote d'Ivoire</b>	<b>Gambia</b>	<b>Ghana</b>	<b>Guinea</b>	<b>Guinea-Bissau</b>	<b>Liberia</b>	<b>Mali</b>	<b>Niger</b>	<b>Nigeria</b>	<b>Senegal</b>	<b>Sierra Leone</b>	<b>Togo</b>
2017	23.1	25.3	96.5	24.5	46.2	68.6	9.2	20.8	24.3	25.6	28.	15.	41.0	40.3	19.9
	%	%	%	%	%	%	%	%	%	%	7%	2%	%	%	%
2018	26.5	23.8	91.1	-	44.2	-	9.0	22.7	28.7	23.3	29.		43.6	42.9	
	%	%	%		%		%	%	%	%	1%		%	%	

Source: International Monetary Fund (2019)

As shown in Table 4.6, most ECOWAS countries are obsessed with external debt, given the high debt-to-GDP ratio, with Cape Verde, whose external debt-to-GDP ratio stands at 96.5 and 91.1 percents in 2017 and 2018 respectively. This is far above our estimated optimal external debt threshold of 75.95 percent for the ECOWAS Countries. Gambia, Ghana, Senegal and Sierra Leone are next in line, with external debt-to-GDP ratio of 46.2 and 44.2 percents for Gambia, 41.0 and 43.6 percents for Senegal, and 40.3 and 42.9 percents for Sierra Leone in 2017 and 2018 respectively. The external debt-to-GDP ratio for Ghana stood at 68.6 percent in 2017, which is quite high (and close to our estimated optimal external debt threshold of 75.95 percent) comparing to the external debt-to-GDP ratio of most ECOWAS

member countries. Guinea has a single digit ratio of 9.2 and 9.0 percents in 2017 and 2018 respectively, while Nigeria, Togo, Cote d'Ivoire, and Guinea-Bissau have ratios below 25 percent.

The external debt-to-GDP ratio for Cape Verde has already surpassed the estimated optimal external debt threshold. It is, therefore, safe to say that external debt is detrimental to economic growth in Cape Verde. External debt results to a decrease in economic growth rate. Although, not yet at the threshold, Ghana, Gambia, Senegal and Sierra Leone are getting close, and there is every reason to be obsessed about that and halt this risky drift, considering the high external debt-to-GDP ratio.

#### 4.7 Direction of Causality between External Debt, Capital Formation and Economic Growth

Objective 3 is to find out the direction of causality between external debt, capital formation and economic growth in ECOWAS Countries. Equation (3.16) that was specified to capture this objective was estimated and the direction of causality was tested using the VAR-Granger causality Wald test. The result of the test is reported in Table 4.7 below.

Table 4.7: Result of causality between external debt and economic growth in ECOWAS Countries

panel VAR-Granger causality Wald test  
 Ho: Excluded variable does not Granger-cause Equation variable  
 Ha: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2	
exd	gfcf	1.842	1	0.175
	GDPG	1.037	1	0.308
	ALL	5.315	2	0.070
gfcf	exd	5.624	1	0.018
	GDPG	0.895	1	0.344
	ALL	7.758	2	0.021
GDPG	exd	0.206	1	0.650
	gfcf	0.013	1	0.908
	ALL	0.207	2	0.902

Source: Author's computation

Regarding the 1<sup>st</sup> equation (for external debt), none of the variables – domestic investment (GFCF) and economic growth (GDPG) is significant at the 5 percent level. This means no causality running from neither domestic investment nor economic growth to external debt. Also, taking (all) the two variables together, no causality is found running from the variables to external debt.

Concerning equation (2) (the investment equation), only external debt is significant at the 5 percent level. This means that uni-directional causality runs significantly from external debt to investment in the ECOWAS countries. Thus, the null hypothesis of no causal relationship between external debt and domestic investment is clearly rejected at the 5 percent level. There is no significant causal relationship found running from economic growth to domestic investment, as indicated by its insignificant probability value. There is a strong evidence of causality from all the variables (external debt and economic growth, jointly) to domestic investment in the ECOWAS countries.

For the 3<sup>rd</sup> equation (economic growth), neither external debt nor domestic investment is significant at the 5 percent level. This means that causality does not run significantly from any of external debt and domestic investment to economic growth. Also, no significant causality is found rounding to economic growth, taken all the variables (external debt and domestic investment) together.



## CHAPTER FIVE

### SUMMARY OF FINDINGS AND CONCLUSION

#### 5.1 Introduction

The rising debt stock of ECOWAS countries in particular and other African countries in general, and the high percentage of revenue (over 50%) used to service debts annually, according to Punch (2019) do not bode well for the economic development of the ECOWAS region. No doubt, this has gone noticed by the leadership of the ECOWAS, debt management offices of the member countries, the African Development Bank and other international institutions. There are earlier expressed concerns even from multilateral institutions such as the World Bank and the International Monetary Fund that if the current borrowing binge continued, the region would risk economic growth for debt services. The danger comes out more clearly with some ECOWAS countries such as Cape Verde having an estimated external debt-to-GDP ratio of over 90 percent. Also troubling is the stepwise swinging of the loans of ECOWAS member countries towards non-concessional conditions, a hostile fiscal policy that keeps rising starting from 2010. The African Development Bank stated that "the increase has heightened the fiscal burden in an already fiscally and growth constrained environment." This did not raise only an important concern about the sustainability of external debt, but also, a concern on empirical evidence on the effect of external debt on the economic growth of the region. Thus, this study used the Generalized Method of Moments (GMM) estimator to estimate the impact of external debt and capital formation on economic growth in ECOWAS Countries, and the optimal external debt threshold for the region was also ascertained. Whereas, the Wald tests was used to test the causal relationship between external debt, capital formation and economic growth in ECOWAS Countries In this chapter, summary of the findings are presented and the economic policy relevance of the findings are discussed. Also in this chapter, conclusion is drawn from the findings and policy recommendations are proffered alongside areas suggested for further studies.

#### 5.2 Summary of the Findings

The major findings of this study are summarized below:

- i. In relation to objective one, capital formation was found to have a positive and significant impact on economic growth in ECOWAS countries. On the other hand, external

debt had a significant negative impact on economic growth. In addition, a positive lag effect of GDP growth rate was found. Also, population growth rate, exchange rate and interest rate had positive effect on economic growth, while inflation rate had negative effect. Exchange rate, interest rate and inflation rate were not statistically significant but population growth rate was statistically significant at the 5 percent level.

- ii. The findings with respect to the second objective showed evidence supporting the existence of a non-linear relationship between external debt and economic growth. The optimal threshold for external debt in the ECOWAS region was found to be 75.95%. It is the point at which external debt is detrimental to economic growth. The debt-to-GDP ratio of most ECOWAS countries such as Cape Verde had already surpassed the estimated optimal external debt threshold, therefore, are obsessed with external debt burden.
- iii. For objective three, we found no significant Granger causality running from capital formation and economic growth to external debt. Uni-directional causal relationship between external debt and capital formation was, however found, while the causal relationship between economic growth and capital formation was insignificant. Also, no evidence of significant causality was established running from external debt and capital formation to economic growth

### **5.3 Economic Policy Relevance of the Major Findings**

The positive and significant impact of capital formation on economic growth implies that capital formation is an important factor of economic growth. It is a (core) contributing factor to economic growth in the ECOWAS. Capital formation contributes to the level of production. The leading significance of capital formation in the economic growth process especially in its initial stages is that it enhances the establishment of social overheads, which goes a long way in the development of basic capital goods. Capital formation positively and significantly impacted economic growth by first increasing the income per capita and enhances the purchasing power, which in turn results to higher effective demand that brings about increase production.

On the other hand, the findings that external debt had a significant negative impact on economic growth implies that external debt within the period of the study has not been a contributing factor to economic growth. In fact, it is a drag-down to economic growth. This does not mean that external debt by ECOWAS countries has gotten to its saturation at which

it could no longer contribute positively to economic growth, but it means that money borrowed from external sources are not used for the specific reasons why it is borrowed. Among other reasons, countries borrowed in order to finance their reoccurring budget deficit, with the aim of deepening the financial market, to help them fund the increasing government expenditures, and to augment the limited resources so as to bridge the savings-investment gap. When this is not achieved, that is, when government borrowing is not allocated appropriately to the right sectors, aggregate demand cannot be stimulated and thus, increase in private investments will not be encouraged, and economic growth is not promoted. This is the reason for the negative impact of external debt (below the saturation point) on economic growth in the ECOWAS countries. Corruption and political instability among other socio-economic factors are the reason for the inappropriate allocation of government borrowing in the ECOWAS region.

The findings that population growth rate, exchange rate and interest rate had positive effect on economic growth imply that these factors are also responsible for economic growth in the ECOWAS countries. An adequate watch of the population growth rate by member countries of the economic community, appropriate exchange rate and interest rate management promote economic growth rate among the states in the ECOWAS countries. On the other hand, the negative effect of inflation points to the fact that the rate of inflation in the countries should be a serious concern for the ECOWAS. It is an indication of high (excessive) price level that needs to be checked.

Concerning the finding of an optimal threshold of 75.95% for external debt in the ECOWAS countries, it means that government external borrowing beyond 75.95% of the GDP would bring about a reduction in economic growth rate instead of promoting it. The implication is that when public debt becomes so large (beyond 75.95% in this case), domestic investment will become insufficiently low, whereby undermining economic growth. As a result, the government debt burden brings about a shortage of liquidity, which will be negatively affecting capital formation and economic growth. Governments will find it difficult to finance external debt at or close to the threshold level because of the increased servicing obligations that serve as a tax on investment and other economic activities.

The lack of evidence of significant Granger causality running from capital formation and economic growth to external debt implies that capital formation and economic growth do not warrant external debt, while the evidence of uni-directional causal relationship between

external debt and capital formation means that external debt cause (brings about change in) capital formation in the domestic economies of the ECOWAS countries.

#### **5.4 Conclusion**

Our examination of the relationship between capital formation, external debt and economic growth in ECOWAS countries leads us to conclude that high debt is bad. When external debt is in a range of 75.95% of GDP, any additional increase in external debt would be very detrimental to economic growth. For the debt-to-GDP ratio of the ECOWAS countries, none has gotten to the threshold value of 75.95% except Cape Verde whose threshold value has surpassed the turning point value. Ghana, Gambia, Senegal and Sierra Leone have very high debt-to-GDP ratio. Besides, though the external debt level of ECOWAS countries has not reached the threshold value, the estimate of the impact of external debt is significantly negative. A clear implication is that governments of the ECOWAS countries have not been making judicious use of public external borrowings. Aggregate demand is not really stimulated by external debt because productivity raising investments are not affected through external debt. Since the cost of investments in economic and social overheads such as power, transportation, education and health is high, state funding through government borrowing is necessary as they have a direct bearing with capital formation, which has significant impact on economic growth.

