EFFECTS OF EXTERNAL DEBT ON ECONOMIC GROWTH IN KENYA

BY

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X51/10383/2018

A RESEARCH PAPER SUBMITTED TO THE SCHOOL OF ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF DEGREE OF MASTER OF ARTS IN ECONOMIC POLICY MANAGEMENT OF THE UNIVERSITY OF NAIROBI

NOVEMBER 2021

DECLARATION

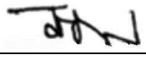
I confirm that this research paper is my original work and has not been presented elsewhere for the award of any degree.

Sign:  Date: 13/12/2021

Martin Muthengi Thiora

X51/10383/2018

I confirm that this research paper has been carried out under my supervision and submitted for examination with my approval as a university supervisor.

Sign:  Date: 13/12/2021

Dr. Japheth Osotsi Awiti

DEDICATION

I dedicate this project to my daughter Celeste Kinya.

ACKNOWLEDGEMENT

First, I thank the Almighty God for helping me come this far and bestowing the gift of life upon me to pursue personal growth through learning. My special thanks go to my supervisor, Dr. Japheth Awiti, whose steady advice was invaluable in finishing this research endeavor. In addition, I want to thank the lecturers at the school of economics for their tutelage and continued support throughout my entire period of study. I thank my parents, late father Joseph Thiora and mum Loreen Kaindi for the kindness and effort they put in raising me up and ensuring I attended school and providing all that I needed to succeed in my academic journey. More so, I want to acknowledge my wife Irene and daughter Celeste for giving me sufficient time to do my studies. I want to thank Dr. Mzalendo Kibunjia for his unwavering support and encouragement. And lastly, I want to appreciate my friends and classmates for their unwavering moral support.

ABSTRACT

To overcome savings gap, developing nations have continued to acquire massive foreign loans. Managing and repaying massive inventories of external loans has presented hurdles and problems in developing countries, Kenya inclusive. When employed in productive sectors, borrowed funds from other economies can help a country stimulate its economic growth. However, mismanagement or excessive consumption can lead to growth retardation. The study sought to examine effects of external debt on economic growth in Kenya. This was achieved by analyzing annual time series secondary data from 1970 to 2018. The motivation behind the study is that Kenya has been heavily relying on foreign borrowings to fund its annual fiscal deficits and infrastructural development. Financing fiscal deficit through foreign borrowing has raised Kenya's debt load, increasing worries about its sustainability. The study adopted ARDL bound cointegration test in which long-run link amongst variables was established. Consequently, ARDL-ECM model was used to carry out empirical estimation and its outcome yielded a valid long-run relationship between the variables utilized. The findings revealed that external debt stock has positive effects while external debt services have negative effects on Kenyan economic growth. In addition, both variables significantly affect economic growth. The study concludes that external debt has positive contribution to economic growth in Kenya. Furthermore, the study proposes that the government guarantee that loans are routed towards productive sectors, diversify the economy to permit greater income generation, stimulate capital formation, and acquire debts in essential capital areas when needed.

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ABBREVIATIONS AND ACRONYMS

ADF	—	Augmented Dickey-Fuller.
AIC	—	Akaike Information Criteria
AO	—	Additive outlier.
ARDL	—	Autoregressive Distributed Lag.
CUSUM	—	Cumulative Sum.
CUSUMSQ	—	Cumulative Sum of Square.
ECM	—	Error Correction Model.
GDP	—	Gross Domestic Product.
GNP	—	Gross National Product.
IO	—	Innovative outlier.
KNBS	—	Kenya National Bureau of Statistics.
Ksh.	—	Kenya Shillings.
OLS	—	Ordinary Least Square.
RGDP	—	Real Gross Domestic Product.
SAPs	—	Structural Adjustment Programs.
SSA	—	Sub-Saharan Africa.

CHAPTER 1: INTRODUCTION

1.1 Background Information

An economy experiencing a fiscal deficit may finance it by borrowing; by doing so, debt is created. A nation can borrow internally or from external sources. Internal borrowing constitutes domestic debt, while external borrowing constitutes external debt. External borrowing creates an influx of foreign capital into a country. These inflows inject additional resources into a country and assist in technology transfer. This can provide the stimulus that can boost the productivity of a country.

Before the twentieth century, the accumulation of public debt in the world was sluggish and occurred primarily because of wars. According to Reinhart and Rogoff (2010), the war debts pose fewer hitches for growth because the high war-time government spending stops when peace returns. However, peace-time debt expansion might continue for a more protracted period (Reinhart & Rogoff, 2010). Other than war, the industrial countries accumulated debts for other purposes. For example, the United States incurred substantial debts in the early nineteenth century, mainly for public works. During the twentieth century, public spending increased enormously in industrialized countries. Tanzi and Schuknecht (1997), in a study covering a group of thirteen industrial states, noted their average government spending relative to GDP surged up to 43% in 1990, right from 12% in 1913. Bigger government spending contributed significantly to increased debt buildup in industrial countries; nonetheless, they use debt well than in developing countries (Presbitero, 2012). More so, they handle side effects of hefty debts more effectively than developing ones (Kharusi & Ada, 2018).

