



**THE DETERMINANTS OF PUBLIC DEBT IN SUB-SAHARAN AFRICA**

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# **The Determinants of Public Debt in Sub-Saharan Africa**

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## Declaration

I, Abdi Teshome, do hereby announce that this thesis titled: **The determinants of public debt in Sub-Saharan Africa** is entirely my own original work and has not been presented for higher degree at any other University or institute anywhere for the award of any academic degree, diploma or certificate. All references made to works of other persons have been duly acknowledged.

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**ADDIS ABABA UNIVERSITY**  
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**“The determinants of public debt in Sub-Saharan Africa”**

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## Abstract

*The determinants of public debt in developing countries remain the focus of much attention among academics and policy makers. This paper introduces model uncertainty into an empirical study of continental public debt determinants. This is achieved by adopting a panel data model that applies to data from 30 countries in sub-Saharan Africa from 2011 to 2020. Using the generalized method of moments (GMM) and Random effects methodological approach the study confirms that negative relationships between public debt and economic growth exchange rate sub Saharan Africa. Our findings additionally indicate that government investment enhances the positive and significant association with public debt levels in the sampled countries. And also results suggest that, Budget balance and inflation have a positive contribution to public debt accumulation activity in sub Saharan Africa.*

**Keywords:** Panel data, Public debt determinants, Sub Saharan Africa

**JEL Classification:** C23; N37; H63

## **Contents**

<b>Declaration</b> .....	ii
<b>Acknowledgment</b> .....	iv
<b>Abstract</b> .....	v
<b>Acronyms</b> .....	ix
<b>CHAPTER ONE</b> .....	1
<b>1. INTRODUCTORY BACKGROUND</b> .....	1
1.1 Background of the study .....	1
1.2 Statement of problem .....	3
1.3 Objectives of the study.....	5
1.3.1 General objective of the study .....	5
1.3.2 Specific objectives .....	5
1.4 Significance of the study .....	5
1.5 Scope of the study .....	5
1.6 Research question.....	6
1.7 Limitation of the study .....	6
<b>CHAPTER TWO</b> .....	7
<b>2. REVIEW OF THEORETICAL LITREATURE AND EMPIRICAL EVIDENCES</b> .....	7
2.1 Theoretical Literature Review.....	7
2.1.1 Definition of public debts .....	7
2.1.2 Classification of public debts .....	8
2.1.3 Sources of Public debts.....	10
2.2 Theory of public debt .....	12
2.3 Empirical Literature review .....	13
2.3.1 International perspective.....	13
2.3.2 Regional (SSA) based .....	14
<b>3. DATA SOURCES, METHODOLOGY &amp; MODEL SPECIFICATION</b> .....	17
3.1 Data sources and Scope.....	17
3.2 Variable Description .....	17
3.2.1 Dependent variable .....	17
3.2.2 Independent variables .....	18
3.3 Methodology and Model Specification .....	19
3.3.1 Panel data model specification .....	19

3.3.3 Generalized Moments of Methods (GMM).....	20
3.3.4 Fixed Effects.....	21
3.3.5 Random Effect.....	21
3.3.6 Pre- Estimation Diagnostic test .....	22
3.3.7 Test Specification .....	22
<b>CHAPTER FOUR</b> .....	<b>25</b>
<b>4. RESULTS AND DISCUSSION</b> .....	<b>25</b>
4.1 Descriptive Statistics.....	25
4.2 Correlation Matrix.....	27
4.3 Estimation Result .....	28
4.4 Random effect estimation.....	30
4.5 GMM Estimation.....	32
4.6 Sargan and Hansen test result.....	33
4.6 Diagnostic tests .....	34
<b>CHAPTER FIVE</b> .....	<b>36</b>
<b>5 CONCLUSION AND RECOMMENDATIONS</b> .....	<b>36</b>
5.1 Conclusion.....	36
5.2. Recommendation.....	37
<b>References</b> .....	<b>39</b>
<b>Appendix</b> .....	<b>43</b>

**List of Tables**

Table 1: Summary of descriptive statistics ..... 25  
Table 2: Correlation matrix of the variables in the sample..... 27  
Table 3: Estimation Result of fixed effect and random effect model ..... 28  
Table 4: Random effect estimation result ..... 30  
Table 5: Estimates system generalized method of moment and Random ..... 32  
Table 6 Sargan and Hansen test result ..... 33  
Table 7: Autocorrelation test ..... 49

## Acronyms

B-GMM	.....	Arellano Bond General Moments Method
DSF	.....	Debt Sustainability Framework
EIB	.....	European Investment Bank
EIB	.....	Islamic Improvement Bank
FE	.....	Fixed Effect
GDP	.....	Gross Domestic Product
GMM	.....	Generalized Moments of Methods
GNI	.....	Gross National Income
GNP	.....	Gross National Product
HIPC	.....	Heavily Indebted Poor Country
IDA	.....	International development association
IMF	.....	International Monetary Fund
IMF	.....	International Financial Fund
IFC	.....	Worldwide Finance Enterprise
MDRI	.....	Multilateral Debt Relief Initiative
RE	.....	Random Effect
RGDP	.....	Real Growth Domestic Product
SSA	.....	Sub-Saharan Africa
USD	.....	United States Dollar
WB	.....	World Bank

# CHAPTER ONE

## 1. INTRODUCTORY BACKGROUND

### 1.1 Background of the study

Within the 1980s, the world practiced a debt crisis in which, fairly indebted Latin American and other rising regions were powerless to pay back their debt. The study of (Harl, 1990) presented that, the problem exploded in August 1982 as Mexico reported the failure to service its international debt, and a similar complex immediately extended to the relaxation of the region. To solve this, macroeconomic narrowing and structural tuning were conducted, through the conditionality of the IMF and the WB. This disaster complicated lengthy-term business financial institution debt which became accrued within the public department. The administrations of developing nations had been powerless to pay off their debt, so economic liberalizing tactics have become essential.

The main problem of many African countries is lack of finance to finance all of their development spending with the revenues they collect. That is, governments have domestic revenue sources (tax and non-tax sources) to provide activities such as infrastructural development, defense, and provision of social services. However, to finance these happenings the resources are not sufficient. As a result, governments consider borrowing as a substantial source of financing to realize sustainable economic growth. Governments' debt financing can help in this regard by channeling resources to projects where the rates of returns are at least sufficient to service the debt incurred (Buscemi Antonino, 2012)

Governments borrow either from nearby or out of doors sources or both. Domestic debt holds funds raised through financial assets such as Treasury bills and bonds and money borrowed from other locally-owned financial institutions. Likewise, external debt made from bilateral and multilateral resources. Bilateral external debt sources include government to government while multilateral sources include government to a union of countries or agencies. Multilateral debt could be obtained from financial organizations such as the World Bank, European Investment Bank, International Monetary Fund, European Commission, and African Development Bank, among extra institutions.

Of the 16 countries exposed to high debt risk, you can repay. Debt spikes are a concern for bilateral creditors and international financial institutions, as many countries continue to borrow more to deal with debt burdens and poor macroeconomic conditions. It is based on two prominent debt relief initiatives, the Heavily Indebted Poor Countries (HIPC) Initiative and the Multilateral Debt Relief Initiative (MDRI), which is worth \$ 99 billion, or 40% of Africa's total public debt. This is taking location at the returned of two protuberant debt comfort tasks, Heavily Indebted Poor Country (HIPC) initiative and the Multilateral Debt alleviation Initiative (MDRI), which provided \$99 billion in debt remedy, approximately forty% of Africa's total public debt supply. (Monetary, 2019)

Similarly, debt-related issues are not new to SSA countries. In the 1980s and 1990s, their debt burden rose to higher levels and they were unable to repay their debt. Most of them were adopted as relief and reduction programs after the massive debt relief campaigns of the 1990s. Subsequent declines in debt levels have eased concerns about debt-related issues in these countries. (Megersa, 2014)

Though borrowing is good, it comes with the implication that, if care is not taken, the rate of the public debt levels will keep on rising. It has therefore become a major concern for policy makers and academicians to pay very close attention to the debt composition of SSA countries and the key drivers of such debts. It is, however, important to study public debt and find ways to help manage public debt build up. Thus, it is vital to study the key determining drivers that have a direct and indirect influence on the rising level of the public debt in SSA.

Therefore, the situation in SSA countries in terms of debt repayment and debt accumulation raises the issue of debt sustainability. Debt sustainability is the country's ability to meet its debt without the need for debt relief and without accumulating delinquency charges. One of the methods used to assess a country's debt sustainability is the Debt Sustainability Framework (DSF), which was developed in 2005.

The framework is designed to manage borrowing by low-income countries in a way that matches funding demands with currently projected debt repayment capacity. Therefore, the main aim of our study was to explore the key determining drivers that have a direct and indirect influence on

the rising level of public debt in SSA within the period 2011–2020. Our results will complement existing knowledge on the determining factors of public debt levels in SSA, which remain scant.

## **1.2 Statement of problem**

The economic literature has stated numerous elements both external and interior that can have an effect on public (Calderon & Zeufack, 2020). Externally, unfavorable global trends such as the global financial crisis, high interest rates, oil price shocks, recessions in corporate and developed countries, and low commodity prices (especially commodities) are behind the accumulation of public debt. Known to be one of the main reasons (Joseph Atta-Mensah, 2020). At the home obverse, macroeconomic guidelines had been blamed consisting of alternate fee misalignment, fiscal irresponsibility, guidelines that deter saving (negative real interest fees as an example) and the institutional framework (IMF, 2019), (Bank T. W.)