A possible conclusion is that ECOWAS countries with high external debt have to act quickly and decisively to tackle their looming fiscal problems. The longer they wait, the bigger the negative impact will be on economic growth, and the more difficult it will be to adjust. For the fact that governments of the ECOWAS countries never know exactly the time an extraordinary shock will hit, it is proper to aim at keeping external debt at levels that are well below the estimated threshold. Also, external debt has to be channeled to investments in economic and social overheads capable of causing capital formation in the economy. The population growth rate, exchange rate and interest rate, etc. also has a role in the economic growth process of countries in the ECOWAS region.

## **5.5 Policy Recommendations**

The following policy recommendations are proffered:

- i. ECOWAS executives should collaborate with the governments of member countries to pursue adequate governance practices if they are to ensure appropriate and effective external debt management in ways that economic growth will be enhanced instead of economic growth retardation.
- ii. The policy authorities of the ECOWAS countries must be cognizant of the fact that their economies are dynamic in nature and therefore, commit to estimating the optimal external debt thresholds periodically as their economies, hopefully, progress to greater levels. Also, countries in the ECOWAS are not necessarily homogenous; therefore, each member country needs to place itself appropriately around (not necessarily exactly) the estimated threshold level of the countries of the ECOWAS.
- iii. Also, there has to be concerted effort to promote domestic resource mobilization, especially tax revenue collection efficiency, combating illegal capital flow, strengthening governance around natural resource management, and accelerating the financial deepening of the domestic financial markets. These are areas the ECOWAS can be of support to member countries, including debt management, helping to build capacity for domestic resource mobilization, and support development banks to play a stronger role in infrastructure financing.

## **5.6 Areas for Further Studies**

- i. Further studies focusing on the optimal external debt threshold for each of the ECOWAS countries would be useful, considering the fact that countries in the ECOWAS are not necessarily homogenous.
- ii. It would also be relevant that further studies identify the optimal domestic debt threshold, as well as the impact of domestic debt on economic growth in the ECOWAS countries.
- iii. Further studies can be done in case of examining regions within Africa such as North, South, East and West Africa in form of comparative studies.

## 5.7 Contribution to Knowledge

This study has provided empirical evidence on the relationship between external debt, capital formation and economic growth of ECOWAS countries as a group. The study has informed us that the optimal threshold for external debt in the ECOWAS countries is 75.95%, pointing out that country whose external debt is beyond 75.95% of their GDP is in danger of economic growth deterioration. This study has also informed us that capital formation plays a positive and significant role in economic growth of the ECOWAS countries, while external debt negatively effected economic growth. We have been informed that the debt-to-GDP ratio of the ECOWAS countries are still below the threshold value, therefore, the negative impact of external debt on economic growth is as a result of misappropriation and inappropriate allocation of funds from external debt. Thus, aggregate demand is not really stimulated by external debt because productivity raising investments are not affected through external debt. This finding suggests that corruption and political instability among other socio-economic factors are the reason for the inappropriate allocation government external debt in the ECOWAS countries. This study in addition, brings to our notice that other multitude factors such as population growth rate, exchange rate, interest rate and inflation rate could explain economic growth in ECOWAS countries besides capital formation and external debt.

## REFERENCES

- Abbott, G. C. (1993). *Debt Relief and Sustainable Development in Sub-Saharan Africa*, Edward Elgar.
- Abdullahi, M. M., Bakar, N. A. B. and Hassan, S. B. (2016). Debt Overhang versus Crowding Out Effects: Understanding the Impact of External Debts on Capital Formation in Theory. *International Journal of Economics and Financial Issues*, 6(1), 271- 278.
- Adeniran, A. O., Azeez, M. I., and Aremu, J. A. (2016). External debt and economic growth in Nigeria: A Vector Auto-Regression (VAR) Approach. *International Journal of Management and Commerce Innovations*, 4(1), 706 - 714.
- Ayadi, F. S. and Ayadi, F. O. (2008). The Impact of external debt on economic growth: A comparative study of Nigeria and South Africa. *Journal of Sustainable Development in Africa*, 10(3), 234 – 264.
- Castejón, C. F. and Woerz, J. M. (2005). Good or Bad? - The Influence of FDI on Output Growth - An Industry-level Analysis. Working Papers No. 38, Vienna: The Vienna Institute for International Economic Studies, wiiw.
- Adesola W. A. (2009). Debt Servicing and Economic Growth in Nigeria: An Empirical Investigation. *Journal of Social Sciences*, 8(2), 1-11.
- Adofu, I and Abula, M (2010). Domestic Debt and the Nigerian Economy. *Current Research Journal of Economic Theory*, 2(1), 22-26.
- Afxentiou, P.C. and A. Serletis, (1996a). Foreign indebtedness in low and middle income developing countries. *Soc. Econ. Stud.*, 45(1), 131-159.
- Afxentiou, P.C. and A. Serletis, (1996). Growth and foreign indebtedness in developing countries: An empirical study using long term cross-country data. *J. Dev. Areas*, 31(1), 25-40.
- Afxentiou, P.C (1993). GNP growth and foreign indebtedness in middle-income developing countries. *International Economic Journal*, 7 (3), 81 -92.
- Agenor, P. R. and Montiel, P.J. (1996). *Development Macroeconomics*. Princeton: Princeton University Press.
- Albert, W., Brain, D. and Palitha, P. (2005). Economic Growth and External Debt Servicing: a cointegration Analysis of Sri Lanka 1952-2002. University of England School of Economics. Working Paper Series in Economics ISSN 14422980. [www.une.au/feb1/econstud/wps.html](http://www.une.au/feb1/econstud/wps.html).
- Alfredo S. and Francisco I. (2004). Debt and economic growth in developing and industrial countries. Working paper No.34, Columbia University, Department of Economics
- Alfredo S. and Francisco, I. (2005). External Debt and Economic Growth in Latin America. Ph.D. thesis, Dept. of Economics, Lund University
- Ajayi, S. I., and Khan, M. S. (2000). External Debt and Capital Flight in Sub-Saharan Africa. *International Monetary Fund*.

- Amoateng, K., and Amoako-Adu, B. (1996), Economic Growth, Export and External Debt Causality: The Case of African Countries. *Applied Economics*, 28, 21-27.
- Arellano, Manuel, Bond, Stephen (1991). Some Tests of Specification for Panel Data: *Monte Carlo Evidence and an Application to Employment Equations*, in: *Review of Economic Studies* 58, 277 – 297.
- Arellano, M. and Olympia, B. (1995). Another look at the instrumental variable estimation of error-components models, in: *Journal of Econometrics* 68, 29 – 51.
- Anyanwu, J. C. and Oaikhenan, H. E. (1995). *Modern Macroeconomics: Theory and Applications in Nigeria*. Joanee Educational Publishers Limited, Onitsha, Nigeria.
- Audu, I. (2004). The Impact of External Debt on Economic Growth and Public Investment: *The Case of Nigeria*, *African Institute for Economic Development and Planning (IDEP)*, Dakar Senegal.
- Babu J. O., Kiprop S. I., Kailio A. M. and Gisore M. (2014). External debt and Economic Growth in the East Africa Community. *African Journal of Business Management*. 8(21). 1011-1018.
- Baltagi, B. (2008): *Econometric analysis of panel data*. Chichester: John Wiley and Sons.
- Baum, C. F., Schaffer M.E., and Stillman S. (2003). Instrumental variables and GMM: Estimation and testing. *Stata Journal*, 3, 1–31.
- Barro, and Sala-i-Martin, (1997). *Economic Growth*, New York. Beck, Thorsten, and HeikoHesse, 2009, “Why Are Interest Spreads So High in Uganda?” *Journal of Development Economics*, 88, 192–204.
- Bazzi, S., and Clemens, M. (2009). Blunt instruments: on establishing the causes of economic growth. *Working Paper*, 171. Washington, D.C.: Centre for Global Development.
- Breitung, J., and Pesaran, M. H. (2007). *Unit Roots and Cointegration in Panels*, Forthcoming in L. Matyas, and P. Sevestre (Eds.), *The Econometrics of Panel Data (Third Edition)*, Kluwer Academic Publishers.
- Borensztein, E. (1990). Debt Overhang, Debt Reduction and Investment: The Case of the Philippines. *IMF Working Paper No. 77*, International Monetary Fund, September 1990.
- Berensmann, K. (2004). New Ways of Achieving Debt Sustainability Beyond the Enhanced HIPC Initiatives *Inter economics* 39 (6), 321-330.
- Blinder, A. S. (2008). *Keynesian Economics*. 2nd Edition. The course encyclopedia of economics. File111c:/users/hp/desktop/ph.
- Blundell, Richard/ Bond, Stephen (1998). Initial conditions and moment restrictions in dynamic panel data models, in: *Journal of Econometrics*, 87, 115 – 143.
- Bullow, J and Rogoff, K (1990). Cleaning up Third World debt without getting taken to the cleaners. *Journal of Economic Perspectives*, 4(1), 31 – 42
- Bond, Hoeffler and Temple J. (2001). GMM Estimation of Empirical growth models. *Economics paper 2001 – w21*, Economics group, Nuffield college, university of Oxford.



- Bun and windmeijer (2010). The weak instrument problem of the system GMM estimator in dynamic panel data models. *Econometrics Journal*, 13(1), 95-126.
- Bond (2002). Dynamic panel data model: a guide to micro data methods and practice. *Portuguese Economic Journal August 2002*, 1(2), 141 – 162.
- Butt and Hassan (2008) Role of Trade, External debt, Labor Force & Education in Economic Growth: Empirical Evidence from Pakistan by using ARDL Approach. *European Journal of Scientific Research*, 20, 852-860
- Caron F. (2007). Trade and poverty: when the third world fell behind.
- Choi, I. (2001). Unit root tests for panel data, *Journal of International Money and Finance*, 20(2), 249-272.
- Chowdhury K. (1994) A Structural Analysis of External Debt and Economic Growth: Some Evidence From Selected Countries in Asia and the Pacific. *Applied Economics*, 26, 1121-1131
- Checherita C. Hand Rother, Philipp (2010). The impact of high and growing government debt on economic growth an empirical investigation for the euro area. *Working Paper Series 1237*.
- Cohen, D. (1991). Slow Growth and Large LDC Debt in the Eighties: An Empirical Analysis. *CEPR Discussion Paper No. 461*, The Center for Economic Policy Research, January 1991.
- Cohen D. (1993). Low Investment and Large LDC Debt in the 1980s. *American Economic Review*, 83(3), 437-49.
- Cunningham, R.T., (1993). The effects of debt burden on economic growth in heavily indebted Nations. *J. Econ. Dev.*, 18(1) 115-126.
- Dickey, D. A., and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*. 74(366), 427-431.
- Duverger (1975). External debt and economic growth in Zambia: An empirical investigations (1975 – 2000).
- ECOWAS - convergence - report 2015
- Eduardo, B. (1989). The Effect of External debt on Investment. *Finanace and Development*, 26(3) 17-19.
- Essien, E., and Onwioduokit, E. (1998). Nigeria's Economic Growth and Foreign Debt, An Analytical Examination. *CBN Economic and Financial Review*, 3(1).
- Elbadawi, A. I., Ndulu, J.B., and Ndung'u, N. (1996): Debt overhang and economic growth in Sub-Saharan Africa. *A paper presented to the IMF/World Bank conference on External Financing for Low Income Countries in December*.
- Elmendorf, D. W. and Mankiw, N. G. (1998). Government Debt. In (J. B. Taylor & M. Woodford (ed.)) *Handbook of Macroeconomics*, 1(3), 1615-1669.
- Domar, E. (1946). Capital expansion, rate of growth, and Employment. *Econometrica*, 14, 137-47.