The governments borrow for a range of reasons. Main cause is to arouse economic growth. The major causes for developing countries stockpiling foreign debt are low levels of savings and investment (Chenery & Strout, 1966). According to Okonjo-Iweala et al. (2003), governments have two broad reasons for borrowing. First, macroeconomic reasons such as raising investment and funding the transitional balance of payment deficit. Second, because of the long-term domestic credit crunch or fiscal limitations. Gohar (2012) attributed borrowing to low investment and revenue levels and budget deficits, while Babu et al. (2015) attributed it to debt payment and expected government revenue falling below estimated spending. Krumm (1985) stressed that borrowing to repay the initial loans cannot arise if the existing loan improves the production capacity.

Many developing nations suffer from low savings and investment rates because of low incomes (Kasidi & Said, 2013). Failure to generate sufficient domestic savings forces these countries to supplement it with external debts (Ezeabasili et al., 2011). This helps them to sustain their economic activities. The international community long recognized that country needs a significant infusion of foreign funds (Karagol, 2002b). As a result, emerging countries have relied largely on external borrowing to overcome savings deficiency and lessen foreign exchange shortages (Gani, 1999). Akram (2011) cautioned that borrowing should not exceed the economy's carrying capacity because it can lead to intergenerational equity problems. It is preferable to finance fiscal deficits through debt rather than printing money or taxing because debt accumulation functions as an anti-inflationary device.

How external debt accumulates is critical and can be assessed based on its impact on economic growth and repayment methods (Munasinghe et al., 2018). The significant danger connected with external debt accrual is that it may surpass a sustainable level in respect to national repayment ability. However, substantial external debt is not an expressway for lower growth. The reason is that a country might have high external debt, but large exports enable it to sustain it. External debt typically poses greater risks to economic prosperity if it is not sustainable and when there is little evidence about its nature, structure, and size (Were, 2001). External debt payment cannot harm economic growth if it is invested in productive sectors and infrastructure that improves the productivity of other sectors (Cline, 1995). Therefore, the need to use external debt to fund productive initiatives that create future incomes.

The literature points that foreign debt affects economic growth by reducing investment levels. External loans have the greatest influence on economic growth through lessening investment efficiency (Pattillo et al., 2011). Several factors affect the efficiency of investments, including the macroeconomic environment. Due to the prominent level of external liabilities, government may fail to implement some reforms like liberalizing trade and monetary adjustment. Such rigidities make it difficult to respond effectively to some shocks, reducing the efficiency of investment (Karagol, 2002b). Excessive debt stock buildup can also create prospects of debt restructuring, or that debt service will be paid by distortionary taxation or reduced productive public investment (Agénor & Montiel, 2015). Thus, creating an uncertain environment in the economy. This makes speculation about fraction of debt to be paid using the country's resources to heighten hence varying the level and allocation of investments (Serven, 1999). As a result, investors begin to choose short-term investments over long-term ones.

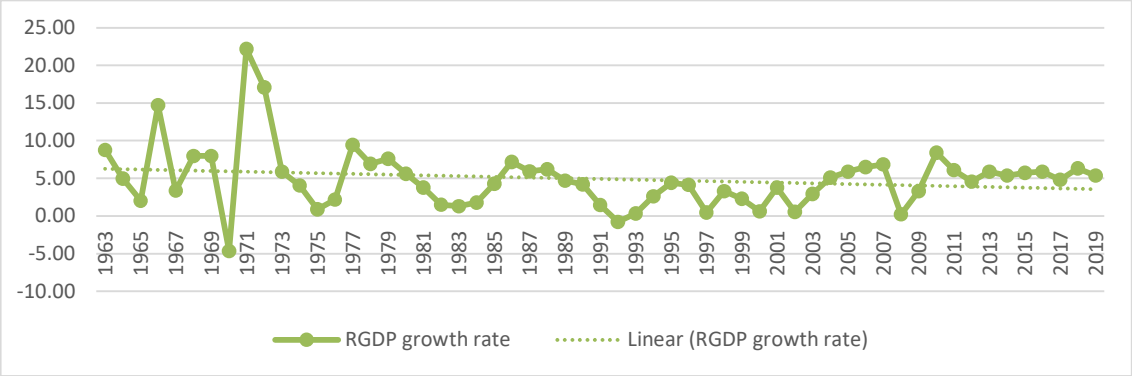
1.1.1 Origin of Developing Country's External Debts

The emergence of external debt stems from efforts by developing economies to promote and accelerate economic growth using external resources. Since the mid-1960s, developing countries shifted from the in-ward to the out-ward-oriented development approach (Costa, 1991). However, excessive international liquidity and rising inflation in the industrial nations intensified exchange rate tensions between 1973 and 1980, causing the Bretton Woods adjustable peg system to fail, ushering in the managed floating exchange system (Costa, 1991). In addition, non-oil commodity booms fueled inflation and drove up oil prices. Consequently, the global trade crisis developed, as did growing protectionism in industrial economies. Oil price increases in 1973 and 1979 resulted in a significant surge in deposits held by banks in the oil-producing countries (Costa, 1991). However, the depressed economic situation in industrialized countries resulted in reduced demand for loans from those banks. Therefore, the banks shifted their attention to developing countries. In addition, industrial economies' monetary expansion and surplus liquidity kept nominal interest rates low compared to the inflation rates, resulting in lengthy periods of negative real interest rates on loans (Glasberg & Ward, 1993). This induced developing countries to take resources from those banks.