Many studies have shown that these economic factors can drive public debt. For the sake of explanation, in addition to the development of Africa (Ibrahim, 2020), it is founded that the difference in interest rate growth is the main driver of universal debt dynamics in the African economy. By focusing on the motives for borrowing, (Sadik-Zada I. R., 1993) launch that inter temporal tax-smoothing, fiscal stimulus and asset management can clarify a number of the will increase in public debt in latest years. Explore into the foremost drivers of the general public debt increase in 184 international locations. Their discoveries have proven that economic growth rate, oil abundance, the share of mineral rent in the overall sales, interest rate bills for overseas borrowings, and being a developing country have statistically enormous have an effect on the growth of the public debt, while unemployment rate, defense spending, and inflation rate do not have a statistically significant positive impact on the general public debt rate. In line with (Madow Nagou, 2020) who check out into the determinants of outside debt in Sub-Saharan Africa, international locations countries that acquired debt comfort appear to accumulate less debt in comparison to those that did not get hold of debt relief. Their findings additionally highlighted the importance of financial activity in lowering debt inside the vicinity.

Beyond studies quoted above, (Nimonka, 2020), have found that even supposing factors said can explain a number of the increases in public debt in recent a long time, they can't account for all of the detected modifications. So, the political elements may generate numerous incentives to

borrow. They are a primary purpose of over borrowing even though budgetary institutions and economic guidelines can play a role in mitigating governments' inclinations to over borrow. Most of these research carried out a wide array of guesstimate techniques on big sample sizes and lengthy periods of studies. This implies that, even though it is vital to expose the principle causes of public debt, there's no clear compromise at the determinants of public debt in the literature.

(Sadik-Zada, 1993) Explored into the important drivers of the public debt increase in 184 countries. The writers applied panel data method. Their findings have exposed that, oil abundance, economic growth rate, the percentage of mineral rent within the total sales and interest fee payments for foreign borrowings have statistically full-size impact at the growing of the public debt, moreover, (Nicolaidou, 2015) who investigated into the determinants of external debt in Sub-Saharan Africa the use of pooled OLS and stuck consequences, international locations that acquired debt remedy seem to collect less debt in contrast to those who did no longer get hold of debt comfort.

Stimulated with the aid of the lack of consensus on the drivers of public debt, these studies make contributions to the literature by using saying version uncertainty into this context thru a Panel data model technique. By taking place on this manner, the look at continue concurrently address model choice, estimation and inference. That is a key methodological contribution of the have a look at as researchers are regularly stressed with the selection of variables for models.

Unarguably, public debt is an integral part of the development journey of every country. However, like a double-edged sword, over borrowing and imprudent allocation of borrowed funds can lead to debt overhang which is detrimental to economic growth. Several studies have been done to determine the debt threshold that when surpassed by African countries' debt, is associated to negative economic growth.

Africa had a high debt level of approximately 68 percent during the early years of 2000. This high debt level can be traced back to 1970 (J. Dev. Econ, 1997). In recent times, public debt levels in Africa are rising again, placing the continent as the third most heavily indebted region comparative to other regions. The increasing growth of public debt level in 2019 has crossed the 50 percent threshold, which is an alarming signal that the fast growth in the public debt levels in Africa can again surpass the highest public debt levels-to-GDP in the world, which can cause another debt crisis. Therefore, the main aim of our study was to explore the main determinant of public that in SSA.

## **1.3 Objectives of the study**

### **1.3.1 General objective of the study**

- The general objective of the study is to investigate the main drivers of public debt in Sub-Saharan Africa.

### **1.3.2 Specific objectives**

- To brighten on public debt in sub-Saharan Africa.
- To design the Random effect model from the panel data model.
- To understand degree of relationship between debt to various variables.
- To regress the output record of sampled data with 30 SSA by Stata 15.

## **1.4 Significance of the study**

Indebtedness has been a grave monetary hassle in growing international locations in trendy and in Sub-Saharan Africa nations mainly. And as a result of this, the burden of public debt has been a matter of great concern to the government of all nations in Sub-Saharan Africa countries. Previous studies have attempted to provide an explanation for the driving force of public debt. The study attempted to address the consequences and sustainability of external debt in the state. Thus, its findings will be helpful for better understanding of the position of public debt in Sub-Saharan Africa countries and its effect on the economy.

## **1.5 Scope of the study**

The study look for to analyses the drivers of public debt in Sub-Saharan Africa nations. In order to the main determinants of public debt in the study area, thorough empirical investigation is will be conducted with data covering a period of 10 years i.e. 2011 – 2020. This period is chosen because in order to account recent time data and data availability of most Sub-Saharan Africa countries.

## **1.6 Research question**

Based on the problem of the statement above, the following research questions are set:

1. What is the main driver of public debt in Sub-Saharan Africa?
2. Are there Public debt overhang in Sub-Saharan Africa?
3. Is there a limit on the public debt?
4. What practical impact does the public debt have in Sub-Saharan Africa?

## **1.7 Limitation of the study**

- In sufficiency of resources to find some restricted data.
- Lack of previous research studies on the topic of SSA.
- Limited access to long time data.

## **CHAPTER TWO**

### **2. REVIEW OF THEORETICAL LITREATURE AND EMPIRICAL EVIDENCES**

#### **2.1 Theoretical Literature Review**

##### **2.1.1 Definition of public debts**

In the present day state standpoint, the wishes continuously increasing; therefore, the country has to use extra to fulfill these needs. Public spending are usually met by way of normal public revenues inclusive of taxes, duties, prices, Para fiscal revenues, assets and agency revenues, taxes, and penalties. However, the state is faced with the general public zone deficit because of reasons consisting of improvement financing, natural failures, economic crises, high-quality infrastructure investments, warfare, finances deficits, as well as the ever-growing normal public expenditure. To overcome this condition, they refer to borrowing.

Borrowing is the cash and alike values for reimbursement after a sure period of time. Public borrowing refers to the felony obligation of the country to pay returned the important and interest to the holders of the predetermined rights in accordance with a sure agenda. Public credit score and public borrowing stated as state borrowing inside the economic literature suggest debts taken by way of authorities of different public group (A. Devlet, 2013).

Governments in early and medieval a long time required funding, as in modern-day states, however governments did now not borrow “publically” inside the belief of drawing finances from a big population and paying essential and interest, as like deferred taxes (RM, 2017).

In the 13th century, public borrowing, including even the king’s borrowing, changed into first scientifically inspected by (Davenant, 1710). Thereafter, economists consisting of David Hume, Adam Smith, D. Ricardo, Malthus, J.S. Mill, J.B. Say, A.P. Lerner, and A.G. Hart have operated on borrowing. Smith and Ricardo contrary public borrowing. In their view, borrowing may be spent irresponsibly for the purpose that of being smooth income; so that origins deterioration within the functioning of monetary life. On this context, the classics have supported that capital is wasted, and the debt burden is relocated to the subsequent generations because of the inefficiency of public prices (Turkiye, 2010). In addition, classics have defended that borrowing might be in

some case consisting of big infrastructure funding and warfare but emphasized that it should be confined and now not be kept on.

The majority borrowing regulations over the sector have particularly experienced a turning factor with the sector conflict I (1914–1918) and the super depression (Nineteen Thirties). During the period in query, John Maynard Keynes had planned public borrowing as a war financing to England and argued that it might be beneficial. In the procedure that started with this proposal, public borrowing became an indispensable cause of financing for the states. This situation does not mean that states contributed in Keynesian concept. Whereas public borrowing becomes an indispensable source of financing, it additionally fetches the debt interest cycle, poverty, and crises. The result of public borrowing leaves an exceptional burden on the next generations. This condition has justified the classics (Turkiye, 2010). Especially after the sector battle II, public borrowing indicated each large rise and structural modifications because of on the one hand the repair works of the nation's suffering from the conflict, however, the financing wants of developing nations (Ankara, 1978). In the next duration, the borrowing manner are not interstate and feature started to advantage a brand new size through organizing global agencies such as international financial Fund (IMF), world bank (WB), worldwide Finance enterprise (IFC), global development association (IDA), European investment bank (EIB), and Islamic improvement bank (IDB). Inside the manner of globalization, the mobility of capital has amplified; and critical economic opposition has arisen in worldwide markets.

### **2.1.2 Classification of public debts**

Public debts are categorized into various sorts in keeping with their characteristics. Whilst the general public debt literature is investigated, it's far categorized into 3 center organizations in line with maturity, resources, and voluntariness (Borclanması, 1994) Public debts in line with maturities: quick, medium-, and lengthy-term public debts. Short-term public debt owed (floating debts) state to debts up to 1 yr. Inside the short-term borrowing, treasury payments and treasury assured bond are used. The medium-term public debts confer with debts ranging from 1 to five years. The lengthy-time period public money owed seek advice from money owed greater than 5 years. The tool of long-time period borrowing is the authorities bond. These money owed are supplied from the capital markets and feature advanced interest fee than the interest charge of short-term borrowing. Long-time period money owed are categorized as redeemable money owed and irredeemable debts. (Sibel Aybarc, 2018).