- Ezeabasili, V. N. (2006). Nigeria External Debt: Past, Present and Future. *The certified National Accountant*, 14(1), 25 – 43.
- Frankel A. and David Romer (1999). Trade and growth: An empirical investigation. *NBER working paper 5476*.
- Fosu, A. K. (1996). The impact of external debt on economic growth in Sub Saharan Africa. *Journal of Economic Development* 21(1), 93-117.
- Fosu, A. K. (1999). The external debt burden and economic growth in the 1980s: evidence from sub-Saharan Africa. *Canadian Journal of Development Studies* 20 (2), 307-318.
- Granger (1963). Some recent development in a concept of causality. *Journal of econometrics*, 39(1-2) 199 – 211.
- Hausman, J.A. (1978). Specification tests in econometrics. *Econometrica* 46, 1251-1271.
- Hameed, A., Ashraf, H., and Chaudhary, M.A. (2008). External Debt and Its Impact on Economic and Business Growth in Pakistan. *International Research Journal of Finance and Economics*, ISSN 1450-2887, Issue 20, 132-140.
- Hansen, B. E. (2000). Sample Splitting and Threshold Estimation. *Econometrica*, 68, 575–603.
- Ijirshar, V. U., Fefa, J. and Godoo, M. (2016). The Relationship between External Debt and Economic Growth in Nigeria. *International Journal of Economic Management Science*, 6(1), 89 - 104
- Im, K. S., Pesaran, M. H., and Shin, Y. (2003). Testing for unit roots in heterogeneous panels, *Journal of Econometrics*. 115(1), 53-74.
- Iyoha, M. A. (1996) External Debt and Economic Growth in Sub-Saharan Africa Countries: An Econometric Study. [www.researchnetwork 17/07/2005](http://www.researchnetwork.org/17/07/2005)
- International Monetary Fund (2019), Official External Debt: Debtor Based. Retrieved from FRED, Federal Reserve Bank of St. Louis. Available at: <https://fred.stlouisfed.org/series/BFADGGDPPT>
- International Monetary fund (IMF) 2003. External debt statistics: guide for compilers and users
- Jones I. Charles (2002). Introduction to Economic Growth, Edition 4, New York: W.W. Norton.
- Karagol E. (2002), The causality analysis of external debt service and GNP: The case of Turkey. *Central Bank Rev.*, 2(1), 39-64
- Kassu, T., D. K., Mishra and Asfaw, M. (2014). Public External Debt, Capital formation and Economic growth in Ethiopia. *Journal of Economics and Sustainable Development*, 5(15), 222 - 232
- Keynes, M. and Kalecki, T. (1982). The investment theories. *Journal of post Keynesian Economics* , 9, 2.
- Krugman, P. (1988). Financing vs. Forgiving a debt overhang. *Journal of Development Economics*, 29, 253-268.

- Landais, B. (1998). The monetary origins of the economic and financial crisis, IREA Université de Bretagne Sud, 2
- Liao, Q., Wu, Z. and Xu, J. (2010). A new production function with technological innovation factor and its application to the analysis of energy saving effect in LSD. *Modeling and Simulation*, 6(4), 257 - 266.
- Maddala, G. S. and Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, Special Issue, 631-652.
- Manghyereh, A. and Hashemite, U. (2003). External Debt and Economic Growth in Jordan; the Threshold Effect. *Economina Internationale/International Economics*, 56(3), 337-355.
- Malik, K. and K. Hayat (2010) External Debt and Economic Growth: Empirical Evidence from Pakistan”; *International Research Journal of Finance and Economics*, (44), 89-96
- Mbah, S. A., Umunna, G. and Agu, O. C. (2016). Impact of external debt on economic growth in Nigeria: An ARDL bound testing approach. *Journal of Economics and Sustainable Development*, 7(10), 16-26.
- Milton A (1999). External debt and economic growth in sub-Saharan African countries: An econometric study. *AERC Research Paper 90, African Economic Research Consortium*, Nairobi.
- Momodu, A. A. (2012). Effect of Debt Servicing on Economic Growth in Nigeria *Reikojournals.org*
- Nurske R. (1953). *Problem of Capital Formation in Under Developed Countries*, Oxford. Oxford University Press.
- Odubuasi, A. C., Uzoka, P. A. and Anichebe, A. S. (2018). External Debt and Economic Growth in Nigeria. *Journal of Accounting and Financial Management*, 4(6), 98 - 108
- Ogiemudia, A. O. and Ajao (2012). Foreign Debt Management and the Development of Nigeria Economy, in *Review of Economic and Finance*, *Academic Research Centre of Canada*.
- Ogunmuyiwa M. S. (2011). Does Debt Promote Economic Growth in Nigeria? *Current Research Journal of Economic Theory*, 3(1), 29-35
- Oke, O. M. and Sulaiman, L. A. (2012). External Debt, Economic Growth and Investment in Nigeria. *European Journal of Business and Management*, 4(11), 54 - 69.
- Olasode, O. S. and Babatunde, T. S. (2016). External Debts and Economic Growth in Nigeria: An Empirical Study Using Autoregressive Distributed Lag Model. *Business and Economics Journal*, 7(2), 102-113.
- Oloyede, B. (2002). *Principles of International Finance*, Forthright Educational Publishers, Lagos.
- Olukunmi, O. (2007). *Easy to Understand Economics For Schools and Colleges*. Revised Edition. Ibadan: Rasmed Publications Limited.

- Onalan, O. and Basegmez, H. (2018). Estimation of Economic Growth using Grey Cobb-Douglas Production Function: An Application for US Economy. *Journal of Business, Economics and Finance*, 7(2), 178 - 190.
- Oyejide T. A., Soyede A. and M. O. Kayode (1985): Nigeria and the IMF. Heinemann Educational book Nig. Ltd Ibadan,
- Omotoye O. R., Sharma H. P., Ngassam, C. and Eseonu, M. (2006). "Sub-Saharan Africa's Debt Crisis: Analysis and Forecast Based on Nigeria". *Managerial Finance*, 32, 7.
- Orji A. (2014). Foreign private investment, capital formation and economic growth in Nigeria: a two stage least square approach. *Journal of economics and sustainable development*, 2(2), 150 - 162
- Pattillo, C., Helene, P., and Luka, R. (2002). External Debt and Growth. IMF Working Paper 02/69 (Washington: International Monetary Fund).
- Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors, *Oxford Bulletin of Economics and Statistics*, 61(0), 653-70.
- Pedroni, P. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties Of Pooled Time Series Tests With An Application To The PPP Hypothesis, *Econometric Theory*, Cambridge University Press. 20(3), 597-625.
- Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. CESifo Working Papers, 1233.
- Perasso G. (1992). Debt reduction versus 'Appropriate' Domestic policies. *Wiley online library*, 45(4).
- Punch (June 24,2019), High cost of debt servicing. Punch news. Available at: <https://punchng.com/high-cost-of-debt-servicing/>
- Rifaqat, A. and Mustafa, U. (2008), External Debt Accumulation and Its Impact on Economic Growth in Pakistan. *Pakistan development review*.
- Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics* 71, 135-158.
- Romer, Paul M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, October 1986, 94(5), 1002-37.
- Ricardo H. and UgoPanizza (2005). Capital controls and Capital flows in emerging economies: policies, practices and consequences. *National Bureau of Economic research*.
- Sachs, J (1989). The Debt Overhang of the Developing Countries in: G. Calvo, R. Findlay, P. Kouri and J.B. de Macedo, eds., *Debt, Stabilisation and Development*, Basil Blackwell, Cambridge, M.A, 35-56.
- Safdari M. and Mehrizi A. (2011). External Debt and Economic Growth in Iran. *Journal of Economics and International Finance* , 3(5), 322–327
- Sanusi, J.O. (2003). Management of Nigeria's Domestic Debt. Key Note Address by the Governor of the Central Bank of Nigeria at the 7th Monetary Policy Forum organised By the Central Bank of Nigeria at the CBN Conference Hall, Abuja.

- Shabbir, S., (2009). Does External Debt Affect Economic Growth: Evidence from Developing Countries. Retrieved 03/03/13 from [http://aysps:gsu.edu/ECON\\_MA\\_shabbirs.pdf](http://aysps:gsu.edu/ECON_MA_shabbirs.pdf)
- Shah, M. H. and Pervin, S. (2012). External Public Debt and Economic Growth: Empirical Evidence from Bangladesh, 1974 to 2010. *Academic Research International* 3(2), 508-515.
- Shkolnik, I. and Koilo, V. (2018). The relationship between external debt and economic growth: Empirical evidence from Ukraine and other emerging economies. *Investment Management and Financial Innovations*, 15(1):387 - 400
- Soludo, C.C. (2003). Debt Poverty and Inequality in OkonjoIweala, Soludo, and Muntar (Eds). *The Debt Trap in Nigeria, Africa World Press NJ*, 23-74.
- Solow, R.M. (1957). Technical change and the aggregate productive function: Review of Economics and Statistics.
- Sulaiman, L. A. and Azeez, B. A. (2012). Effect of external debt on economic growth of Nigeria. *Journal of Economics and Sustainable Development*, 3(8), 71 - 79.
- Suma, D. F. (2007). The External Debt Crisis and its Impact on Economic Growth and Investment in Sub-Saharan Africa: *A regional econometric approach of ECOWAS countries*. Doctoral thesis, WU Vienna University of Economics and Business. <http://epub.wu.ac.at/1994/983>.
- Sundell, F. and Lemdal, M. (2011). Debt Overhang and the Effects on Developing and Developed Economies. M.Sc. Thesis. Stockholm School of Economics.
- Theo S. Eicher and Leukert A. (2009). Institution and economic performance. Endogeneity and parameter heterogeneity. *Journal of money, credit and banking*, 41 (1).
- Todaro M. P. (1977). *Economics for a Developing World*. Harlow, Essex, Longman.
- Tsoufidis (2007). The rate of profit in the Greek economy 1988 – 1997. An input – output analysis.
- Udeh, S. N., Ugwu, J. I., and Onwuka, I. O. (2016). External debt and economic growth: The Nigeria experience. *European Journal of Accounting, Auditing and Finance Research*, 4(2), 33 -48.
- Ugbor, I. K, Ugbor, U. J. K. and Aduku, E. B. (2018). Governance Structure and Economic Diversification. A paper presented at the Department of Economics, University of Nigeria, Nsukka International Conference, 20<sup>th</sup> – 21<sup>st</sup> July, 2018.
- Ugbor, I. K., David-Wayas, O. M., Chukwuma, Q. O. and Aduku, E. B. (2017). Empirical Analysis of the Debt-Economic Growth Turning Point in Nigeria. *Researchjournali's Journal of Economics*, 5(4), 1 – 12.
- Ugwuegbe, S. U., Okafor, I.G. and Akarogbe, C. A. (2016). Effect of external borrowing and foreign aid on economic growth in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 6(4), 155 - 175.
- Were, M. (2001). The Impact of External Debt on Economic Growth in Kenya: An Empirical Assessment, *UNU-WIDER Research Paper*, DP2001/116.