1.1.2 Economic Growth

Sustainable economic growth is vital for all nations, specifically developing ones, where external debt service and rising current account deficits are constantly causing growing fiscal deficits (Senadza et al., 2017). Economic growth is the increase of real GDP over time. It reflects the living standard and well-being of society. Kenya is a country engaged in capitalist development, and immediately after independence, there was significant economic growth between 1964 and 1972. GDP growth over that period averaged 6.5%. However, the 1973/74 oil crisis negatively impacted the balance of payments (Were, 2001). The 1977 coffee boom on the other hand led to an upward surge in export earnings (Were, 2001). However, a further oil crisis followed in 1979 and export revenues stagnated. In recent years, Kenya has experienced significant fluctuations in its annual RGDP growth rate. Figure 1.1 below illustrates these changes.

Figure 1.1: RGDP growth rate trend



Source: Own computation using World Development Indicators (WDI) data

1.1.3 Debt Stock and Economic Growth

The goal of debts is to leverage and increase output. In essence, this output is always expected to pay the cost of leverage. The development initiatives in developing countries involve considerable investments far beyond their domestic saving capacity, and external debt has become a key element in funding these initiatives. The large magnitude of external debt is common in Sub-Sahara African (SSA) countries (Ramakrishna, 2003) and Kenya is no exception. The growing external debt of African countries has been viewed with skepticism because it outpaces the size of exports. Theoretical models linking debt to growth indicate that reasonable debt levels can increase growth while larger inflows can stifle it.

High debts levels can reduce factor productivity, hence economic growth. Doubling the debt has a 1% reduction effect on factor productivity (Pattillo et al., 2004). Some studies claim debt and economic growth have a negative link (Chowdhury, 2001; Cunningham, 1993; Ibrahim, 2015; Levy & Chowdhury, 1993; Mukui, 2013; Sawada, 1994; Sen et al., 2007; Were, 2001). Others claim a favorable association (Degefe, 1992; Hassan et al., 2014; Ramakrishna, 2003). Smyth and Hsing (1995) noted rising debt ratios in early 1980, but overall debt financing stirred economic growth during that period. Pattillo et al. (2004) found that foreign liability boosts growth to a tune of 160% of debt to exports. External debt lower than 53% of GDP is associated with a positive link with GDP in Jordan (Maghyereh & Omet, 2002). Above that, the relationship turns negative. Little guidance on optimal public debt level exists in economic theory. However, empirical studies indicate that if the debt is more than 50% of a country's GDP, the additional increase can be detrimental (Fry, 1989). Reinhart and Rogoff (2015) found growth in emerging economies is adversely affected when debt-GDP ratio hits a 60% tolerance level. Other studies in developing economies indicate lower threshold of 30% to 40%.

The Kenyan public debt is sustainable (Ryan & Maana, 2014). According to them, its structure is favorable. This notwithstanding, the Kenyan public debt stock has been rising over the years, raising debt sustainability concerns. This rise in public debt is fueled by the need to finance infrastructure developments. Table 1.1 below shows Kenya's total debt rose from Ksh. 502.25 billion in 1999 to Ksh.4,569.63 billion in 2017. Notably, the structure of Kenyan public debt has changed over the years. External debt increased from Ksh.311.95 billion in 1999 to Kshs. 2,349.284 billion in 2017, while domestic debt grew from Ksh.190.3 in 1999 to Ksh. 2,220.35 billion in 2017. Its stake in public debt dropped from 62.11% in 1999 to 51.41% in 2017. Domestic debt accounted for 48.59% of total public debt in 2017 compared to 37.89% in 1999. This demonstrates that there has been a shift from external borrowing to domestic borrowing over the years in Kenya. We can attribute this shift toward domestic sources to unpredictable external financing, as Ryan and Maana (2014) alluded. This trend of increasing public debt, especially external debt in Kenya, poses uncertainty about its contribution to the economy. This is because the external debt buildup can surpass sustainable levels, hence retarding growth because country's resources will be committed to paying foreign debt.

Table 1.1: Kenya *Public Debt*

Year	Domestic Debt (Billions Kshs)	External Debt (Billions Kshs)	Total Debt; TD (Billions Kshs)	Domestic debt (% Annual Growth)	External debt (% Annual Growth)	Total debt (% Annual Growth)	Internal debt (% TD)	External debt (% TD)
1999	190.30	311.95	502.25	—	—	—	37.89	62.11
2000	192.67	405.36	598.02	1.24	29.94	19.07	32.22	67.78
2001	221.98	384.30	606.29	15.22	-5.19	1.38	36.61	63.39
2002	259.83	369.73	629.56	17.05	-3.79	3.84	41.27	58.73
2003	301.19	410.15	711.34	15.92	10.93	12.99	42.34	57.66
2004	295.37	439.99	735.37	-1.93	7.28	3.38	40.17	59.83
2005	335.00	408.60	743.60	13.42	-7.13	1.12	45.05	54.95
2006	385.12	407.74	792.86	14.96	-0.21	6.62	48.57	51.43
2007	438.06	406.92	844.98	13.75	-0.20	6.57	51.84	48.16
2008	456.23	516.67	972.90	4.15	26.97	15.14	46.89	53.11
2009	588.97	588.97	1177.94	29.10	13.99	21.08	50.00	50.00
2010	720.21	599.93	1320.14	22.28	1.86	12.07	54.56	45.44
2011	799.88	685.61	1485.49	11.06	14.28	12.53	53.85	46.15
2012	971.27	821.97	1793.24	21.43	19.89	20.72	54.16	45.84
2013	1189.18	922.37	2111.55	22.44	12.21	17.75	56.32	43.68
2014	1307.75	1170.70	2478.44	9.97	26.92	17.38	52.76	47.24
2015	1540.58	1615.18	3155.76	17.80	37.97	27.33	48.82	51.18
2016	1930.86	1896.44	3827.30	25.33	17.41	21.28	50.45	49.55
2017	2220.35	2349.28	4569.63	14.99	23.88	19.40	48.59	51.41