**Internal and External Debt:** Public loans floated within the interior the country are known as internal debt. Public borrowings from other international locations are referred as outside debt. External debt represents a claim of foreigners against the real profits (GNP) of the country, whilst it borrows from different international locations and has to repay at the time of adulthood. External public debt allows import of actual resources. It enables the country to consume greater than it produces. (The American monetary evaluation Vol. 47, 1957)

**Productive and Unproductive Debt:** Public debt is said to be effective or reproductive, whilst authorities' loans are invested in effective assets or organizations which includes railways, irrigation, and multipurpose projects etc., which yield a sufficient earnings to the public authority to pay out annual interest at the debt as well as assist in repaying the major in the long run. An unproductive debt, then again, is one that does now not add to the effective belongings of a country. Whilst the government borrows for unproductive drives like financing a warfare, or for lavish expenditure on public management, and so on. Such public loans are seemed as unproductive. Unproductive loans do now not upload to the efficient functionality of the economy, so they're now not self-liquidating. Unproductive public loans thus solid a net burden on the network, as for their servicing and compensation pressure, authorities ought to hotel to extra taxation. (International journal of Economics, June 2017)

**Compulsory and Voluntary Debt:** when government borrows from human beings by using coercive tactics, loans so raised are said to as compulsory public debt. Below the obligatory Deposit Scheme in India, tax-payers ought to compulsorily deposit a prescribed amount and defaulters are punished. That is a case of obligatory debt. Commonly, public borrowings are volunteer in nature. whilst the government floats a loan by issuing safekeeping, individuals of the public and institutions like commercial banks may also enroll in them (Chand S. , 2003).

**Redeemable and Irredeemable Debts:** At the precept of adulthood, public money owed may be labeled as redeemable or irredeemable. Loans which the government guarantees to pay off at a few future date are named redeemable money owed. For redeemable debts, the authorities has to make a few technique for their repayment. They are, therefore, terminable loans. while loans for which no promise is made by way of the authorities regarding the exact date of adulthood, and all that the authorities does is to agree to pay interest often for the bonds issued, are referred to as irredeemable money owed. Their maturity period isn't always constant. They may be typically of a protracted duration. Beneath such loans, society is pressured with a perpetual debt, as tax-payers

could must pay closely ultimately. Therefore, redeemable money owed are preferred on grounds of sound finance and suitability. (Simmons, 2016) (Arif)

Short-term, Medium-term and Long-term loans: In line with their amount, redeemable loans may also similarly be treasury payments are a tool of credit score considerably used as a technique of short term borrowing with the resource of the authorities, commodities, for covering transient deficits in the budget. Interest fees on such loans are normally low. Lengthy time period cash owned, on the other hand, are the ones repayable after an extended time body, typically, ten years or more. For development finance, such loans are generally increased thru the authorities. Long-term loans generally undergo excessive price of hobby. Likewise, loans of medium-term (in between quick-time period and long-time period) are floated through the government, bearing halfway hobby fees. For warfare finance, or to satisfy spending on training, health, remedy work, and so forth. Such loans are generally desired categorized as quick-time period, medium-term or lengthy - time period money owed. Short-time period money owed mature within a brief length say, of three to nine months (Pour).

Funded and Unfunded Debt: Funded debt is, in fact, a long-time period debt, beyond the duration of at least a year. It encompasses securities which might be marketable on the inventory trade. Funded debt in its suitable experience is, but, a responsibility to pay a fixed sum of hobby, problem to the option of the government to repay the predominant. In such money owed, the creditor bondholder has no right to everything however the interest. Unfunded money owed, however, are for a moderately short duration. They are typically exchangeable within a year. Unfunded debts are for that reason, incurred usually in anticipation of public sales, temporary degree to fulfill cutting edge wishes (Narasimha, 1987).

### **2.1.3 Sources of Public debts**

Consistent with inner debts and outside debts; inner borrowing speak about a country's borrowing from personal country wide sources. This borrowing has no outcome on increasing or reducing national earnings. External borrowing refers back to the resources supplied from overseas country that is repaid with main and hobby on the cease of a positive length. External debt has an increasing effect on national earnings whilst it's far taken and vice versa has a reducing effect on countrywide earnings whilst its miles paid (Aybarc, 2018).

Productive and unproductive debts also are obtainable. If the debts are used in construction, inclusive of electricity stations, railways, and irrigation tasks, which make a contribution to the

productive capability of the financial system, they denote to effective money owed. By way of this way, efficient money owed provide a constant drift of income to the kingdom. (JMPC. Module, 2018) the state mainly will pay the interest and most important debt quantity from those initiatives' revenues. If the money owed are used in the region consisting of battle, famine comfort, social offerings, etc., which do not pay to the efficient potential of economy, they denote to unproductive money owed. The nation usually can pay the interest and important debt amount from taxes; consequently, these money owed are a burden on the society (Saman, 2007; Muley, 2018).

These days, hastily growing worldwide family members have extended the significance of outside money owed. The less evolved and growing international locations have to speak about to outside borrowing for the realization in their financial development. The lack of excellent capital markets for improvement in these nations and the insufficient wide variety of technical substances and personnel required outside sources. As a count number of reality, these are the main reasons for applying to external borrowing inside the Ottoman Empire and the Turkish Republic periods in advance internal borrowing (Kamu Kredisi, 1996). Internal and external borrowing amounts are adversely proceeded in much less developed and advanced countries. In line with this, the debt of advanced nations are basically inner money owed; the debts of much less evolved and growing countries are often external debts. Because in developed countries, the state can sincerely offer the money owed needed via own inner resources. It is also great from wherein and the way the sources of investment are provided in a country's economy as well as how those assets are channeled lower back into the economic system (Kamu Kredisi, 1996).

Internal and external borrowing quantities are harmfully advanced in less developed and advanced nations. According to this, the money owed of advanced countries are in the main inner money owed; the debts of much less evolved and developing international locations are in the main outside debts. Because in advanced countries, the country can definitely offer the debts wanted with the aid of very own internal assets. It's also extensive from wherein and how the assets of investment are furnished in a country's financial system as well as how those sources are channeled returned into the economy (Ricardo D. , 1920).

## 2.2 Theory of public debt

The essential premise for raising the public debt is that government require public debt so that the shortfall in revenue era can be offset thru acquiring loans from home and out of doors sources with the purpose to finance the development desires of the country. The classical economists like (Adam, 1927) did no longer like the idea of public debt in some time, (Ricardo T.R., 1989) posted that purchasers have an eye fixed constant at the destiny desires and consequently, taxation and debt are some in the long run. Ricardo's declare has been referred to as Ricardian Equivalence and it has remained effective inside the face of aversion of traditional economists to public debt. All through the great despair, (Keynes, 1933) made a case for public debt. In keeping with Keynesian principle, if the private region perceives administration debt as net wealth, the monetary deficit and next authorities' charges will further spur the personal intake prices, transaction demand, hobby rates, and expenses (JamesM. Buchanan, 1958).

(Buchanan J. M., 1986) In a latest and significant book, public concepts of public debts, has attempted to offer a widespread theory of public debt. He offers a concept of public debt that is appropriate each to length of full employment and intervals of unemployment. He claims logically and devastatingly towards his very own colleagues, and in choose of what different economists disdainfully label "popular fallacies." His presentations that these so known as "popular fallacies" may not be so improper in any case; as an alternative they're correct in all essential respects. The motive of this text is appraise the significance of Buchanan's work and its consequences on modern debt concept (Ricardo quoted from Melon).

In over-all, it can be said that there are two principal thoughts embodied in cutting-edge debt idea which are of conventional heritage. One, the real fee of presidency expenditure is the sacrifice in private production. Two, there is no future actual value of debt financing with the exclusion of switch prices. The early classicists (Smith), detecting the unproductiveness of public spending, and frequently inquisitive about stimulating personal capital formation, logically concurred that the real value of increasing administration spending is the sacrifice in private capital formation which ensues (Burkhead, 1995). In view of the scarcity of private capital and the waste and extravagances of government expenditure for the duration of this time, this view become tenable. However, as non-public capital come to be more accessible and as public expenditure commenced

to be considered. However, the sacrifice in private production price of government expenditure changed into unquestionable then and is unquestionable now in most current debt concept.

Whilst debt is created to finance administration expenditure, the actual cost to society is the sacrifice in non-public production. The crucial price of loan- financed government spending happens whilst the debt is created (Ricardo, 1920). Mill, but, changed into disbursed now not best by using the cost rising when resources are transferred to the management, however additionally by way of the price at later date while interest bills are made- in particular enormous is the destiny value of servicing the debt if the borrowing sports of the government multiplied the rate of interest (Ricardo D. , 1920).

Assuming unemployment, the Keynesian role adds something first-hand to the classical role, and the Keynesian function may be named what Buchanan known as the new orthodoxy (John Stuart Mill, 1894). Given that authorities' expenditure may additionally growth without a decline in private manufacturing, there won't be any actual cost linked with loan financing. Is there a future real burden within the form of servicing and amortizing authorities' debt? (Buchanan) The Ricardian reasoning prevails. With the exemption of the real price worried in moving funds from the taxpayer to the bondholder, there's no future actual burden in servicing the general public debt. If posterity sacrifices, posterity benefits so, the reasoning goes. Interest bills to home creditors offset the sacrifices incurred by way of countrywide taxpayers. The wealth of society is unaffected inside the destiny. There's no destiny public debt hassle (RM, 2017). Since there can be no massive cutting-edge fee or destiny public fee in management debt financing.