Wijeweera, A., B. Dollery and P. Pathberiya,( 2005). Economic growth and external debt servicing: A cointegration analysis of Sri Lanka, 1952 to 2002. Working Paper Series in Economics, ISSN 1442- 2980, School of Economics, University of New England

World Bank (2016) World Development indicators 2016. World Bank: Washington D.C

World Bank annual report 1998

Zaman, R. and Arslan, M. (2014). The Role of External Debt on Economic Growth: Evidence from Pakistan Economy. *International Journal of Innovation and Sustainable Development*, 5(24), 140 - 147.

## APPENDIX A

## DATA USED FOR THE STUDY

Table A1: The panel data set used for the study

Country	Period	EXD	EXD2	GFCF	POPG	EXR	INR	INF	EDS	GDPG
Benin	2000	1.319e+09	1.741e+18	2.217e+08	3.0988099	201.69788	3.5	4.2108452	2.360e+09	4.8616676
Benin	2001	1.350e+09	1.823e+18	6.123e+08	3.2455479	201.07294	3.5	3.9898256	2.506e+09	6.1961201
Benin	2002	1.344e+09	1.807e+18	75713221	3.3426617	205.09783	3.5	2.4530016	2.617e+09	4.4418469
Benin	2003	1.301e+09	1.692e+18	7.977e+08	3.3842976	207.23078	3.5	1.4597544	2.721e+09	3.9507555
Benin	2004	1.370e+09	1.876e+18	8.105e+08	3.3541051	203.24596	3.5	.89149433	2.805e+09	3.0824312
Benin	2005	1.626e+09	2.643e+18	8.429e+08	3.2761919	205.34977	3.5	5.3643079	2.885e+09	2.8652368
Benin	2006	5.443e+08	2.963e+17	8.851e+08	3.1941266	203.39546	3.5	3.7870945	2.993e+09	3.7521545
Benin	2007	6.976e+08	4.866e+17	9.382e+08	3.1256377	198.89763	3.5	1.2883133	3.132e+09	4.6263965
Benin	2008	1.040e+09	1.082e+18	1.016e+09	3.0535035	207.6237	3.5	7.9473436	3.289e+09	5.0184303
Benin	2009	1.070e+09	1.145e+18	1.043e+09	2.9805121	211.28624	3.5	.4375	3.365e+09	2.3192269
Benin	2010	1.187e+09	1.409e+18	9.814e+08	2.9089549	210.57099	3.5	2.1447832	3.436e+09	2.1135934
Benin	2011	1.233e+09	1.520e+18	1.035e+09	2.8348972	214.03456	3.5	2.7317034	3.538e+09	2.9692234
Benin	2012	1.278e+09	1.633e+18	1.103e+09	2.7650086	226.34215	3.5	6.7413598	3.708e+09	4.8070371

Benin	2013	1.580e+09	2.498e+18	4.143e+09	2.7109019	225.84954	3.5	.9725998	3.975e+09	7.1930965
Benin	2014	1.788e+09	3.195e+18	3.114e+08	2.6762623	221.32566	3.5	-1.0857445	4.228e+09	6.354764
Benin	2015	1.731e+09	2.995e+18	4.025e+09	2.6545971	219.11462	3.5	.32039872	4.316e+09	2.0958084
Benin	2016	1.836e+09	3.372e+18	2.112e+09	2.6363374	215.61656	3.5	-.88567542	4.487e+09	3.9648599
Benin	2017	2.336e+09	5.459e+18	6.142e+09	2.6145065	216.43268	3.5	1.6465303	4.733e+09	5.4634285
Benin	2018	1.933e+09	3.738e+18	6.013e+09	2.3240065	215.91256	3.5	1.9641453	5.019e+09	6.0591833
Burkina Faso	2000	1.639e+09	2.687e+18	3.341e+08	2.8797974	189.47901	3.5	-.28089888	2.618e+09	2.9343635
Burkina Faso	2001	1.396e+09	1.950e+18	4.365e+08	2.892812	192.54022	3.5	4.727267	2.791e+09	6.6088153
Burkina Faso	2002	1.676e+09	2.810e+18	7.074e+09	2.9073305	195.51473	3.5	2.3000254	2.912e+09	4.3527894
Burkina Faso	2003	1.778e+09	3.161e+18	8.331e+08	2.9339555	194.39743	3.5	2.0403282	3.140e+09	7.8097503
Burkina Faso	2004	2.106e+09	4.436e+18	9.262e+08	2.9754586	189.37025	3.5	-.41146953	3.280e+09	4.4778753
Burkina Faso	2005	2.115e+09	4.474e+18	1.075e+09	3.0234021	190.43898	3.5	6.4	3.564e+09	8.6618732
Burkina Faso	2006	1.216e+09	1.479e+18	1.298e+09	3.0715853	183.44202	3.5	2.4	3.787e+09	6.2531586
Burkina Faso	2007	1.579e+09	2.493e+18	1.641e+09	3.106845	183.19145	3.5	-.27534957	3.943e+09	4.1113816
Burkina Faso	2008	1.757e+09	3.087e+18	1.758e+09	3.1198047	196.12418	3.5	10.7	4.172e+09	5.8000051
Burkina Faso	2009	2.146e+09	4.604e+18	1.802e+09	3.1058852	199.32824	3.5	2.6	4.291e+09	2.8666995
Burkina Faso	2010	2.393e+09	5.728e+18	1.980e+09	3.0740764	204.36519	3.5	-.6	4.654e+09	8.4462212



Burkina Faso	2011	2.333e+09	5.445e+18	1.971e+09	3.0372505	213.65917	3.5	2.8	4.962e+09	6.6269151
Burkina Faso	2012	2.562e+09	6.563e+18	2.093e+09	3.0046966	222.01296	3.5	3.8	5.409e+09	8.9952162
Burkina Faso	2013	2.637e+09	6.955e+18	4.443e+08	2.9759904	213.87798	3.5	.5	5.721e+09	5.7796876
Burkina Faso	2014	2.708e+09	7.335e+18	1.758e+09	2.9538026	208.16784	3.5	-.33858001	5.969e+09	4.3268456
Burkina Faso	2015	2.704e+09	7.312e+18	2.932e+09	2.9357336	214.4652	3.5	.9122807	6.201e+09	3.8945233
Burkina Faso	2016	2.920e+09	8.527e+18	2.970e+09	2.9170857	217.9639	3.5	-.20862309	6.570e+09	5.9473275
Burkina Faso	2017	3.120e+09	9.736e+18	2.981e+09	2.8958085	218.51651	3.5	1.5369816	7.013e+09	6.7428983
Burkina Faso	2018	2.970e+09	8.823e+18	2.992e+09	2.7347336	218.9839	3.5	2.8565679	7.252e+09	3.4143429
Cape Verde	2000	3.200e+08	1.024e+17	1.973e+08	2.1325679	51.611817	4.33917	-2.4	5.711e+08	7.2669508
Cape Verde	2001	3.132e+08	9.812e+16	2.325e+08	1.9647306	51.124255	4.67	3.7	6.061e+08	6.1375967
Cape Verde	2002	3.878e+08	1.504e+17	46711325	1.7969988	50.188749	4.85583	1.9	6.381e+08	5.282517
Cape Verde	2003	4.996e+08	2.496e+17	2.993e+08	1.5983891	50.08278	3.93236	1.2	6.860e+08	7.5022094
Cape Verde	2004	5.418e+08	2.935e+17	3.725e+08	1.3638083	48.438689	3.45833	-1.9500966	7.198e+08	4.9266994
Cape Verde	2005	4.986e+08	2.486e+17	3.478e+08	1.1170933	47.223109	3.38247	.4	7.667e+08	6.5208923
Cape Verde	2006	5.856e+08	3.430e+17	4.114e+08	.85212895	47.211732	4.43387	4.8424542	8.366e+08	9.1182556
Cape Verde	2007	6.497e+08	4.220e+17	5.639e+08	.62998547	47.238582	3.28646	4.3943319	9.090e+08	8.6491531
Cape Verde	2008	6.521e+08	4.252e+17	5.779e+08	.52900818	47.972583	3.81016	6.7931131	9.695e+08	6.6505977

Cape Verde	2009	7.788e+08	6.065e+17	5.286e+08	.58885049	48.64638	2.7505929	1	9.571e+08	-1.270426
Cape Verde	2010	8.515e+08	7.251e+17	6.288e+08	.76149694	48.301941	4.33917	2.1	9.712e+08	1.4667901
Cape Verde	2011	9.923e+08	9.847e+17	7.062e+08	.97475626	48.591679	4.67	4.5	1.010e+09	3.9688864
Cape Verde	2012	1.226e+09	1.502e+18	7.807e+08	1.1533669	47.976553	4.85583	2.5	1.021e+09	1.0819183
Cape Verde	2013	1.506e+09	2.267e+18	7.739e+08	1.2753808	47.888494	3.93236	1.5	1.029e+09	.80279755
Cape Verde	2014	1.537e+09	2.363e+18	7.780e+08	1.3105757	46.97511	3.45833	-.2	1.035e+09	.61121268
Cape Verde	2015	1.519e+09	2.308e+18	8.183e+08	1.2835032	47.278084	3.38247	.1	1.046e+09	1.0068637
Cape Verde	2016	1.523e+09	2.321e+18	8.487e+08	1.2470653	46.292588	4.43387	-1.4076655	1.085e+09	3.8174704
Cape Verde	2017	1.647e+09	2.712e+18	8.162e+08	1.2286691	45.999594	3.28646	1.0984543	1.129e+09	4.0350569
Cape Verde	2018	1.723e+09	2.970e+18	8.817e+08	1.3460653	46.989594	3.81016	1.4415635	1.176e+09	4.1037064
Cote d'Ivoire	2000	8.629e+09	7.445e+19	1.145e+09	2.3554849	193.90444	5	2.533928	1.042e+10	-4.6293212
Cote d'Ivoire	2001	8.550e+09	7.310e+19	1.445e+09	2.1033363	203.60616	5	4.3574922	1.042e+10	.01938378
Cote d'Ivoire	2002	8.057e+09	6.492e+19	1.617e+09	1.8976452	213.89748	5	3.0819486	1.026e+10	-1.5735628
Cote d'Ivoire	2003	9.089e+09	8.262e+19	1.646e+09	1.7812656	219.78432	5	3.3066961	1.009e+10	-1.6771676
Cote d'Ivoire	2004	9.582e+09	9.181e+19	1.605e+09	1.777871	207.7191	5	1.4453897	1.025e+10	1.5795401
Cote d'Ivoire	2005	9.085e+09	8.254e+19	1.516e+09	1.8547154	203.86327	4.91667	3.8916645	1.043e+10	1.8290093
Cote d'Ivoire	2006	10291886	1.059e+14	1.442e+09	1.9505642	201.23527	4.33333	2.4614022	1.051e+10	.71902951