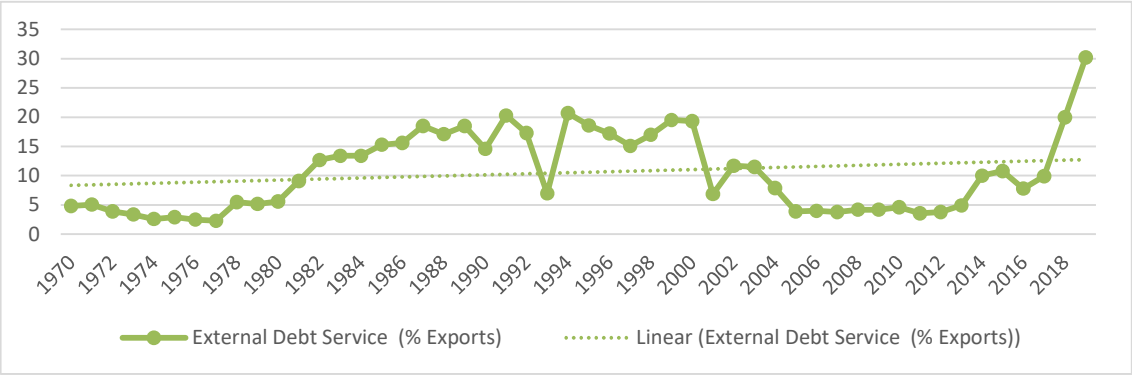
Source: Central bank of Kenya Data Portal

1.1.4 Debt Servicing and Economic Growth

Debt servicing is repayment of debts. Payment of domestic Debt is a transfer of resources from the government to the bondholders, and the funds go into the productive side of the economy. Paying external debt transfers wealth from the country. This transfer of resources out of the country can burden the economy and sometimes wipe out benefits from external loans. Concerns have been raised concerning the steep and soaring share of developing nations' resources dedicated to foreign debt servicing (Karagol, 2002b). This is because debt servicing deprives the economy of the benefits from increased exports that limit the economy's potential to grow. The proportion of public spending or the size of private sector investments changes with external debt services. Higher debt payment lessens economy's overall savings. Moreover, it adversely affects the composition of public spending by straining infrastructure

and human capital resources. When persons trust the future debt will exceed country repayment ability, service cost discourages domestic and foreign investment. Over the years, Kenya has increased its external debt services. Specifically, Kenya's debt service to exports ratio has oscillated substantially in recent years. Figure 1.2 below shows these fluctuations.

Figure 1.2: External-debt-service-exports ratio trend



Source: Author computation using data from KNBS statistical abstracts

Table 1.2 below shows that Kenya's total external debt service increased from Kshs. 31.31 billion in June 2012 to 95.62 billion in June 2017. It represents an increase from 27.5% to 31%. In June 2015, the total external debt service was highest at Kshs. 113.54 billion. This represents 44.8% of the total debt service. The external debt service to exports in June 2012 was 6.3% and rose significantly to 16.4% in June 2017. Within the same period, the total debt service to revenue increased from 16.5% to 23.6%.

Table 1.2: Kenya Public Debt Service (Billion Kshs)

	June 2012	**June 2013**	**June 2014**	**June 2015**	**June 2016**	**June 2017**
External Debt Service (EDS)	31.31	35.04	41.4	113.54	78.58	95.62
EDS (% Debt Service)	27.5%	24.1%	25.8%	44.8%	31.3%	31%
Debt Service	113.64	145.23	160.6	253.27	251.44	308.49
Debt Service (% Revenue)	16.5%	18.6%	17.5%	24.5%	21.8%	23.6%
EDS (% Exports)	6.3%	6.6%	7.9%	21.6%	12.8%	16.4%

Source: Annual Public Debt Management Report 2018

1.2 Statement of the Problem

External debt has the potential of boosting the economy of a country. However, accumulating it in massive quantities may result in debt servicing consuming substantial public expenditure and foreign exchange revenues (Wijeweera et al., 2005). According to Elmendorf and Mankiw (1999), rising public debt reduces public savings. As a result, an increase in private savings fails to compensate national savings decline. This diminishes national investment and capital stock, resulting in lower output and income. An important motive for borrowing externally is insufficient resources to fund investment initiatives. Therefore, increasing aggregate external debt is supposed to boost investment, capital formation and consequently increase potential output (GDP).