## **2.3 Empirical Literature review**

Numerous researchers have attempts to provide an explanation for what decide debt service in numerous nations internationally. Public debt is one of the primary dimensions of a financial system and subsequently has been put to empirical inquiry via several scholars.

### **2.3.1 International perspective**

The consequence of many empirical research display the existence of an awful correlation between public debt and GDP growth (Diamond, Jan, 1965; Qamar Abbas, 1992). Most empirical literature in this subject matter look at the effect of outside debt on monetary growth especially in growing especially in growing international location. Consistent with (financial institution W. , 2005) an

exam of 31 u.s. instances such as Pakistan has confirmed debt as end result of alternate charge changes and financial expenses associated with contingent liabilities such as financial institution bailouts as the factors figuring out the debt to GDP ratios (Taher, 2017).

(Fund, 2001) Defines debt “as all liabilities that require bills of interest and vital with the aid of the debtor to the creditor at a date or dates in the future. As a result all, liabilities in the government Finance records tool are debt besides for stocks and different fairness and financial derivatives” to begin with, (Frank Kardes, 2010) implemented time collection methodology to analyze factors explaining debt carrier in 20 among 1980-2009. This test predicted consequences the use of vector blunders correction version (VECM) after confirming long run courting inside the series. They said that debt export ration end up definitely associated with debt provider. Similarly, they discovered that GDP come to be certainly related to debt service. The observed concluded that growth in exports and economic increase charge become a remedy to external debt burden. (Sargent, 2010) have a look at carried out on US debt display that greater than 3 quarters of US debt reduction, at some point of the duration 1946-74 happened due to better increase whilst a much less than quarter happened due to inflation. (Eichengreen, 1930) Observed a negative correlation between public debt and GDP increase. (Benjamin Ayodele, 2013) confirmed that the GDP increase price is negatively related to the general public debt and that it's far the maximum critical determinant.

(Neck, 2001) was interested in 25 European countries over the 1996-2009 period and also located this positive effect of army spending on debt however additionally a poor impact of GDP increase. On this context, (Schclarek, 2004) studies the connection among increase and debt for a number of growing and developed/industrial economies and covers the duration 1970–2002. He unearths that better growth charges are related to lower outside debt levels, and specifically this courting isn't by way of non-public outside debt however by way of public external debt for developing nations. But, he does now not locate any tremendous courting between government debt and economic growth for business countries (Bellot, 2017).

### **2.3.2 Regional (SSA) based**

Research have examined the effects of army spending on debt to-GDP ratio. The usage of static and dynamic panels, (Dunne, Jul 2013) discovered an effective and vast effect of army spending on outside debt in eleven small industrialized economies. The same results were found, by (Smyth, 2009) taking the Middle East country sample and by (Bayale, Empirical Investigation into the

Determinants of Public Debts in Africa, 2020). who studied a group of 25 sub Saharan nations. Every other observed performed within the sub-Saharan location has installed real capital inflows changed into very key in determining an economy's capacity to settle the outside debt responsibilities (Milton A, 1999). (Negash, 1991) performed a look at on factors influencing debt servicing capacity amongst 45 African international locations. The have a look at used panel facts method where in it turned into set up that reserve to import ratio, capital inflows, financial growth rate, and inflation is the key factors influencing the capacity of an financial system to carrier its debts. In addition, they have a look at located that incapability to honor external debt duty, turned into a main predicament to us of a financial increase. (Milton A, 1999) look at elements figuring out debt service in South African nations. The look at employed time collection strategies using information from 1960-1999. The hooked up numerous determinants of public providers. They blanketed the extent of tax fee, authority's expenditure, exports and the boom in GDP. At the same time as government spending end up negatively associated with debt servicing among South Africans international locations. The authors concluded that to keep away from debt service burden, the nations are suggested to beautify monetary sports and manage cost.

## 2.4 Hypothesis

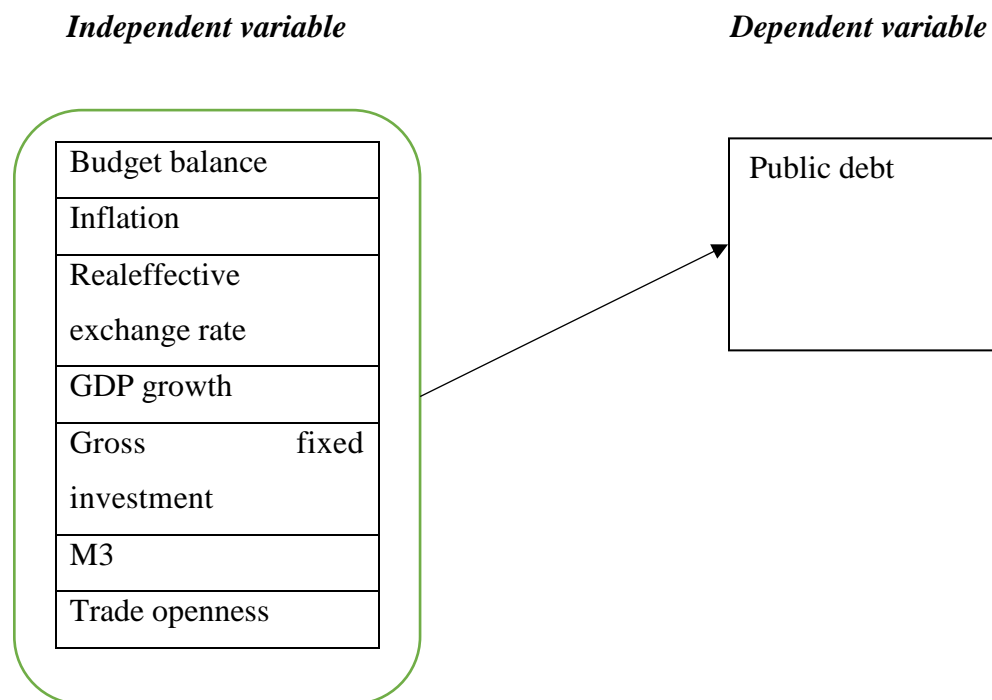
This study empirically tests hypotheses supported by the conventional theoretical conception (Brunner, 1986; Schwab, 1996; Blanchard, 2008):

- Hypothesis 1 Public debt has a negative impact on economic growth.
- Hypothesis 2 Public debt raises with government investment.

The first hypothesis forms what it can call basic hypothesis of the conventional theory. Following the large majority of other studies, this hypothesis will be tested by examining relations between the public debt and gross domestic product. The second hypothesis is more restrictive but plays a central role in the conventional theory. As a matter of fact, this theory often puts the increase of government investment increase the degree of public debt.

## 2.4 Conceptual framework

Conceptual framework according researcher Saunders (2007) are structured from a set of broad ideas and theories that help a researcher to properly identified the problem they are looking at frame their questions and find suitable literature. According to Young (2009) conceptual framework is a dramatically representation that show the relations between the dependent variables and independent variables. In this study the conceptual framework we look at the effect of public debt and the Independent variables in SSA. As stated by Oyejide (1985), “Debt is the resource or money used in an organization that is not contributed by its owner and does not in any other way belong to them. It is a liability represented by a financial instrument or other formal equivalent. Public debt is the total money owed by the Government of a country to various creditors, institution, other and individuals resident”. The variables used in the study are:



## **CHAPTER THREE**

### **3. DATA SOURCES, METHODOLOGY & MODEL SPECIFICATION**

#### **3.1 Data sources and Scope**

This study is used secondary data mainly drawn from World Bank (World Development Indicators, International Financial Statistics and International Debt statistics) and IMF (World Economic Outlook) 2020 online databases. The study covers a period of 10 years from the period (2011 – 2020) which captures the effects on 2006 multilateral debt relief incentives and 2008 global financial crisis.

Information resources and variables in this paper, following (Alesina, 2016) and (Forslund, 2011), who recognized extensive theoretical households linking debt with socioeconomic, political and demographic factors. On this regard, IMF, World Bank, SIPRI, and ICRG databases had been used. So, it is then extracted statistics on public debt from the world monetary Outlook (WEO) database of the international monetary Fund (IMF). It contains decided on macroeconomic facts collection together with finances balance, inflation, real effective exchange price and real interest charge. It is reasonable to extract the statistics in this first institution of variables from there because the IMF, whose assignment is to ensure the stableness of the worldwide financial device, has facts in the direction of that of countries (country wide debts) on those variables (IMF, 2019).

#### **3.2 Variable Description**

Before embarking on the empirical investigation of the drivers of public debt in Sub-Saharan Africa, description of some variables in the specified model is outlined below in order to present some preliminary explanation to the relationships between some key regression variables.

##### **3.2.1 Dependent variable**

The panel data model on this research at will use public debt as established variable. Public debt, responsibilities of governments, particularly the ones evidenced by using securities, to pay positive

sums to the holders at some future time. Public debt is prominent from private debt, which consists of the responsibilities of people, enterprise firms, and nongovernmental groups.

### **3.2.2 Independent variables**

The set of variable encompasses population growth, gross capital formation (as proxy for total capital), inflation rate (as a proxy for macro-economic instability of a country), openness (export plus import over GDP and as a proxy for level of country's interaction to the rest of the world), Inside the standard monetary growth principle, population growth and gross capital formation fees are expected to have nice coefficients, the coefficient on inflation rate is predicted to be negative. Trade openness will assume to be increase productivity through transfers of information and efficiency benefit. Different institutional variables also may be blanketed in this have a look at as said inside the above desk. Budget balance is the distinction between a central authority's sales (taxes and proceeds from asset income) and its prices. Its miles regularly expressed as a ratio of Gross domestic product (GDP).