Cote d'Ivoire	2007	1.381e+10	1.906e+20	1.570e+09	2.0327385	201.76882	4.25	1.8958809	1.068e+10	1.5931577
Cote d'Ivoire	2008	1.377e+10	1.895e+20	1.733e+09	2.1178632	214.71248	3.75	6.3090909	1.092e+10	2.2954394
Cote d'Ivoire	2009	1.287e+10	1.657e+20	1.829e+09	2.1974341	218.09287	3.25	4.6843887	1.134e+10	3.8060114
Cote d'Ivoire	2010	1.171e+10	1.371e+20	1.894e+09	2.2697489	227.06602	4.91667	1.7	1.161e+10	2.4125816
Cote d'Ivoire	2011	1.236e+10	1.527e+20	1.634e+09	2.34687	228.22848	4.33333	4.9	1.106e+10	-4.6916428
Cote d'Ivoire	2012	7.792e+09	6.071e+19	2.666e+09	2.4192625	229.83105	4.25	1.3	1.225e+10	10.674085
Cote d'Ivoire	2013	8.505e+09	7.234e+19	2.267e+09	2.463431	233.74961	3.75	2.6	1.331e+10	8.7
Cote d'Ivoire	2014	8.667e+09	7.512e+19	2.834e+09	2.4725043	238.60531	3.25	.4	1.444e+10	8.5
Cote d'Ivoire	2015	9.581e+09	9.179e+19	2.859e+09	2.4572206	240.26515	4.91667	1.2	1.572e+10	8.8428654
Cote d'Ivoire	2016	9.733e+09	9.473e+19	2.995e+09	2.4343177	240.54108	4.33333	.7	1.703e+10	8.3357925
Cote d'Ivoire	2017	1.282e+10	1.643e+20	2.647e+09	2.4154879	241.0642	4.25	.974898	1.840e+10	8.0196122
Cote d'Ivoire	2018	9.863e+09	9.729e+19	2.776e+09	2.4682206	240.3642	3.75	1.7711628	1.984e+10	7.851181
Gambia	2000	5.215e+08	2.719e+17	1.560e+08	3.0130269	5.1323958	12.5	.19036169	4.209e+08	5.52489
Gambia	2001	5.492e+08	3.016e+17	1.775e+08	3.1118196	5.7796683	12.5	4.5	4.451e+08	5.7530379
Gambia	2002	5.922e+08	3.507e+17	1.963e+08	3.2018707	6.6087484	12.7083	8.6	4.307e+08	-3.2469478
Gambia	2003	6.219e+08	3.867e+17	2.460e+08	3.2631222	8.2533845	16.4167	17	4.603e+08	6.8743185
Gambia	2004	6.595e+08	4.349e+17	1.895e+08	3.2867156	9.0136194	22	14.319939	4.927e+08	7.0455864

Gambia	2005	6.988e+08	4.883e+17	1.853e+08	3.2848722	9.0464879	17.3333	3.2	4.881e+08	-.94167615
Gambia	2006	7.593e+08	5.765e+17	2.009e+08	3.2757809	8.9463479	12.6667	2.0557881	4.936e+08	1.1240996
Gambia	2007	3.353e+08	1.124e+17	2.014e+08	3.2729707	9.0886576	12.8917	5.3697096	5.115e+08	3.6310258
Gambia	2008	3.439e+08	1.183e+17	1.883e+08	3.275463	9.0930903	12.9	4.451085	5.408e+08	5.734642
Gambia	2009	3.688e+08	1.360e+17	2.034e+08	3.2865942	9.4919467	12.5	4.5542313	5.757e+08	6.4496958
Gambia	2010	3.776e+08	1.426e+17	1.429e+08	3.3011796	9.7805844	12.5	5.0493414	6.133e+08	6.5262974
Gambia	2011	3.862e+08	1.491e+17	2.286e+08	3.3134633	9.9387871	12.7083	4.7962212	5.869e+08	-4.2951217
Gambia	2012	3.758e+08	1.412e+17	2.411e+08	3.3165075	10.193512	16.4167	4.6449588	6.198e+08	5.5997608
Gambia	2013	3.941e+08	1.553e+17	2.975e+08	3.3074946	10.600635	22	5.2242582	6.495e+08	4.7889222
Gambia	2014	4.488e+08	2.014e+17	2.763e+08	3.2847888	11.102875	17.3333	6.2451822	6.481e+08	-.21907947
Gambia	2015	4.990e+08	2.490e+17	2.985e+08	3.2529285	11.683936	12.6667	6.8081539	6.742e+08	4.0375415
Gambia	2016	5.042e+08	2.542e+17	3.109e+08	3.2177019	12.360519	12.8917	7.2333385	6.891e+08	2.2109636
Gambia	2017	5.172e+08	2.675e+17	3.226e+08	3.1840606	13.159574	12.9	7.0199057	7.239e+08	5.0538296
Gambia	2018	6.042e+08	3.650e+17	3.411e+08	3.2367011	13.459574	13.9	6.9429486	7.506e+08	3.6805186
Ghana	2000	6.021e+09	3.625e+19	3.215e+09	2.3964197	.13044157	28.6042	25.2	7.362e+09	4.1876832
Ghana	2001	6.026e+09	3.631e+19	3.794e+09	2.4903594	.17163821	30.8542	32.9	7.693e+09	4.4972116
Ghana	2002	6.131e+09	3.759e+19	3.360e+08	2.5623615	.2075219	16.2083	14.8	8.051e+09	4.6536074

Ghana	2003	7.549e+09	5.699e+19	3.725e+09	2.6137572	.26174681	14.3233	26.7	8.463e+09	5.1116249
Ghana	2004	6.448e+09	4.158e+19	4.795e+09	2.6352453	.2913567	13.625	12.628453	8.912e+09	5.3154652
Ghana	2005	6.348e+09	4.029e+19	5.162e+09	2.6343955	.32461286	10.1625	15.4	9.435e+09	5.8680807
Ghana	2006	2.177e+09	4.737e+18	6.379e+09	2.6292182	.35018492	8.88542	11.682614	1.001e+10	6.1200943
Ghana	2007	3.586e+09	1.286e+19	7.549e+09	2.624603	.40464947	8.89583	10.728863	1.066e+10	6.4631316
Ghana	2008	4.035e+09	1.628e+19	9.819e+09	2.6095389	.47389691	11.285	16.504616	1.156e+10	8.4251819
Ghana	2009	5.008e+09	2.508e+19	7.721e+09	2.5836957	.54400903	15.546667	19.2	1.202e+10	3.9952581
Ghana	2010	6.255e+09	3.912e+19	9.605e+09	2.5495122	.62663472	28.6042	10.7	1.243e+10	3.4
Ghana	2011	7.653e+09	5.857e+19	1.364e+10	2.5116197	.69939228	30.8542	8.7	1.417e+10	14
Ghana	2012	9.154e+09	8.380e+19	1.607e+10	2.4713157	.79116275	16.2083	9.2	1.549e+10	9.3
Ghana	2013	1.190e+10	1.417e+20	6.549e+09	2.4266101	.89990172	14.3233	11.666192	1.662e+10	7.3125251
Ghana	2014	1.387e+10	1.924e+20	4.219e+09	2.3779075	1.0314878	13.625	15.486428	1.728e+10	3.9858655
Ghana	2015	1.578e+10	2.491e+20	5.221e+09	2.3268912	1.1874735	10.1625	17.153203	1.795e+10	3.8814241
Ghana	2016	1.646e+10	2.710e+20	6.625e+09	2.2746605	1.3843876	8.88542	17.502094	1.859e+10	3.5368916
Ghana	2017	1.635e+10	2.674e+20	6.364e+10	2.2235924	1.5543569	8.89583	11.924438	1.970e+10	5.9636985
Ghana	2018	1.745e+10	3.045e+20	6.607e+10	2.2616604	1.6543568	15.956667	8.898791	2.137e+10	8.4814301
Guinea	2000	3.261e+09	1.063e+19	3.618e+08	1.7557893	711.3203	7.5	6.9241012	2.995e+09	2.8848743

Guinea	2001	3.209e+09	1.030e+19	3.342e+08	1.779612	705.99537	8.025	5.4	3.108e+09	3.7689782
Guinea	2002	3.046e+09	9.276e+18	3.842e+08	1.7701577	707.78404	7.4	3	3.238e+09	4.1669699
Guinea	2003	3.364e+09	1.132e+19	4.668e+08	1.8354151	814.65524	6.5	12.9	3.277e+09	1.2
Guinea	2004	3.290e+09	1.083e+19	5.549e+08	1.9737928	922.34495	8.85	15.454683	3.353e+09	2.3401173
Guinea	2005	3.235e+09	1.046e+19	6.841e+08	2.1580237	1266.907	14.35	31.360492	3.454e+09	2.9972726
Guinea	2006	3.188e+09	1.016e+19	8.648e+08	2.3712634	1586.6067	7.5	34.702254	3.540e+09	2.4967286
Guinea	2007	3.242e+09	1.051e+19	8.221e+08	2.5683196	1760.9259	8.025	22.860678	3.602e+09	1.7576824
Guinea	2008	3.130e+09	9.795e+18	1.042e+09	2.7070616	2015.3887	7.4	18.366555	3.780e+09	4.9369327
Guinea	2009	3.224e+09	1.040e+19	8.883e+08	2.7659361	2044.2381	6.5	4.6815022	3.722e+09	-1.5375363
Guinea	2010	3.155e+09	9.952e+18	1.124e+09	2.7682192	2360.9584	8.85	15.465933	3.879e+09	4.2185633
Guinea	2011	3.214e+09	1.033e+19	1.501e+09	2.7600236	2518.3864	14.35	21.3511	4.097e+09	5.6139233
Guinea	2012	1.306e+09	1.707e+18	2.100e+09	2.7607486	2666.9849	7.5	15.22694	4.339e+09	5.9153224
Guinea	2013	1.577e+09	2.488e+18	5.222e+08	2.7514439	2831.5925	8.025	11.887476	4.510e+09	3.9336375
Guinea	2014	1.829e+09	3.345e+18	6.042e+09	2.735028	2858.2804	7.4	9.7	4.677e+09	3.7
Guinea	2015	1.878e+09	3.529e+18	7.813e+08	2.7132277	2907.4143	6.5	8.2	4.840e+09	3.5
Guinea	2016	1.934e+09	3.742e+18	6.930e+09	2.6849315	3115.6106	8.85	8.3	5.160e+09	6.6
Guinea	2017	2.226e+09	4.954e+18	7.901e+09	2.6533851	3302.4577	14.35	8.4124469	5.489e+09	6.377258