Shah and Pervin (2012) debated whether external debt boosts or stifles growth. They found debt stock having positive while debt service adverse effects. Extensive external debt and growth link documentation exists. However, it remains one of policymakers' and scholars' most pressing concerns. Sadly, contradicting findings are found in the literature. Some researchers found positive effects, others negative, and others insignificant effects in studies that have covered various countries and economic conditions. Clements et al. (2003), for example, confirms that externally borrowed resources positively impact investment and growth. However, they noted that this occurs to some degree beyond which its impact turns negative.

A nation is likely to gain from multiplier effects if the foreign debt is used to finance development expenditure. However, it might have negative effects when it is substantial relative to the economy leading to capital flight (Ajayi, 1995). Most developing nations have an undiversified export, a substantial proportion of the labor working in the primary sector and instability in their governance systems. These countries constantly experience shortages in current account, annual budgets, and savings-investment rates. As such, debt management in these nations is increasingly challenging. According to Afxentiou and Serletis (1996), developing countries suffer negative external debt consequences because of poor debt management. Such consequences outweigh any potential gains of using debt in productive ventures. Kenya, being one of the developing countries, could be facing such consequences. This is because its external debt stock trend has been on an upward surge over the years. Therefore, this study tackled this issue by empirically examining the effect of externally borrowed resources on Kenyan GDP growth.

1.3 Research Questions

This research work endeavored to respond to the following questions.

1. What are the effects of the external debt stock on Kenya's economic growth?
2. What are the effects of the external debt service on Kenya's economic growth?

1.4 Objectives of the Study

The main objective of this research work was to empirically investigate effects of external loans on Kenya's economic growth. Listed below were specific objectives.

1. To investigate the effects of the external debt stock on Kenya's economic growth.
2. To investigate the effects of the external debt service on Kenya's economic growth.
3. To draw policy recommendations that can enhance public debt management in Kenya.

1.5 Significance of the Study

This research work is weighty because Kenyan external debt has been growing over the years. Therefore, it is critical for policymakers, financial institutions, and individuals in the country to understand inherent effects that are caused by these burgeoning external debt stocks on economic growth. This study helps understand these effects and their implication on economic growth. Understanding these effects helps develop policies geared toward debt management for sustainable economic growth. More so, the study forms a reference material for future researchers.

1.6 Limitations of the Study

The study used annual time-series secondary data from various sources. The data's availability dictated the choice of the period for which the study covered.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The literature emphasizes that using foreign debt to fund infrastructure development in developing countries is desirable because they have insufficient capital and savings. Theoretical and empirical records on this topic present negative, positive, or no significant effects. The chapter discusses the theoretical and empirical literature of the previous studies, and in the end, the overview is given.

2.2 Theoretical Literature Review

2.2.1 Ricardian Equivalence Theory

According to this theorem, government expenditures funded through debt has a neutral effect on growth of a state. It argues that when the government seeks to finance deficit through borrowing, consumers predict higher tax imposition in the future because they are rational and far-sighted. Consequently, they start to save. These savings, in effect, have the current value equating to a reduced later day's tax and fiscal funding through borrowing. This way, in the Ricardian equivalence theorem's spirit, saving and investment level in the economy remains the same, hence the debt will not affect national income.

2.2.2 Keynesian Theorem

Keynes favored borrowings as way of stimulating economy. He consented to the issue of accumulating public debt by saying that it cannot inflict economic growth path but rather boosts its speed. According to Keynes, the country may accelerate saving streams and mobilize unutilized resources through debt creation. He argued this raises productivity and capital formation leading to increased national income hence surplus creation. In addition, he asserted that surplus would enhance tax collection to treat the debt.

2.2.3 Debt Overhang Theory

This theory points that external debt decreases the countries' economic growth. According to this hypothesis, the accrued debt will function like tax on future production. This discourages the private sector's fruitful investment plans and government adjustment efforts. Foreign borrowing affects growth and increases potential debt service commitments (Kahn et al., 1989). Debt overhang is a condition where anticipated external loans payment drops below its obligations under the contract value (Krugman, 1989). Debt service becomes an increasing

output function as long the debt level is above the country's ability to repay. Hence, returns from investing domestically by domestic and foreign investors are taxed away. In addition, debt overhang can create an uncertain environment in an economy and so depressing economic growth. Increasing public debt creates uncertainty about the government's actions and strategies for meeting debt payment commitments. As such, the chances of rerouting investments to endeavors with quicker returns rather than long-term escalates.

2.2.4 Liquidity Constraint Hypothesis

This hypothesis asserts that rising external liability servicing reduces the funds to invest and develop, and in effect, lowers an economy's potential to service it. It then starts straining the economy on part of domestic borrowing, hence triggering crowding-out effect. This effect is also caused by paying foreign debts using resources from foreign exchange earnings. According to this hypothesis, reducing debt service should increase investment in future. However, using considerable foreign resources to service external debt leaves little capital ventures and growth resources. Elmendorf and Mankiw (1999), for example, noted that high external debt interest payments crowd out private capital ventures and, in the end, dampen the capacity of the economy to expand.