Inflation is growth within the degree of fees of the products and offerings that families purchase. It is measured due to the fact the fee of alternate of those prices. Typically, expenses upward push over the years, but fees can also fall (a state of affairs called deflation). Actually effective trade charge is the weighted common of a country's foreign exchange in phrases of an index or basket of different most essential currencies. The weights are decided via the use of comparing the relative alternate stability of a country's oversees money closer to that of each inside the index. Gross domestic product boom is the same old diploma of the fee introduced created thru the manufacturing of merchandise and services in a rustic at some stage in a certain duration. As such, it also measures the profits earned from that manufacturing, or the complete amount spent on very last goods and services.

Gross constant funding is the buy of produced assets, together with the producing of such belongings via using manufacturing for their personal use, minus disposal. Liquid liabilities as % GDP in USA become at 365% in 2014, regular with the sector economic organization series of improvement signs, compiled from officially diagnosed assets. Population boom is the growth inside the rage of human beings in a population. Exchange openness refers back to the orientation of a rustic's financial system in the context of global trade. The degree of openness is measured by means of the use of the real length of registered imports and exports of an economy.

Table 1: Variable description and sources: potential determinants of public debt

N	Variables	Description	Source
1	dept	Public debt (% of GDP)	IMF data
2	bud_bal	Budget balance (% of GDP)	IMF data
3	infl	Inflation (%)	IMF data
4	exch_cpi	Real effective exchange rate (CPI-based)	IMF data
5	gdp	GDP growth (%)	World Bank data
6	ginf	Gross fixed investment (% of GDP)	World Bank data
7	M3	M3 (% of GDP)	World Bank data
8	open	Trade openness (computed)	World Bank data

Note: Data sources are IMF, World Bank, SIPRI, and ICRG databases.

### 3.3 Methodology and Model Specification

#### 3.3.1 Panel data model specification

The Panel data permits for variables you cannot examine or degree variables that alternate over the years. With panel statistics you can include variables at extraordinary degrees of evaluation. Especially, the fixed effect and random effect model are the most distinguished one. For this reason, let Y constitute a commentary and X represent a px1 vector of covariates that the observe aim to investigate the diploma of affiliation to Y through the linear panel records model particular as follows:

The overall form of the panel records model can be distinctive as:

$$y_{it} = \alpha + \beta X_{it} + u_{it} \dots \dots \dots [1]$$

Where  $\beta$  and  $\alpha$  parameter vector of fixed consequences, u is a random impact and X a vector of explanatory variables (capability drivers of public debt). Explanatory variables will be those decided on by the panel method.

Where the subscript i denotes the pass-sectional size and t represents the time series size.

$Y_{it}$  Represents the based variable in the model.  $\alpha$  is the consistent and  $\beta$  represents the coefficients.  $X_{it}$  consists of the set of explanatory variables inside the estimation model.  $u_{it}$  is the

mistake time period. In line with (Baltagi 2001), maximum panel statistics programs were restrained to a single regression with errors components disturbances which is defined as:

$$Y_{it} = \alpha + \beta X_{it} + \mu_i + \lambda_t + v_{it} \dots \dots \dots (2)$$

In which the  $\mu_i$  is an unobserved person particular effect.  $\lambda_t$  Is an unobserved time specific effect.  $v_{it}$  Miles a zero mean random disturbance with variance  $\delta$  and the other variables, are as explained in Equation (2). The character of the test to be finished calls for that a dynamic panel method is carried out.

Further to extraordinary advantages related to panel statistics method, dynamic panel permits for measuring the rate of adjustment (via the lagged dependent variable) the usage of the partial adjustment primarily based technique.

The dynamic panel approach accounts for individual effects, which more often than not is the pass-sectional (Baltagi, 2005) the time-specific effects also may be covered.

The dynamic errors components regression is characterized by way of the presence of a lagged dependent variable many of the regressors i.e.

$$Y_{it} = Y_{it-1} + \beta X_{it} + \mu_i + \lambda_t + v_{it} \dots \dots \dots [3]$$

Wherein  $Y_{it}$  is dependent variable in country  $i$  for time  $t$  and  $Y_{it-1}$  is the dependent variable in the previous period,  $\beta X_{it}$  is a vector of explanatory variables,  $i = 1 \dots 30$ ,  $t = 1 \dots 10$

Indices:  $i$ : individuals i.e., the unit of observation

$t$ : time period

### 3.3.3 Generalized Moments of Methods (GMM)

The gadget GMM can be a superior technique among all of the dynamic version estimators since it's an in built mechanism to remedy issues with endogeneity springing up from not noted variables, endogeneity of explanatory variables, and also the presence of size errors, among others (Francesco Caselli; Heiko, 2008). The Arellano-Bond GMM approach is designed with the power to deal with the econometric issues at the manner to stand up in estimating Equation (1). It additionally makes use of the differencing (first differencing) approach to wipe out the time invariant precise consequences (which is likewise correlated with the explanatory variables) and moreover the problem of autocorrelation which may be because of the inclusion of the lagged variable. In the end, the AB technique has been designed for small  $-T$  (10 years) and massive  $-N$

(30 international locations) panels (Mileva, 2007). Therefore, throughout this paper is used panel facts technique for empirical device designer moments technique is hired.

Numerous estimation strategies are used even as using the panel statistics method. Specifically, the fixed effect and random effect models are the most outstanding ones and that they may be going to be employed on this paper as properly.

### 3.3.4 Fixed Effects

In the method of the regular impact the intercept in the regression is permitted to vary among individual gadgets in reputation of the reality that every move-sectional unit might have a few unique characteristics of its very personal. That is, the version assumes that differences throughout devices may be captured in differences throughout devices may be captured in differences in the consistent time period. They  $\alpha_i$  are random variables that capture unobserved heterogeneity. The model permits every circulate-sectional unit to have a tremendous intercept time period even though all slopes are the identical. So that

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \dots\dots\dots$$

Where  $\alpha_i$  ( $i=1 \dots n$ ) is the unknown intercept for each entity (n entity-specific intercepts).  $Y_{it}$  is the dependent variable (DV) where  $i$  = entity and  $t$  = time.  $X_{it}$  represents one independent variable (IV).  $\beta_1$  is the coefficient for that IV.  $u_{it}$  is the error term. The FE is appropriate in situations where the individual specific effect might be correlated with one or more regressors (Greene; Gujarati).

### 3.3.5 Random Effect

In assessment to the FE, the RE assumes that the unobserved individual effect is a randomly draw from a much larger populace with a steady imply (Greene; Gujarati). The person intercept is then expressed as a deviation from this consistent imply fee. The RE has a bonus over the FE in that it is low-cost in terms of degrees of freedom, considering that it's now not need to estimate N circulate-sectional intercepts.

The RE is appropriate in situations in which the random intercept of each go-sectional unit is uncorrelated with the regressors. The fundamental idea is to start with Equation. However, instead

of treating  $\beta_1$  as fixed, it is assumed to be a random variable with a mean value of  $\beta_1$ . Then the value of the intercept for person entity can be expressed as:

$$\alpha_i = \alpha + \varepsilon_i \text{ Where } i = 1, 2, 3 \dots n.$$

The random error term is assumed to be distributed with a zero mean and constant variance:

$$Y_{it} = X_{it}\beta + \alpha + \varepsilon_i + \mu_{it}$$

$$Y_{it} = X_{it}\beta + \alpha_i + \omega_i$$

The composite blunders time period  $\omega_i$  includes components:  $\varepsilon_i$  is the move-sectional or person-precise mistakes thing and  $\mu_{it}$ 's miles the combined time collection and pass-sectional errors issue, given that

$$\varepsilon_i \sim (0 \delta^2) \quad \mu_{it} \sim (0 \delta v^2) \quad \varepsilon_i \text{ independent of the } X_{it} \text{ (Gujirati, 2003).}$$

### 3.3.6 Pre- Estimation Diagnostic test

#### Sargan test

The Sargan check and autocorrelation test are the two principal diagnostic exams applicable to this take a look at. The Sargan take a look at for over-figuring out restrictions is used to determine if the devices are suitable. The null hypothesis states that "the contraptions as a collection are exogenous". Consequently, a higher p-value is desired. Accordingly, if the p-price is much less than 0.05, it can reject the null speculation in favor of the exchange. The null speculation of no autocorrelation is carried out to the differenced residuals (Mileva, 2007).

### 3.3.7 Test Specification

#### Hausman test

Check Following (Hausman, 1978) take a look at specification either constant impact or random effect version is appropriate based at the given facts and facilitates to find out the parameters to be expected within the version. It can be employed primarily based on the subsequent assessments.

**Null hypothesis H0:**  $Cov(X_{it}, v_{it}) = 0$  which states explanatory variables are uncorrelated with variant across the region. When Ho is true RE is more efficient than FE model, because both  $(\beta_{RE})$  and  $(\beta_{FE})$  are consistence but looking at the standard error of both estimator,  $SE(\beta_{RE})$  less than  $SE(\beta_{FE})$ , so using RE is more efficient.