Guinea	2018	2.933e+09	8.605e+18	8.130e+09	2.6444315	3300.6576	15.36	8.5301952	5.827e+09	6.1547069
Guinea-Bissau	2000	7.873e+08	6.199e+17	29886046	2.1532514	190.99385	4.91667	8.6363745	2.161e+08	7.5097916
Guinea-Bissau	2001	8.004e+08	6.406e+17	29975653	2.1430608	197.51297	4.83333	3.2520634	2.203e+08	1.9678573
Guinea-Bissau	2002	9.408e+08	8.851e+17	30299722	2.1375422	201.23633	5.1875	3.3018155	2.174e+08	-1.3479475
Guinea-Bissau	2003	1.013e+09	1.026e+18	49516045	2.1385679	191.21463	5.16167	-3.5074688	2.182e+08	.39059159
Guinea-Bissau	2004	1.023e+09	1.046e+18	38973663	2.1473679	183.51621	4.24167	.85528567	2.244e+08	2.8427809
Guinea-Bissau	2005	1.028e+09	1.057e+18	35599721	2.1628477	188.10849	3.95417	3.3484806	2.340e+08	4.2655136
Guinea-Bissau	2006	1.024e+09	1.048e+18	40976052	2.1752357	178.35311	4.54333	.71349602	2.394e+08	2.3107339
Guinea-Bissau	2007	1.031e+09	1.064e+18	73855403	2.1904814	181.34146	6.45833	4.6273942	2.471e+08	3.2040759
Guinea-Bissau	2008	1.040e+09	1.082e+18	63924915	2.2228813	200.0398	7.64167	10.44535	2.550e+08	3.2084603
Guinea-Bissau	2009	1.067e+09	1.138e+18	67261713	2.2762544	193.65184	6.35	-1.6366042	2.634e+08	3.3144123
Guinea-Bissau	2010	3.100e+08	9.608e+16	71742970	2.339883	196.98806	4.91667	1.0705164	2.751e+08	4.4086381
Guinea-Bissau	2011	2.693e+08	7.253e+16	82788785	2.4056478	220.08467	4.83333	5.0552363	3.008e+08	9.3553398
Guinea-Bissau	2012	2.699e+08	7.282e+16	93616552	2.4565748	214.2662	5.1875	1.9840637	2.956e+08	-1.712683
Guinea-Bissau	2013	2.685e+08	7.209e+16	93955403	2.4797331	208.89531	5.16167	.70317994	3.053e+08	3.2560023
Guinea-Bissau	2014	2.399e+08	5.753e+16	93984915	2.4685028	204.90804	4.24167	-1.0163705	3.082e+08	.96449682
Guinea-Bissau	2015	2.425e+08	5.880e+16	97361711	2.4333065	227.88174	3.95417	1.4782881	3.271e+08	6.1325702

Guinea-Bissau	2016	2.477e+08	6.135e+16	91762979	2.3913356	237.56377	4.54333	1.5015525	3.459e+08	5.7568525
Guinea-Bissau	2017	2.647e+08	7.007e+16	92798787	2.3533847	245.17096	6.45833	2.3081162	3.649e+08	5.4712404
Guinea-Bissau	2018	2.678e+08	7.172e+16	98814557	2.3414356	243.27096	7.64167	1.9918736	3.837e+08	5.1694503
Liberia	2000	4.132e+09	1.708e+19	47166811	5.4787171	.3263059	33.25	5.3	6.610e+08	0
Liberia	2001	4.232e+09	1.791e+19	44685913	3.6930561	.32395245	34.9583	12.1	6.803e+08	2.9330375
Liberia	2002	4.332e+09	1.877e+19	4.988e+08	2.3977497	.31796443	28.0833	14.2	7.108e+08	4.4802617
Liberia	2003	4.432e+09	1.964e+19	57396890	1.7438848	.34724154	25.125	10.3	5.093e+08	-28.355641
Liberia	2004	4.532e+09	2.054e+19	82885919	1.9339535	.37281369	13.7292	3.5928874	5.300e+08	4.0675817
Liberia	2005	4.632e+09	2.146e+19	1.088e+08	2.6735493	.39408051	10.9167	6.9445049	5.612e+08	5.8861036
Liberia	2006	4.732e+09	2.239e+19	1.426e+08	3.5176002	.39610737	11	7.2	6.121e+08	9.0721649
Liberia	2007	4.248e+09	1.805e+19	1.560e+08	4.0632486	.42581146	5.97389	11.390819	6.919e+08	13.043478
Liberia	2008	3.042e+09	9.256e+18	1.671e+08	4.27117	.45353965	3.5	17.490171	7.347e+08	6.187291
Liberia	2009	1.689e+09	2.854e+18	1.746e+08	4.0491377	.45122671	3.5	7.427005	7.721e+08	5.0852207
Liberia	2010	1.380e+08	1.905e+16	1.837e+08	3.5716884	.47551952	33.25	7.2913708	8.191e+08	6.0882214
Liberia	2011	1.645e+08	2.707e+16	1.940e+08	3.0718622	.51705866	34.9583	8.4865919	8.800e+08	7.4310728
Liberia	2012	1.801e+08	3.242e+16	2.039e+08	2.7106016	.53163161	28.0833	6.8316567	9.525e+08	8.2448973
Liberia	2013	2.297e+08	5.278e+16	2.560e+08	2.4709587	.54099419	25.125	7.5780396	1.035e+09	8.6589011



Liberia	2014	3.600e+08	1.296e+17	5.681e+08	2.3956539	.54205575	13.7292	9.8582745	1.042e+09	.69062692
Liberia	2015	5.288e+08	2.796e+17	6.746e+08	2.4310858	.54232978	10.9167	7.7417501	1.042e+09	.02008631
Liberia	2016	6.776e+08	4.592e+17	8.817e+08	2.4821925	.56130337	11	8.8438092	1.025e+09	-1.6373723
Liberia	2017	8.199e+08	6.723e+17	9.000e+08	2.496413	.54778286	5.97389	11.718773	1.052e+09	2.642258
Liberia	2018	8.756e+08	7.667e+17	8.139e+08	2.4781925	.55788216	3.5	9.9690719	1.093e+09	3.8522994
Mali	2000	2.653e+09	7.041e+18	6.354e+08	2.8909122	165.38281	33.25	-.7	2.640e+09	-3.2746949
Mali	2001	2.678e+09	7.172e+18	6.992e+08	2.9797249	169.26246	34.9583	5.1705713	2.953e+09	11.855168
Mali	2002	1.795e+09	3.221e+18	7.554e+08	3.0495792	172.55934	28.0833	5.0257933	3.080e+09	4.3066593
Mali	2003	2.191e+09	4.801e+18	7.372e+08	3.1207837	156.33738	25.125	-1.3247005	3.315e+09	7.6156565
Mali	2004	2.421e+09	5.862e+18	7.952e+08	3.1929378	157.62871	13.7292	-3.0893849	3.390e+09	2.2590561
Mali	2005	2.665e+09	7.101e+18	8.464e+08	3.2587708	164.17169	10.9167	6.3978829	3.598e+09	6.1328671
Mali	2006	1.221e+09	1.492e+18	8.801e+08	3.3269562	166.67895	11	1.543526	3.787e+09	5.2513561
Mali	2007	1.430e+09	2.045e+18	1.014e+09	3.3755519	169.75418	5.97389	1.412002	3.949e+09	4.2971609
Mali	2008	1.684e+09	2.835e+18	1.006e+09	3.3735691	177.72877	3.5	9.1	4.146e+09	4.9791715
Mali	2009	2.132e+09	4.547e+18	1.147e+09	3.3125828	185.51821	3.5	2.217198	4.340e+09	4.6790657
Mali	2010	2.285e+09	5.223e+18	1.226e+09	3.2169785	191.28475	33.25	1.2893126	4.575e+09	5.4134522
Mali	2011	2.470e+09	6.102e+18	1.295e+09	3.1108334	210.19337	34.9583	3.0507515	4.723e+09	3.2402529

Mali	2012	2.764e+09	7.638e+18	8.814e+08	3.0258618	215.89537	28.0833	5.3203125	4.684e+09	-.83617886
Mali	2013	2.940e+09	8.641e+18	8.214e+09	2.9776197	213.94368	25.125	-.60084563	4.792e+09	2.3035848
Mali	2014	2.810e+09	7.898e+18	8.906e+09	2.976869	213.44129	13.7292	.8880597	5.129e+09	7.04334
Mali	2015	2.909e+09	8.463e+18	8.146e+09	3.0063873	217.03822	10.9167	1.4424144	5.435e+09	5.9625816
Mali	2016	3.332e+09	1.110e+19	8.225e+09	3.0406267	217.57688	11	-1.80035	5.750e+09	5.7874333
Mali	2017	3.646e+09	1.330e+19	8.299e+09	3.0611307	216.41892	5.97389	1.9506909	6.065e+09	5.47867
Mali	2018	3.696e+09	1.366e+19	8.874e+08	3.0716268	217.43893	3.5	1.2435218	6.366e+09	4.9776831
Niger	2000	1.484e+09	2.203e+18	5.004e+08	3.724913	188.64334	7.39	-.7	1.667e+09	-2.5836315
Niger	2001	1.545e+09	2.386e+18	5.507e+08	3.7220735	191.31702	6.79417	5.1705713	1.801e+09	8.040139
Niger	2002	1.843e+09	3.397e+18	5.208e+08	3.7250604	193.68831	7.80917	5.0257933	1.897e+09	5.3377354
Niger	2003	1.848e+09	3.416e+18	5.164e+08	3.7324804	189.06604	8.755	-1.3247005	2.031e+09	7.0549541
Niger	2004	1.707e+09	2.914e+18	5.517e+08	3.7462864	185.07025	6.35167	-3.0893849	2.014e+09	-.82537648
Niger	2005	1.743e+09	3.037e+18	7.278e+08	3.7659553	192.02179	6.24	6.3978829	2.159e+09	7.1866521
Niger	2006	5.753e+08	3.309e+17	7.829e+08	3.7825548	188.94345	6.29833	1.543526	2.284e+09	5.8
Niger	2007	6.823e+08	4.655e+17	8.156e+08	3.8019353	192.06956	7.54667	1.412002	2.356e+09	3.1466446
Niger	2008	7.519e+08	5.653e+17	9.772e+08	3.837508	202.48258	8.38417	9.1	2.581e+09	9.587504
Niger	2009	1.059e+09	1.122e+18	1.047e+09	3.8916735	213.17017	7.765	2.217198	2.563e+09	-.7118124