2.2.5 Debt Laffer Curve Theory

According to this theory, external debt can positively or negatively impact economic growth. A negative result is caused by borrowing too much, such that some debt level limit is surpassed. Sachs (1989) introduced the Debt Laffer Curve Theory, and later Krugman refined it. Krugman (1989), using U-shaped Laffer curve, depicted the nominal debt versus actual expected payment nexus. He showed that debt and anticipated payments rise because of the minimal risk of default, and the level of debt increases while due payments fall because the risk of default is high. He concluded that country experiences debt overhang when on descending section of Laffer curve. Under such circumstances, Krugman wrote that external debt contracts function like tax on capital spending. Similarly, Cohen (1993) used Laffer curve exhibiting the association amongst the debt face value and capital ventures. He showed that when owing debt rises past a certain tolerance level, the likely repayment falls. This happens because of the adverse effects of external debt.

2.3 Empirical Literature Review

There is no consensus built on what effect external debt would exert on growth of any economy. A litany of research works endeavors to assess the nexus of external borrowing and growth of nations. These studies further extend to investigating the effects thereof on economy as a result of seeking foreign assistance. These studies adopted different methods of analysis and covered different geographical and economic areas. The results from these wide-ranging studies are diverse and contradictory. A discussion of some of the studies is done below.

Adam and Bevan (2005) made an interesting assumption that individuals only live for two periods in their study. Their analysis was aimed at assessing the ways of financing public deficits. Their results indicated that increasing domestic public debt slows growth. Furthermore, additional external public debt-financed in concessional terms but rationed was found to boost economic growth. Also, another study carried out by Lerner (1948) dealing with internal debt notes that such obligations do not burden future generations since it transfers income from one group to another within an economy.

Savvides (1992) delved into testing factors affecting investment rates and chances that countries that are not developed would encounter crisis in their endeavor to meet their external obligations. Two-Stage Limited Dependent Variable model was adopted to analyze cross-section-time series data of forty-three underdeveloped nations from 1980 to 1986. His findings indicate a significant negative effect of debt overhang and diminished foreign capital inflows on investment rate. His far-reaching conclusion was that indebted nation will have debt servicing linked to its economic performance if it fails to meet its obligations. He added that debtor countries have partial benefits from increased productivity when a considerable share is diverted to service debt and accruals.

Bauerfreund (1989) measured the Turkish economy's external debt cost. He elucidated the debt overhang sticking to debt forgiveness hypothesis. He tested debt overhang measures that were put forward by Sachs (1986) and Feldstein (1986). Sachs (1986) argued that paying debts amounts to transferring resources that are owned privately to public sector. This means that a levy is imposed on private sector by government. The end result of doing this will be reduction of net returns from investment, hence future production, and income. Feldstein (1986) contended that the debt burden is an issue of converting them into foreign exchange. According to the findings, the external debt payment acted as a detriment to investment and growth.

Afxentiou and Serletis (1996) endeavored to determine connection between externally sourced funds and the productivity of fifty-five developing nations facing debt repayment challenges. These countries were classified into various categories and the study period stretched from 1970-1990. It involved splitting this period into 1970-1980 because it was perceived to be years of increases in foreign debt, and 1981-1990, believed to be years of difficulties in meeting their obligations and debt overhang. Analyzing 1970 to 1980 data showed that indebtedness and national productivity association was positive in all categories of the countries. However, from 1980 to 1990, negative link between debt and productivity of two categories of nations that were classified as severely indebted was discovered. Thus, they concluded that severely indebted developing countries did not use foreign loans properly.

Geiger (1990) investigated connection of growth and debt. This study covered South America's most heavily indebted countries utilizing 1974 to 1986 data. The findings indicated a significant negative link. Therefore, according to him, debt and growth are negatively associated. Consequently, he detailed four ways in which excessive debt impacts economic growth. First, colossal debt services put a strain on earnings from abroad and domestic investments as they are rerouted to paying debts. Second, in case the developing countries fail to meet their debt payment as expected, affects their creditworthiness, and therefore borrowing for new ventures becomes hard. Third, debt accumulation reduces the countries' efficiency, making adjusting to shocks and international financial fluctuations challenging. Fourth, pressure mounts on the need to have more earnings from overseas in order to service the debt, and consequently, these nations put some constraint on imports. This, in effect, reduces trade for these nations considerably.

Fosu (1996) studied possible link between nations' growth and external debt. He adopted OLS method utilizing 1970 to 1986 data in SSA economies. The study examined how much debt hurt economic growth by estimating debt propositions of direct and indirect effects. The first proposition claims that if debt service cannot diminish savings and investment, it directly affects growth by lowering productivity. Thus, it alludes to an adverse effect on growth as a result of an attempt to ensure debt obligation is met as well as debt outstanding. This is so even when investment levels are not affected. The second proposition alludes that debt and growth nexus is indirect and at the same time adverse. Findings showed that the debt hypothesis's direct effect negatively influences GDP growth by diminishing the capital's marginal productivity. Additionally, the findings show that an indebted country faces roughly a 1% decrease in GDP growth every year. However, results disagreed with indirect debt hypothesis.

Fosu (1999) did explore effect of borrowings from abroad on economic growth. The work covered SSA, and period was 1980 to 1990. The analysis adopted an augmented production function, and the outcomes revealed negative debt coefficient. Dissatisfied, he further delved into comprehending why negative effects. He did so because SSA nations adopted SAPs in 1980s. Supposing it is because of a bad actor receiving sizable external debt, he repeated the steps of estimation using 1980 to 1985 data. The findings reaffirmed the negative coefficient of debt that was significant too.