**Alternative Hypothesis H1:**  $Cov[X_{it}, v_{it}] \neq 0$  when explanatory variables are correlated with variation across the region, then  $\beta_{RE}$  is solely consistent and only FE model is appropriate. Hence,

when  $H_0$  is rejecting the difference is systematically justified and FE model uses to interpret the estimated coefficients. In other hypothesis if result:

$H_0$ : Select RE (P-value greater than 0.05)     $H_1$ : Select FE (P-value less than 0.05)

## Endogeneity test

The Hausman's test is also described as a test for model misspecification. In panel data analysis (the analysis of data over time), the Hausman's test can help us to choose between fixed effects model and a random effects model.

What is interested at present is Hausman's test for endogeneity. This section introduces methods to determine if endogeneity is indeed a problem. (Wooldridge, 2002), has given the total concept and it can be simplified the test mechanism in the following way.

Suppose our linear model is:  $y = b_0 + b_{1x} + u$

Then the steps of the test are:

1. Seek out an appropriate instrument  $Z$ . Regress the endogenous variable  $X$  on the instrument(s)  $Z$  i.e.  $X = d_0 + d_{1z} + v$  the residuals  $v$ .
2. Include this residual as an extra term in the original model and estimate
 
$$y = b_0 + b_{1x} + b_{2v} + e$$
3. Step 3: Test whether  $b_2 = 0$  (using a t test).

If  $b_2 = 0$  conclude there is no correlation between  $X$  and  $u$ .

If  $b_2 \neq 0$  conclude there is correlation between  $X$  and  $u$ .

Because  $X = d_0 + d_{1z} + v$  and so only way  $X$  could be correlated with  $u$  is through  $v$ . This means the residual in original model ( $y = b_0 + b_{1x} + u$ ) depends on  $v$  + some residual i.e.  $u = b_{2v} + e$ . So estimate  $y = b_0 + b_{1x} + b_{2v} + e$  instead of  $y = b_0 + b_{1x} + u$  and test whether coefficient on  $v$  is significant. If it is, conclude that  $X$  and error term are indeed correlated; there is endogeneity.

## Heterogeneity test

(Yamagata's, 2008) Consider the following high-dimensional panel data model, with a large number of cross-sectional units  $N$  and a large number of time periods  $T$

$$Y_i = \beta_i X_i + u_i \quad i = 1, \dots, T,$$

Where  $Y_i = (Y_{i1}, \dots, Y_{iT})'$   $X_i = (X_{i1}, \dots, X_{iT})'$ ,  $u_i = (u_{i1}, \dots, u_{iT})'$ . Here, each  $X_{i1}$  is a  $p \times 1$  vector of observable regressors,  $\beta_i$  is a  $p \times 1$  vector of unknown slope coefficients, and  $u_{it}$  is an idiosyncratic error. The null hypothesis of interest in this paper is

$$H_0: \beta^0_1 = \beta^0_2 = \dots = \beta^0_N \text{ for some } \beta^0$$

The alternative hypothesis is

$$H_1: \beta^0_i \neq \beta^0_j \text{ for a nonzero fraction of pairwise slopes for } i \neq j.$$

# CHAPTER FOUR

## 4. RESULTS AND DISCUSSION

### 4.1 Descriptive Statistics

The output chart below shows that the name of the variable that are examining and the descriptive statistics. Getting the descriptive statistics in Stata is quick for multiple variables.

Table 1: Summary of descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
<b>debt</b>	overall	24.71593	14.73057	1.247677	97.45268	N = 300
	between		11.79718	4.154458	69.04167	n=30
	within		9.055686	-13.57662	70.60855	T=10
<b>bud_bal</b>	overall	5.522979	15.76875	-189.3357	10.27597	N = 300
	between		10.52454	-54.92504	3.262538	n=30
	within		11.88367	57.66456	57.66456	T=10
<b>infl</b>	overall	5.779295	5.484278	-3.233389	32.01479	N = 300
	between		10.52454	3.262538	3.262538	n=30
	within		3.597945	23.58033	23.58033	T=10
<b>exch_cpi</b>	overall	100.3605	17.53721	55.95589	167.2108	N = 300
	between		15.11417	72.47987	137.3175	n=30
	within		9.273168	59.24271	135.7752	T=10
<b>gdpg</b>	overall	3.688974	3.927578	14.04712	14.04712	N = 300
	between		2.336847	-2.958414	9.129286	n=30
	within		3.18267	-7.908075	14.96026	T=10
<b>gfinv</b>	overall	24.29889	7.410829	5.400697	52.41832	N = 300
	between		5.917774	12.35153	36.91769	n=30
	within		4.577602	51.83352	51.83352	T=10
<b>m3</b>	overall	25.97371	21.38848	-16.35951	161.507	N = 300
	between		20.62156	1.668106	112.3331	n=30
	within		6.709581	7.543503	82.13941	T=10
<b>open</b>	overall	69.73032	27.93821	20.72252	150.2086	N = 300
	between		26.5828	32.05787	139.4811	n=30
	within		9.755439	42.13657	101.9484	T=10

**Source: Author's computation using STATA 15.1**

A summary of the descriptive statistics of the variables employed in all the models is reported in Table 1. The average debt for the sample is 24.71 percent. The maximum debt was 97.45 percent recorded by Angola, Benin, and Botswana. The mean of budget balance and inflation are -5.52 percent and 5.77 percent, respectively. The budget balance and inflation variables peaked at 10.27 percent and 32.01 percent respectively. The mean GDP growth for the sample is 3.68 percent. The standard deviation measures the degree to which variables disperse from their mean. Figures from the Table 1 show that the majority of the variables are very stable.

## 4.2 Correlation Matrix

Correlation matrix below measure the strength and direction of the linear relationship between the variables. The correlation coefficient can range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all.

Table 2: Correlation matrix of the variables in the sample

	<b>debt</b>	<b>bud_bal</b>	<b>infl</b>	<b>exch_cpi</b>	<b>gdp</b>	<b>gfinv</b>	<b>m3</b>	<b>open</b>
<b>debt</b>	1							
<b>bud_bal</b>	-0.0302 0.6022	1.000						
<b>infl</b>	-0.1191 0.0392	0.0334 0.04639	1.000					
<b>exch_cpi</b>	-0.1449 0.012	-0.14025 0.0148*	0.2385 0.0001*	1.000				
<b>gdp</b>	-0.1346 0.0197	-0.0422 0.4666	0.0178 0.0483	0.2447 0.0001*	1.000			
<b>gfinv</b>	0.1048 0.007	-0.2764 0.0001	0.0223* 0.034	0.0842 0.01458	0.2839 0.0001*	1.000		
<b>m3</b>	0.0342 0.0547	-0.4398 0.0001*	-0.0055 0.0238	0.1218 0.035	0.053 0.03601	0.2325 0.0001	1.000	
<b>open</b>	0.1147 0.047	-0.2169* 0.0002*	-0.0287 0.0207*	-0.1968 0.0006*	-0.1338 0.0204	0.2317 0.0001	-0.0139 0.03104	1.000

**Source: Authors computations using Stata 15.1**

The results of the correlation matrix of the variables within the study presented in Table 2, reveals a significant negative correlation between debt stock and economic growth with a correlation of -0.1346. The result indicates that a rise in Economic growth will cause a decrease in a decrease in accumulation of debt. This result reveals that, as Economic growth increase the nation will get

foreign currency that enables them to pay previous debt. Higher growth rates are associated with lower external debt levels, and mainly this relationship is not by private external debt but by public external debt for developing countries. As a contrast, it also implies that when debt is appropriately applied and also the economy is performing well, the funds generated would be enough to service the external debt to a degree where there'll be no negative impact on the economy.

The result also shows that external debt includes a significant negative correlation with inflation, exchange rate and budget balance with a correction coefficients of -0.1191 -0.1449, and -0.0302, respectively while money supply, Gross fixed investment and trade openness contains a significant positive correlation coefficient of 0.0342, 0.1048 and 0.1147 respectively

### 4.3 Estimation Result

The most important practical difference between the two is this: Random effects are estimated with partial pooling, while fixed effects are not. Partial pooling means that, if you have few data points in a group, the group's effect estimate will be based partially on the more abundant data from other groups.

Table 3: Estimation Result of fixed effect and random effect model

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
bud_bal	0.0085624	0.0110507	-0.0024883	0.0039263
infl	0.0905495	0.1392039	-0.0486544	0.0256354
exch_cpi	-0.3514572	-0.315981	-0.0354762	0.0144586
gdpg	-1.001828	-1.013501	0.0116731	0.037421
gfinv	0.0400935	0.0855483	-0.0454548	0.0241344
m3	0.1944685	0.1495679	0.0449006	0.036558
open	-0.0794979	-0.0567337	-0.0227642	0.025628

$$\text{chi2}(7) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 2.92$$

$$\text{Prob}>\text{chi2} = 0.8921$$

The Hausman test seems to look whether the estimates from the fixed and random models are extensively specific from each different. If they may be (the Chi-squared cost will be beneath the critical price) then finish random outcomes is to be preferred. In the desk above there are 7 explanatory variables, the take look at fee is below the critical Chi-squared fee on the ninety five % level. So, go with the random outcomes estimates

In this part the main objective is to estimate public debt and other independent variables. In order to identify the way to treat the individual effect as fixed and random the researcher developed two types of model namely, fixed effect and random effect (Yamano, 2009). The Hausman test indicates that the RE estimators are consistent and efficient. Thus, the test suggests to use the Random Effect model. Accordingly, as conveyed in the table 3 the p value is 0.8921 which shows that random effect panel data analysis is the most efficient estimation used for this study.