Niger	2010	9.671e+08	9.352e+17	1.173e+09	3.9547494	215.99563	7.39	1.2893126	2.777e+09	8.3599986
Niger	2011	9.943e+08	9.886e+17	1.061e+09	4.0172809	221.08717	6.79417	3.0507515	2.839e+09	2.2094446
Niger	2012	1.185e+09	1.405e+18	1.172e+09	4.0674925	227.45569	7.80917	5.3203125	3.175e+09	11.849819
Niger	2013	1.395e+09	1.945e+18	1.157e+08	4.100079	227.28261	8.755	-.60084563	3.342e+09	5.2684229
Niger	2014	1.694e+09	2.869e+18	2.778e+08	4.1117198	223.03793	6.35167	.8880597	3.594e+09	7.5290431
Niger	2015	1.966e+09	3.863e+18	5.046e+09	4.1090466	222.65498	6.24	1.4424144	3.736e+09	3.9580499
Niger	2016	2.277e+09	5.185e+18	7.175e+09	4.101513	217.73247	6.29833	-1.80035	3.924e+09	5.0358548
Niger	2017	2.609e+09	6.806e+18	7.062e+09	4.09515	215.82451	7.54667	1.9506909	4.129e+09	5.2092593
Niger	2018	2.677e+09	7.167e+18	7.177e+09	4.2115132	216.7345	8.38417	1.2435218	4.353e+09	5.4332967
Nigeria	2000	2.674e+10	7.153e+20	7.336e+08	2.5457631	24.950357	3.5	6.9444444	4.639e+10	5.318092
Nigeria	2001	2.635e+10	6.943e+20	7.211e+09	2.5539516	26.970054	3.5	18.9	5.017e+10	8.1643105
Nigeria	2002	2.840e+10	8.064e+20	8.611e+09	2.564258	32.290036	3.5	12.9	6.080e+10	21.177118
Nigeria	2003	3.056e+10	9.341e+20	9.336e+08	2.5805005	33.935628	3.5	14	6.708e+10	10.335474
Nigeria	2004	3.372e+10	1.137e+21	5.201e+09	2.6035589	38.941976	3.5	14.987264	7.418e+10	10.585016
Nigeria	2005	1.839e+10	3.383e+20	6.631e+09	2.6302247	45.330116	3.5	17.9	7.901e+10	6.5119281
Nigeria	2006	3.035e+09	9.212e+18	8.475e+09	2.65502	53.035508	3.5	8.2395265	8.378e+10	6.0310229
Nigeria	2007	8.666e+09	7.510e+19	5.676e+09	2.6755123	55.415106	3.5	5.3822237	8.918e+10	6.4498317

Nigeria	2008	9.997e+09	9.994e+19	6.413e+09	2.6932474	60.167991	3.5	11.98	9.452e+10	5.9836636
Nigeria	2009	1.029e+10	1.059e+20	8.643e+09	2.7075032	62.327614	3.5	11.97	1.011e+11	6.9584355
Nigeria	2010	1.170e+10	1.368e+20	1.023e+10	2.7173987	69.320657	3.5	13.59	1.118e+11	10.6
Nigeria	2011	1.455e+10	2.117e+20	9.122e+09	2.7260054	74.377738	3.5	10.91	1.173e+11	4.9
Nigeria	2012	1.743e+10	3.037e+20	1.013e+10	2.7292641	79.803415	3.5	12.2	1.223e+11	4.3
Nigeria	2013	1.362e+10	1.856e+20	2.680e+09	2.7199852	83.147734	3.5	8.5	1.289e+11	5.4
Nigeria	2014	1.451e+10	2.106e+20	5.813e+09	2.6961943	85.490247	3.5	8.1	1.371e+11	6.3
Nigeria	2015	1.522e+10	2.316e+20	6.663e+09	2.662882	86.995107	3.5	9.1	1.409e+11	2.8
Nigeria	2016	1.633e+10	2.668e+20	6.722e+10	2.6265365	94.097065	3.5	15.57	1.388e+11	-1.5
Nigeria	2017	2.397e+10	5.745e+20	8.112e+09	2.5928853	107.46429	3.5	16.235216	1.399e+11	.7713866
Nigeria	2018	2.434e+10	5.926e+20	8.012e+10	2.6115365	106.5943	3.5	13.695305	1.428e+11	2.101873
Senegal	2000	2.962e+09	8.775e+18	1.008e+09	2.525952	222.9727	21	.74094932	4.681e+09	3.198988
Senegal	2001	2.982e+09	8.892e+18	1.003e+09	2.6114088	223.70261	15	2.9807301	4.895e+09	4.5809164
Senegal	2002	3.485e+09	1.214e+19	1.029e+09	2.6821201	227.59046	15	2.3353379	4.927e+09	.65480365
Senegal	2003	3.712e+09	1.378e+19	1.848e+09	2.7322217	224.28481	9.49	-.03330201	5.257e+09	6.6832282
Senegal	2004	3.723e+09	1.386e+19	2.023e+09	2.7516836	219.43962	11.49	.6317267	5.565e+09	5.8707722
Senegal	2005	3.503e+09	1.227e+19	2.030e+09	2.7535111	217.89837	11.49	1.744186	5.878e+09	5.6226069

Senegal	2006	1.732e+09	3.000e+18	2.297e+09	2.7459062	219.82156	10.75	2.1136988	6.023e+09	2.4703047
Senegal	2007	2.152e+09	4.633e+18	2.468e+09	2.7533958	225.5108	12.75	5.8630399	6.323e+09	4.9653434
Senegal	2008	2.437e+09	5.937e+18	2.668e+09	2.7945413	236.25005	12.75	6.3345113	6.555e+09	3.6825234
Senegal	2009	3.615e+09	1.307e+19	2.555e+09	2.8775924	230.48378	12.75	-2.2480215	6.714e+09	2.4231759
Senegal	2010	3.525e+09	1.242e+19	2.604e+09	2.9818647	231.7911	21	1.2286812	6.995e+09	4.1793631
Senegal	2011	4.003e+09	1.603e+19	2.894e+09	3.0888204	236.28713	15	3.4032283	7.118e+09	1.7611191
Senegal	2012	4.442e+09	1.973e+19	3.050e+09	3.1676642	237.74716	15	1.4182287	7.432e+09	4.411197
Senegal	2013	4.996e+09	2.496e+19	3.468e+09	3.199779	228.48639	9.49	.71024549	7.691e+09	3.4852173
Senegal	2014	5.730e+09	3.283e+19	3.678e+09	3.1749856	222.13538	11.49	-.53197436	8.023e+09	4.311051
Senegal	2015	5.502e+09	3.027e+19	3.553e+09	3.1127226	220.42168	11.49	.1	8.543e+09	6.4851948
Senegal	2016	5.920e+09	3.505e+19	4.604e+09	3.0418646	220.05644	10.75	2.0757453	9.111e+09	6.6543297
Senegal	2017	7.718e+09	5.956e+19	4.994e+09	2.9814327	220.4317	12.75	1.9942036	9.727e+09	6.756693
Senegal	2018	7.971e+09	6.353e+19	5.050e+09	3.0117646	221.53171	12.75	2.1901462	1.041e+10	7.0361646
Sierra Leone	2000	1.286e+09	1.655e+18	1.108e+08	2.8340002	741.9397	4.7675	-.83595292	6.359e+08	3.8072831
Sierra Leone	2001	1.473e+09	2.171e+18	1.514e+08	3.9276146	684.97013	4.92083	2.5677271	7.514e+08	18.169937
Sierra Leone	2002	1.475e+09	2.175e+18	1.768e+08	4.7854627	648.15286	4.93333	-3.6585228	9.508e+08	26.539225
Sierra Leone	2003	1.638e+09	2.682e+18	1.407e+08	5.1003877	718.91726	3.98917	7.5459543	1.040e+09	9.3265983

Sierra Leone	2004	1.712e+09	2.931e+18	1.414e+08	4.7930364	789.32403	3.54583	14.246582	1.108e+09	6.6152177
Sierra Leone	2005	1.754e+09	3.078e+18	1.787e+08	4.1228901	891.87774	3.72	10.1	1.189e+09	7.2541948
Sierra Leone	2006	1.565e+09	2.448e+18	1.726e+08	3.3905307	971.93829	2.45556	9.5457106	1.239e+09	4.2410516
Sierra Leone	2007	5.291e+08	2.799e+17	1.700e+08	2.8206745	1011.0808	3.06859	11.649974	1.339e+09	8.0425594
Sierra Leone	2008	6.084e+08	3.701e+17	1.693e+08	2.424919	1090.7062	3.96617	14.534652	1.411e+09	5.3996778
Sierra Leone	2009	6.926e+08	4.797e+17	1.879e+08	2.2701861	1166.6956	11.8185	6.4427059	1.456e+09	3.1868089
Sierra Leone	2010	7.826e+08	6.125e+17	3.436e+08	2.2791496	1350.5561	4.7675	16.768201	1.534e+09	5.3466647
Sierra Leone	2011	9.546e+08	9.112e+17	5.382e+08	2.3027745	1553.1386	4.92083	16.059487	1.631e+09	6.3120018
Sierra Leone	2012	9.807e+08	9.617e+17	6.017e+08	2.2719765	1708.6663	4.93333	12.087186	1.878e+09	15.17819
Sierra Leone	2013	1.045e+09	1.091e+18	6.800e+08	2.2455481	1797.9967	3.98917	11.141809	2.267e+09	20.716385
Sierra Leone	2014	1.128e+09	1.272e+18	6.697e+08	2.2134831	1798.0994	3.54583	7.1711818	2.371e+09	4.5548729
Sierra Leone	2015	1.250e+09	1.562e+18	6.869e+08	2.1780419	2127.9709	3.72	8.1424144	1.885e+09	-20.492834
Sierra Leone	2016	1.368e+09	1.871e+18	6.473e+08	2.1527048	2188.9373	2.45556	11.54213	2.004e+09	6.304111
Sierra Leone	2017	1.691e+09	2.861e+18	7.082e+08	2.1358438	2504.859	3.06859	18.386706	2.119e+09	5.7391045
Sierra Leone	2018	1.766e+09	3.119e+18	7.017e+08	2.1328048	2503.6189	11.8185	10.610279	2.247e+09	6.0583044
Togo	2000	1.248e+08	1.557e+16	3.344e+08	2.6764736	183.25814	7.38667	1.8900606	1.291e+09	-96538141
Togo	2001	1.440e+09	2.073e+18	3.254e+08	2.6973364	192.40965	4.81083	3.9	1.270e+09	-1.6268063