Cunningham (1993) scrutinized possible linkage of indebtedness and growth. The data from 1971 to 1987 for sixteen heavily indebted economies was used. She argued that the debt burden growth hurts economic growth since debt service influences capital and labor application in production. Additionally, she continued to argue that investors in a country usually get deprived of any gains arising from increases in factor productivity. The conclusion was that the rise of a debt burden hurt growth.

Smyth and Hsing (1995) assessed United States of America's centralized government debt on growth. They scrutinized existence of a debt ratio that maximizes economic advancement. The ratio was 38.4%. They observed that federal debt played a unique role in 1980s and early 1990s. Further, debt ratios during early years of 1980s were observed to have an upward trend but stayed less than 38.4%. As a result, the debt backing stirred growth. Another important observation was that from 1986-1993 the debt ratio increased to 50.9%, right from 40.7%, which exceeds the optimum debt ratio, thus impacting economic progress adversely.

Amoateng and Amoako-Adu (1996) were disturbed by likelihood of existence of causal relationship between debt servicing, exports, and economic growth. In their research work, they committed to getting to the bottom of this issue. This was done by scrutinizing thirty-five economies from SSA. The data between 1971 and 1990 were analyzed using Granger causality technique. The outcomes disclosed bidirectional and positive causal association between aforementioned variables and economic expansion.

Chowdhury (2006) sought to settle debate that was looming at that time concerning cause-and-effect of borrowing overseas and economic downturn. In addition, he tested the Bulow and Rogoff (1990) proposition. This proposition claims that external debts in underdeveloped nations are only signs and not the root of their deteriorating growth. Growth and debt buildup rates were estimated using logarithmic transformations. Time series data of Thailand, Sri Lanka, Indonesia, Malaysia, South Korea, Philippines, and Bangladesh throughout 1970 to

1988 was used. He first estimated hypothesis that accrued external debts do not affect growth. He came to realization that borrowings from abroad were affecting growth positively. This result was observed in Indonesia, South Korea, and Bangladesh. Further, the findings disregarded Bulow and Rogoff (1990) proposal. The second assessment used a simultaneous equation system to evaluate the interconnection between production, private and public external debt buildup, and capital formation. The findings returned an insignificant effect of external debts on productivity.

Karagol (2002a) comprehensively inspected the short- and long-run connection between payment of borrowings from abroad and growth. The study covered the period from 1956 to 1996 in Turkey. He used multivariate cointegration method. He observed a negative connection between debt repayment and growth. Furthermore, Granger test yielded unidirectional causality that ran from debt payments to GNP. Karagöl concluded that evidence of causation is probably because of misallocation or wastage in consumption of borrowed funds.

Ibrahim (2015) carried out an evidence-based analysis on effects of external government liabilities on East African countries' economic advancement. She analyzed the data between 1981 and 2014 utilizing the fixed- and random-effect models. Her analysis yielded negative and significant effect of externally borrowed funds on economic expansion. Further findings showed that internal liabilities had no substantial effect on economic progress.

Were (2001) labored in explaining the implication of Kenya's external liabilities on GDP utilizing the OLS method. The study period under investigation was 1970 to 2000. Her empirical results demonstrate that external borrowings exert significant negative effects on economic advancement.

Musyoka (2011) assessed nexus between repayment of externally borrowed funds and Kenya's economic progress. Her work utilized time-series data, and period covered ranged from 1970 to 2008. She observed no effects of repaying finances borrowed from external sources on economic growth. She concluded that payments made to foreign countries to settle debts were not excessively high in Kenya to cause debt overhang.

Mukui (2013) examined the effect of government borrowing from overseas sources on Kenya's economic expansion. He analyzed data from 1980-2011 utilizing linear model. His findings revealed that the funds that had been borrowed from foreign countries and their repayment had negative effects on growth.

2.4 Overview of Literature Review and Research Gap

Theoretical literature presents conflicting opinions. Ricardian equivalence theorem states that debt obligations tend to neutrally impact national income, and Keynes asserts that debt fosters economic growth. Theory on debt overhang suggests that external borrowings reduce growth. Liquidity constraint hypothesis indicates that increases in foreign debt servicing reduce the financial resources to develop and invest. Debt Laffer Curve Theory says that foreign debt can negatively or positively influence economic expansion. The empirical literature focuses on the debt-overhang; see (Chowdhury, 2001; Deshpande, 1997; Elbadawi et al., 1997; Fosu, 1999). Notably, few studies labored in exploring the debt levels that cause the debt overhang. Savvides (1992) noticed insignificant statistical effect of foreign liabilities on growth. Some research works established a deleterious effect of proceeds from external borrowings on growth; see (Bauerfreund, 1989; Cunningham, 1993; Ibrahim, 2015; Mukui, 2013; Sawada, 1994; Were, 2001). Elbadawi et al. (1997) found a statistically meaningful connection amongst debt servicing and development in African nations, while (Fosu, 1999) found no link. Pattillo et al. (2004) outcomes on issue of debt-service-economic-growth link were non-statistically significant.