## 4.4 Random effect estimation

In a random effect each level can be thought of as a random variable from an underlying process or distribution. Estimation of random effects provides inference about the specific levels also population level information.

Table 4: Random effect estimation result

debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
bud_bal	0.0110507	0.0385177	0.29	0.774	-.0644427	.0865441
infl	0.1392039	0.1253775	1.11	0.267	-.1065315	.3849393
exch_cpi	-0.315981	0.0491271	-6.43	0.000***	-.4122684	-.2196936
gdp	-1.013501	0.1586675	-6.39	0.000***	-1.324484	-.7025186
gfinv	0.0855483	0.1079394	0.79	0.428	-.1260091	.2971057
m3	0.1495679	0.0608154	2.46	0.014**	.0303719	.2687638
open	-0.0567337	0.0446226	-1.27	0.204	-.1441924	.030725
_cons	57.41576	7.047187	8.15	0.000	43.60353	71.228
sigma_u	12.145113					
sigma_e	7.857045					
rho	.70496052 (fraction of variance due to u_i)					

**Source: Authors computation using STATA 15.1 \*\*\* \*\* and \* indicates significance level at 1, 5 and 10 percent respectively.**

From above random effect robust standard error estimation result, out of seven explanatory variables three of them are highly significant in determining public debt of sub Saharan African countries from 2011 to 2020. As shown on table 4 economic growth and exchange rate have negative and significant effect on public debt. Thus one percent increase in Economic growth and exchange rate results in 1.0135 and 0.3159 reduction of public debt respectively. This result consistent with classical and monetarist theory of public debt. It also agrees with findings of Greene, 1989, Iyoha, 1999; presibitro, 2006; Reinhart et al, 2012 that debt particularly external debt depresses investment through both disincentive effect and crowding out effect. Increased growth and exchange rate in return contribute to reduction of debt stock. The result of negative trade openness is supported by the finding of Marc (2004). This finding indicates that trade reform

helps strengthen external viability by improving export competitiveness. Trade liberalization reduces the anti-export bias in domestic policies and promotes an open business environment that attracts foreign investment.

The anti-export bias is reduced through the elimination of direct export controls (taxes and bans) and indirect impediments to competitiveness, including excessive and distortionary import price lists, or nearby content requirement imposed on home producers. These controls and impediments increase manufacturing expenses for exporters, or lessen their potential to acquire first class inputs at internationally competitive costs. However, government gross fixed funding (Firebaugh; Borensztein; Asiedu) have strange impact on public debt.

(Christensen & Abbas) determined that debt has effective impact on monetary boom due to the fact the price range generated through home borrowing have been used partially to finance those expenses made government. Therefore, increase in government gross fixed funding definitely related to accelerated public debt. Eventually inflation is fantastic however its miles insignificant in this examine.

## 4.5 GMM Estimation

GMM estimator in dynamic panel data models combines moment conditions for the differenced equation with moment conditions for the model in levels. And also GMM estimation provides a straightforward way to test.

Table 5: Estimates system generalized method of moment and Random

	<b>GMM</b>	<b>RE</b>
<b>L1</b>	2.19E-02*** (0.00)	
<b>bud_bal</b>	4.56E-02 (0.459)	0.01105 (0.774)
<b>infl</b>	7.29E-02 (0.002)	0.13920 (0.267)
<b>exch_cpi</b>	1.20E-02 (0.282)	-0.3160*** (0.00)
<b>gdpg</b>	2.95E-02*** (0.00)	-1.01350*** (0.00)
<b>gfinv</b>	8.43E-02*** (0.00)	0.08555 (0.428)
<b>m3</b>	1.23E-02 (0.34)	0.149568 (0.014)
<b>open</b>	2.56E-02 (0.806)	-0.05673 (0.204)
<b>_cons</b>	0.035 (0.04)	57.41576*** (0.00)
<b>Observation</b>	240	240

Source: Computed by authors using STATA 15.1 Note: \*, \*\* and \*\*\* denotes significance at 10, 5 and 1 percent level respectively.

As shown from table presents determinant factors of public in Sub Saharan Africa countries using GMM and RE model specification where it allows for heterogeneity or individuality in the analysis and accounts country specific parameters across countries and time invariant factors get rid from the model. Exchange rate, economic growth, government gross fixed investment significant variables that are substantially affects public debt whereas trade openness, measures of money and inflation are insignificant at level.

As it can be seen from table (5) the estimated coefficient Economic growth, exchange rate and trade openness significant and has negatively effect on public debt and the system GMM and RE results a percentage increase in Economic growth, Exchange rate and trade openness causes public debt to decline by 1.01350, 0.3160 and 0.05673 percentage points, respectively.

## 4.6 Sargan and Hansen test result

*Sargan–Hansen test* is a statistical *test* used for *testing* over-identifying restrictions in a statistical model. The test is based on the assumption that model parameters are identified via a priori restrictions on the coefficients, and tests the validity of over-identifying restrictions Sargan, J. D. (1958).

Table 6 Sargan and Hansen test result

debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Debt						
L1.	.8501974	.0446732	19.03	0.000	.7626396	.9377552
bud_bal	-.0117413	.018535	-0.63	0.526	-.0480693	.0245867
infl	-.1389103	.0734774	-1.89	0.059	-.2829233	.0051028
exch_cpi	-.1705449	.0340135	-5.01	0.000	-.2372102	-.1038796
gdpg	-.3945898	.0969048	-4.07	0.000	-.5845198	-.2046598
gfinv	.0394268	.071554	0.55	0.582	-.1008164	.17967
m3	.1456975	.041763	3.49	0.000	.0638436	.2275514
open	-.0933151	.0357493	-2.61	0.009	-.1633824	-.0232478
_cons	26.41041	5.236783	5.04	0.000	16.14651	36.67432

At a 5% significance level it would be rejected the null hypothesis of no model misspecification if the p-value is smaller than 0.05. However, in particular in relatively small samples, the test can suffer from size and power problems. If there are many instruments, a very large p-value close to 1 may also sometimes indicate a problem with a poor estimation of the weighting matrix.

H0: over identifying restrictions are valid

chi2(8) = 870.64

Prob > chi2 = 0.0000

So, what could this tell you, and could it rely on these results.

It quite clearly indicates that it cannot be rejected the null, which is a good thing. The p-value would have to be less than 0.1 or 0.05 to reject, so it is a long way from having any indicated problems with the instruments. However, heed (Roodman, 2013) advice in xtabond2 from SSC: the Sargan test is not very powerful when there are many instruments.

## 4.6 Diagnostic tests

Autocorrelation test measures the relationship of the observations between the different points in time, and thus seeks for a pattern or trend over the time series.

Table 7: Autocorrelation test

Order	z	Prob >  z
1	-2.2141	<b>0.0268</b>
2	-1.0349	0.3007

Source: Authors computation using stata 15.1

The Arellano –Bond test AR (2) in the first differences fails to reject the null hypothesis of no two-period serial correlation in the residuals. From table of the Hausman tests: The null hypothesis Ho: RE model is appropriate and the alternative hypothesis Ha: FE model is appropriate. The probability value indicates that its value is less than 5%, it leads to use, the FE model to investigate the estimated value of the parameters. Generally the diagnostic test, In all cases the F-tests reject the null hypothesis of a common intercept term across countries, and Hausman tests consistently

reject fixed effects in favor of random effects. The system GMM estimates all pass the Sargan test for validity of the instrument set.

## CHAPTER FIVE

### 5 CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

It can be observed that Budget balance, inflation, real effective exchange rate, real interest rate, GDP growth, Gross fixed investment (% of GDP), measure of the money supply, trade openness are priority variables that are included in the models visited. The central focus of our study was to investigate the determinants of public debt in Sub Saharan Africa. Most of the literature reviewed supports negative relationships between public debt and economic growth exchange rate, particularly in low-income countries. (Paul R. Krugman) Argues that, beyond a certain threshold, the outstanding debt starts to become a disincentive for the government to carry out economic reforms and invest in productive activities. Thus, high economic growth reduces stock of public debt. Using the system GMM and RE estimation, the econometric analysis shows a negative and significant effect of the economic growth, as hypothesized.

There is a statistically negative relationship between Economic growth, exchange rate and trade openness and public debt level in SSA. Empirically speaking, the increasing level Economic growth, exchange rate and trade openness in SSA countries fosters the public debt level into lowering. And Government gross fixed investment, measures of money and inflation have a positive contribution to public debt accumulation activity in SSA. i.e. the strong significant association between government gross fixed investment and public debt level. Budget balance had no significant relationship with the level of public debt in Africa. And the other variable can positively or negatively affect public debt but not much significant. Economic growth signifies that, as a country improves on its domestic production of goods and services, it can generate more revenue, leading to less borrowing in SSA. The rise of Exchange rate in SSA conveys the relative price of domestic goods and services of SSA increases while the relative price of foreign goods and services falls. This leads to lowering of Public debt in SSA.

Means the rate of increase in prices over a given period of time can leads to government borrowing. Government investment and public debt relation show: shows Insufficient revenue mobilization

of most SSA countries leads to governments borrowing to fund infrastructural projects such as road construction, railway construction, and building schools and hospitals, other service. So, economic growth (gdp), exchange rate, gov't investment and inflation are the determinant variable that is highly significant to public debt in SSA.