Togo	2002	1.383e+09	1.913e+18	3.665e+08	2.720534	202.09335	3.28903	3.1	1.258e+09	-.92215102
Togo	2003	1.550e+09	2.402e+18	3.244e+08	2.7385361	178.761	3.04789	-.9	1.320e+09	4.9543977
Togo	2004	1.600e+09	2.561e+18	3.214e+08	2.7503168	178.69299	4.20067	.3424887	1.348e+09	2.1190653
Togo	2005	1.537e+09	2.361e+18	3.465e+08	2.7570336	186.38714	4.7328	6.8	1.365e+09	1.2498274
Togo	2006	1.820e+09	3.312e+18	3.836e+08	2.759949	180.96882	6.72652	2.3	1.419e+09	3.9313667
Togo	2007	2.054e+09	4.219e+18	3.365e+08	2.7605403	180.05796	8.67312	23.85571	1.449e+09	2.121598
Togo	2008	1.919e+09	3.684e+18	3.775e+08	2.75911	201.72024	8.04422	10.276276	1.484e+09	2.421415
Togo	2009	1.668e+09	2.782e+18	4.703e+08	2.7560835	204.18437	7.9261329	-18.162315	1.535e+09	3.4218327
Togo	2010	5.737e+08	3.291e+17	5.406e+08	2.7507488	203.94954	7.38667	1.4	1.597e+09	4.024155
Togo	2011	4.864e+08	2.366e+17	5.878e+08	2.7434218	215.06028	4.81083	3.6	1.674e+09	4.8481509
Togo	2012	5.204e+08	2.708e+17	6.796e+08	2.7322131	224.89828	3.28903	2.631951	1.754e+09	4.807279
Togo	2013	6.190e+08	3.831e+17	6.368e+08	2.7149329	222.72704	3.04789	1.7665596	1.824e+09	3.9678098
Togo	2014	7.896e+08	6.235e+17	6.756e+08	2.690887	221.41011	4.20067	.18691931	1.931e+09	5.8717239
Togo	2015	8.780e+08	7.709e+17	6.793e+08	2.6621316	224.94904	4.7328	1.4280912	2.033e+09	5.253618
Togo	2016	8.753e+08	7.662e+17	7.006e+08	2.6319796	225.80222	6.72652	.9	2.135e+09	5.0441725
Togo	2017	9.988e+08	9.977e+17	7.871e+08	2.6021922	224.37728	8.67312	-.32216174	2.230e+09	4.4504478
Togo	2018	9.774e+08	9.553e+17	7.796e+08	2.6418796	223.47427	7.9261329	1.8821157	2.342e+09	4.9912876

Source: World Data Bank (2018)

Where:

Country = Countries Studied

Period = Period of the Study

EXD = External debt

EXD<sup>2</sup> = External debt square

GFCF = Gross fixed capital formation

POPG = Population growth rate

EXR = Exchange rate

INR = Interest rate

INF = Inflation rate

EDS = External debt service

GDPG = GDP growth rate



## APPENDIX B

### ESTIMATION OUTPUT

#### Appendix B

#### Estimation Output

Variable		Mean	Std. Dev.	Min	Max	Observations	
GDPG	overall	4.579752	4.416921	-28.35564	26.53923	N =	285
	between		1.335251	3.073184	7.48944	n =	15
	within		4.223659	-26.84907	23.62954	T =	19
exd	overall	21.39808	1.185277	16.14687	24.24136	N =	285
	between		1.007743	20.00553	23.50344	n =	15
	within		.6735733	14.87484	22.73412	T =	19
exd2	overall	42.79617	2.370554	32.29373	48.48271	N =	285
	between		2.015487	40.01107	47.00687	n =	15
	within		1.347147	29.74968	45.46825	T =	19
gfcf	overall	20.59581	1.507319	17.2129	25.10683	N =	285
	between		1.311576	17.93465	22.68948	n =	15
	within		.8129009	17.55807	23.01315	T =	19
eds	overall	21.83006	1.436011	19.19118	25.6847	N =	285
	between		1.459284	19.41868	25.28521	n =	15
	within		.2599773	21.01577	22.38038	T =	19
POPG	overall	2.74095	.7115828	.5290082	5.478717	N =	285
	between		.6009872	1.218655	3.920999	n =	15
	within		.4099469	1.435849	5.170682	T =	19
EXR	overall	346.0799	621.4554	.1304416	3302.458	N =	285
	between		570.1255	.453979	2020.974	n =	15
	within		285.9459	-968.8989	1627.564	T =	19
INR	overall	8.698997	7.285325	2.45556	34.9583	N =	285
	between		5.564444	3.5	17.71436	n =	15
	within		4.906666	-5.51536	25.94294	T =	19
INF	overall	5.74842	6.514954	-18.16231	34.70225	N =	285
	between		4.983484	1.658534	15.6303	n =	15
	within		4.379905	-14.88104	27.13699	T =	19

**Pedroni's cointegration tests:**

No. of Panel units: 15            Regressors: 6  
No. of obs.: 285                Avg obs. per unit: 19  
Data has been time-demeaned.  
A time trend has been included.

Test Stats.	Panel	Group
v	-4.182	.
rho	3.376	4.706
t	-9.103	-12.7
adf	5.585	9.114

All test statistics are distributed  $N(0,1)$ , under a null of no cointegration, and diverge to negative infinity (save for panel v).

```
. di 1-ttail(1, -4.182)
.0747114
```

```

System dynamic panel-data estimation      Number of obs      =      255
Group variable: id                       Number of groups   =      15
Time variable: Period

Obs per group:   min =      17
                  avg =      17
                  max =      17

Number of instruments =      268          Wald chi2(11)     =      96.51
                                                Prob > chi2       =      0.0000

```

## One-step results

GDPG	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
GDPG						
L1.	.1315379	.0503498	2.61	0.009	.0328541	.2302218
gfcf						
--.	1.024017	.4040318	2.53	0.011	.2321294	1.815905
L1.	-.942745	.4268246	-2.21	0.027	-1.779306	-.1061841
L2.	.4103317	.3591075	1.14	0.253	-.2935061	1.114169
POPG						
--.	6.339963	3.100071	2.05	0.041	.2639352	12.41599
L1.	-2.073599	4.989229	-0.42	0.678	-11.85231	7.705111
L2.	-1.735322	2.508077	-0.69	0.489	-6.651063	3.180419
exd	-.7550694	.3407595	-2.22	0.027	-1.422946	-.0871931
EXR	.0003154	.0006353	0.50	0.620	-.0009297	.0015604
INR	.0695007	.0505147	1.38	0.169	-.0295063	.1685077
INF	-.0034618	.0527857	-0.07	0.948	-.1069199	.0999962
_cons	2.463808	8.705556	0.28	0.777	-14.59877	19.52638

## Instruments for differenced equation

```

GMM-type: L(2/.)GDPG L(1/.)L2.gfcf L(1/.)L2.POPG
Standard: D.exd D.EXR D.INR D.INF

```

## Instruments for level equation

```

GMM-type: LD.GDPG L2D.gfcf L2D.POPG
Standard: _cons

```

.

## Sargan test of overidentifying restrictions

```

H0: overidentifying restrictions are valid

```

```

chi2(256)      = 289.9979
Prob > chi2    = 0.0208

```

**Model 2**

note: exd dropped from div() because of collinearity  
 note: exd dropped because of collinearity  
 note: exd dropped because of collinearity

```
System dynamic panel-data estimation      Number of obs      =      255
Group variable: id                       Number of groups   =      15
Time variable: Period

Obs per group:   min =      17
                  avg =      17
                  max =      17

Number of instruments =      259          Wald chi2(7)       = 32143.44
                                                Prob > chi2        =  0.0000
```

## One-step results

	GDPG	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
	GDPG						
	L1.	.1134436	.0487609	2.33	0.020	.017874	.2090133
	exd						
	L1.	.0199242	.042082	0.47	0.635	-.062495	.1024633
	L2.	.0230569	.033569	0.69	0.492	-.0427371	.0888509
	eds						
	--.	98.17102	.5881462	166.92	0.000	97.01828	99.32377
	L1.	-107.5519	4.749444	-22.65	0.000	-116.8607	-98.24321
	L2.	9.338123	4.833689	1.93	0.053	-.1357337	18.81198
	exd2	-.0131412	.0204596	0.76	0.445	-.024459	.0557413
	_cons	-.4881375	.926886	-0.53	0.598	-2.304801	1.328526

```
Instruments for differenced equation
GMM-type: L(2/.)GDPG L(1/.)L2.exd L(1/.)L2.eds
Standard: D.exd2
```

```
Instruments for level equation
GMM-type: LD.GDPG L2D.exd L2D.eds
Standard: _cons
```

```
Sargan test of overidentifying restrictions
H0: overidentifying restrictions are valid
```

```
chi2(251) = 204.0199
Prob > chi2 = 0.0000
```

**Model 3**

Panel vector autoregresssion

GMM Estimation

Final GMM Criterion Q(b) = 3.49e-33

Initial weight matrix: Identity

GMM weight matrix: Robust

No. of obs	=	255
No. of panels	=	15
Ave. no. of T	=	17.000

		Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
exd	exd L1.	.6802921	.189338	3.59	0.000	.3091965	1.051388
	gfcf L1.	.0966063	.0711738	1.36	0.175	-.0428918	.2361045
	GDPG L1.	-.0083824	.0082309	-1.02	0.308	-.0245146	.0077498
gfcf	exd L1.	.3787341	.1597074	2.37	0.018	.0657133	.6917548
	gfcf L1.	.980748	.0957338	10.24	0.000	.7931132	1.168383
	GDPG L1.	-.0124875	.0132028	-0.95	0.344	-.0383646	.0133896
GDPG	exd L1.	.1884554	.4155341	0.45	0.650	-.6259765	1.002887
	gfcf L1.	.060325	.5231422	0.12	0.908	-.9650149	1.085665
	GDPG L1.	.2610048	.0895499	2.91	0.004	.0854903	.4365194

Instruments : 1(1/1).(exd gfcf GDPG)

panel VAR-Granger causality Wald test

Ho: Excluded variable does not Granger-cause Equation variable

Ha: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2	
exd	gfcf	1.842	1	0.175
	GDPG	1.037	1	0.308
	ALL	5.315	2	0.070
gfcf	exd	5.624	1	0.018
	GDPG	0.895	1	0.344
	ALL	7.758	2	0.021
GDPG	exd	0.206	1	0.650
	gfcf	0.013	1	0.908
	ALL	0.207	2	0.902