## **5.2. Recommendation**

Based on the findings of this research paper the researcher forwards the following recommendations to the policy makers and the concern body. The objective of this study is to analyze the determinants of public debt in the sub Saharan countries. Based on empirical findings the following policy measures are recommended which reduce the level of public debt, by striving to increase Economic growth allied with trade openness in order to positive impact of public debt by investing on returning and productive sectors which increase economic growth to repay the borrowed debt. Furthermore, by minimizing budgetary deficit, implementing import substitution and export diversification.

Secondly investigating the determinant of public debt Using long-term longitudinal information of all 54 African countries. And very profound economic, political and institutional reforms are critically required in managing and controlling the level of indebtedness for debt sustainability in Africa countries. They should enhance data coverage of debt and debt exposure. Countries therefore need to embark on better strategies for the management of their debt so as to borrow at lowest possible cost. It should be important for African countries to design and implement appropriate policies to increase private investment as large public debt chocks-off private investment. Efficiency in the classic tax collection, transparency and the use of local currency bond markets are possibilities that should not be overlooked. Furthermore, African countries need to work collectively to minimize governance failures, corruption and minimize the Illicit Financial Flows (IFFs). For instance, effectively combating IFFs would require policies at home as well as global cooperation on the taxation of multinational corporations. Hence, our future research could examine in greater depth how specific institutional frameworks, such as fiscal rules, inflation targeting or robust financial supervision and regulation could influence the public debt and its composition in some specific African economic and/or monetary zones. In doing this, threshold models could be applied. This will allow comparisons to be made at the regional level.

Lastly Future research can look at the relationship between other independent variables and public debt of individual countries in Africa.

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## Appendix

Table A1: Summary of descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
debt	overall	24.71593	14.73057	1.247677	97.45268	N = 300
	between		11.79718	4.154458	69.04167	n = 30
	within		9.055686	-13.57662	70.60855	T = 10
bud_bal	overall	-5.522979	15.76875	-189.3357	10.27597	N = 300
	between		10.52454	-54.92504	3.262538	n = 30
	within		11.88367	-139.9336	57.66456	T = 10
infl	overall	5.779295	5.484278	-3.233389	32.01479	N = 300
	between		4.202831	.904612	16.33089	n = 30
	within		3.597945	-4.49833	23.58033	T = 10
exch_cpi	overall	100.3605	17.53721	55.95589	167.2108	N = 300
	between		15.11417	72.47987	137.3175	n = 30
	within		9.273168	59.24271	135.7752	T = 10
gdpq	overall	3.688974	3.927578	-11.06099	14.04712	N = 300
	between		2.336847	-2.958414	9.129286	n = 30
	within		3.18267	-7.908075	14.96026	T = 10
gfinv	overall	24.29889	7.410829	5.400697	52.41832	N = 300
	between		5.917774	12.35153	36.91769	n = 30
	within		4.577602	7.258849	51.83352	T = 10
m3	overall	25.97371	21.38848	-16.35951	161.507	N = 300
	between		20.62156	1.668106	112.3331	n = 30
	within		6.709581	7.543503	82.13941	T = 10
open	overall	69.73032	27.93821	20.72252	150.2086	N = 300
	between		26.5828	32.05787	139.4811	n = 30
	within		9.755439	42.13657	101.9484	T = 10

Table A2: Correlation matrix of the variables in the sample

	debt	bud_bal	infl	exch_cpi	gdp	gfinv	m3
debt	1.0000						
bud_bal	-0.0302 0.6022	1.0000					
infl	0.1191 0.0392	0.0334 0.5639	1.0000				
exch_cpi	-0.1449 0.0120	-0.1405 0.0148	0.2385 0.0000	1.0000			
gdp	-0.1346 0.0197	-0.0422 0.4666	0.0178 0.7583	0.2447 0.0000	1.0000		
gfinv	0.1048 0.0700	-0.2764 0.0000	0.0223 0.7000	0.0842 0.1458	0.2839 0.0000	1.0000	
m3	0.0342 0.5547	-0.4398 0.0000	-0.0055 0.9238	0.1218 0.0350	0.0530 0.3601	0.2325 0.0000	1.0000
open	0.1148 0.0470	-0.2169 0.0002	-0.0287 0.6207	-0.1968 0.0006	-0.1338 0.0204	0.2317 0.0001	-0.0139 0.8104
		open					
open		1.0000					

Table A3: Estimation Result of fixed effect and random effect model

. hausman fixed random

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
bud_bal	.0085624	.0110507	-.0024883	.0039263
infl	.0905495	.1392039	-.0486544	.0256354
exch_cpi	-.3514572	-.315981	-.0354762	.0144586
gdpg	-1.001828	-1.013501	.0116731	.037421
gfinv	.0400935	.0855483	-.0454548	.0241344
m3	.1944685	.1495679	.0449006	.036558
open	-.0794979	-.0567337	-.0227642	.025628

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
 = 2.92  
 Prob>chi2 = 0.8921  
 (V\_b-V\_B is not positive definite)

Table A4: Random-effects GLS regression

```

Random-effects GLS regression           Number of obs   =           300
Group variable: country                 Number of groups =            30

R-sq:                                   Obs per group:
    within = 0.3358                      min =           10
    between = 0.0058                     avg =          10.0
    overall = 0.0355                     max =           10

corr(u_i, X) = 0 (assumed)               Wald chi2(7)    =          121.86
theta        = .79957372                 Prob > chi2     =            0.0000
  
```

debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
bud_bal	.0110507	.0385177	0.29	0.774	-.0644427	.0865441
infl	.1392039	.1253775	1.11	0.267	-.1065315	.3849393
exch_cpi	-.315981	.0491271	-6.43	0.000	-.4122684	-.2196936
gdp	-1.013501	.1586675	-6.39	0.000	-1.324484	-.7025186
gfinv	.0855483	.1079394	0.79	0.428	-.1260091	.2971057
m3	.1495679	.0608154	2.46	0.014	.0303719	.2687638
open	-.0567337	.0446226	-1.27	0.204	-.1441924	.030725
_cons	57.41576	7.047187	8.15	0.000	43.60353	71.228
sigma_u	12.145113					
sigma_e	7.857045					
rho	.70496052	(fraction of variance due to u_i)				

Table A5: GMM estimation result

```

Arellano-Bond dynamic panel-data estimation      Number of obs      =      240
Group variable: country                          Number of groups   =      30
Time variable: Year

Obs per group:
      min =      8
      avg =      8
      max =      8

Number of instruments =      157                  Wald chi2(0)      =      .
                                                    Prob > chi2       =      .
  
```

One-step results

debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
debt						
L1.	2.19e-12	1.97e-13	11.15	0.000	1.81e-12	2.58e-12
--.	1	2.17e-13	4.6e+12	0.000	1	1
bud_bal	4.56e-14	6.15e-14	0.74	0.459	-7.50e-14	1.66e-13
infl	7.29e-13	2.37e-13	3.07	0.002	2.64e-13	1.19e-12
exch_cpi	1.20e-13	1.11e-13	1.08	0.282	-9.83e-14	3.38e-13
gdp	2.95e-12	3.33e-13	8.88	0.000	2.30e-12	3.60e-12
gfinv	8.43e-13	2.13e-13	3.95	0.000	4.24e-13	1.26e-12
m3	1.23e-13	1.29e-13	0.95	0.340	-1.30e-13	3.77e-13
open	2.56e-14	1.04e-13	0.25	0.806	-1.79e-13	2.30e-13
_cons	3.50e-11	1.70e-11	2.06	0.040	1.63e-12	6.85e-11

**Table A6: Sargan and Hansen test**

```
. xtabond debt bud_bal infl excl_cpi gdp gfinv m3 open, lags(1) artests(2)
```

```
Arellano-Bond dynamic panel-data estimation      Number of obs      =      240
Group variable: country                          Number of groups   =      30
Time variable: Year

Obs per group:
    min =      8
    avg =      8
    max =      8

Number of instruments =      44                Wald chi2(8)      =      870.64
                                                Prob > chi2       =      0.0000
```

One-step results

debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
debt						
L1.	.8501974	.0446732	19.03	0.000	.7626396	.9377552
bud_bal	-.0117413	.018535	-0.63	0.526	-.0480693	.0245867
infl	-.1389103	.0734774	-1.89	0.059	-.2829233	.0051028
excl_cpi	-.1705449	.0340135	-5.01	0.000	-.2372102	-.1038796
gdp	-.3945898	.0969048	-4.07	0.000	-.5845198	-.2046598
gfinv	.0394268	.071554	0.55	0.582	-.1008164	.17967
m3	.1456975	.041763	3.49	0.000	.0638436	.2275514
open	-.0933151	.0357493	-2.61	0.009	-.1633824	-.0232478
_cons	26.41041	5.236783	5.04	0.000	16.14651	36.67432

Instruments for differenced equation

GMM-type: L(2/.)debt

Standard: D.bud\_bal D.infl D.excl\_cpi D.gdp D.gfinv D.m3 D.open

Instruments for level equation

Standard: \_cons

### Table A 7: Autocorrelation test

Arellano-Bond test for zero autocorrelation in first-differenced errors

Order	z	Prob > z
1	-2.2141	0.0268
2	-1.0349	0.3007

H0: no autocorrelation