Following these mixed findings, it is impossible to generalize the potential effects of borrowing externally and economic growth without conducting relevant economic analysis. Debt Laffer Curve Theory asserts a maximum debt threshold beyond which its impact on the economy becomes negative. Beyond this threshold, debt overhang sets in. Many studies conducted in Kenya point out that the debt overhang does not exist. This implies that Kenya has not reached the maximum threshold in which external debt would cause debt overhang. Suppose this is true, and the external debts have always funded projects with high future returns. There, economic growth must have improved. Suppose Kenya has been suffering from the adverse effects of external debt. There, it means that the external resources have not been adequately managed and used in productive ventures with long-term benefits. Most of the studies carried out in Kenya focus on either debt stock or debt service. Even though some of these studies have made effort to assess effect of externally borrowed funds on growth, it is not clear whether debt servicing or external debt stock has greatest effect. This work was, therefore, an effort to bridge this gap by laying special attention to combined effects of external debt stock and service on economic expansion in the context of Kenyan economy.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The chapter presents a theoretical framework, empirical model, estimation procedures, diagnostic tests, data, and sources.

3.2 Theoretical Framework

Neoclassical growth models favor a positive influence of foreign debt on economic progress. Neoclassicals highlighted that borrowing is a source of funding for capital formation, it can promote economic growth. Growth theories put forward by conventional neoclassicals point that increasing the present productive capability results in higher economic growth (Solow, 1956). Solow (1957) hypothesized that capital and labor inputs and disembodied technical change determine output. He stated production function as follows:

$$Y = AF(K, L) \ldots \ldots \ldots \ldots (1)$$

Where Y represents the output, A the disembodied technical change, K the capital input, and L the labor input.

Economic theories cannot pinpoint all economic growth drivers (Sala-I-Martin, 1997). Therefore, he alluded those approaches employed by analysts are limited to identifying variables that may be key drivers of growth. He proposed a regression model below.

$$\tilde{y} = \alpha + \beta_1 K_1 + \beta_2 K_2 + \cdots + \beta_n K_n + \varepsilon \ldots \ldots \ldots \ldots (2)$$

Where ỹ is economic growth rate vector, and $K_1, \ldots, K_n$ is explanatory variable's vector.

Following Sala-I-Martin suggestion, Ejigayehu and Persson (2013) modified Solow's model when they were inspecting association of externally sourced funds and economic progress in emerging nations. Their model was as follows:

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 IntGDP_{i0} + \beta_2 INV_{it} + \beta_3 n_{it} + \beta_4 TRB_{it} + \beta_5 DSEX_{it} + \beta_6 EDY_{it} + \beta_7 NTDS_{it} + ш_{it} \ldots (3)$$

Where $\frac{y_{it+1} - y_{it}}{y_{it}}$ represents i^{th} country economic growth in year t and year t+1, β_0 the constant, $IntGDP_{i0}$ the logarithm of the initial per capita GDP, INV_{it} investment growth rate, n_{it} population growth rate, TRB_{it} trade balance, $DSEX_{it}$ debt-service-export ratio, EDY_{it} external debt to GNI ratio, $NTDS_{it}$ net debt service, and $ш_{it}$ residuals.

This study adopted this model with some modifications.

3.3 Empirical Model

This study employed a general growth model framework adopted from Ejigayehu and Persson (2013). We modify the model to include variables that measure macroeconomic stability and the economy's openness. The model was specified as follows:

$$GDPgr = \beta_0 + \beta_1 H + \beta_2 GCFgr + \beta_3 PPgr + \beta_4 EDS + \beta_5 DSX + \beta_6 EXR + \beta_7 INF + \mu \dots\dots\dots (4)$$

Where: GDPgr is real gross domestic product growth rate, GCFgr gross capital formation growth rate, PPgr population growth rate, H human capital formation, EDS external debt stock, DSX external debt service, EXR Exchange rate, INF inflation rate, β_0 Constant, $\beta_{1,\dots,}$ β_7 are coefficients and μ is disturbance term.

Table 3.1 below gives the summary of variables.

Table 3.1: Variable's Summary

Variable	Description	Measurement	Expected sign
GDPgr	Real gross domestic product	Annual % growth	N/A
EDS	External debt stock	% GDP	Positive or Negative
DSX	External debt service	% Exports	Negative
GCFgr	Gross capital formation	Annual growth rate (%)	Positive
PPgr	Population	Annual growth rate (%)	Positive or Negative
H	Human capital formation	Secondary Sch enrolment rate %	Positive
EXR	Official exchange rate	Average %	Positive
INF	Inflation	Consumer price index, annual %	Negative

3.4 Estimation Techniques

The study used Autoregressive Distributed Lag (ARDL) model for the estimation. This is because alternative models such as OLS and VAR can only be used when time-series data variables are stationary, and they may provide a spurious relationship if all or some variables are nonstationary (Granger, 2003). The ARDL model was appropriate because it applies irrespective of whether all variables are nonstationary, it is efficient even for small sample data size, the long-run estimates are super consistent, facilitate concurrent short- and long-run relationship testing, and it allows different optimal lags for different variables (Jordan & Philips, 2018; Pesaran et al., 2001). The equation below represents a general ARDL model specification.

$$Y_t = \alpha + \sum_{i=1}^{p} \theta_i Y_{t-1} + \sum_{i=0}^{q} \rho_i X_{t-1} + \varepsilon_t \dots\dots\dots (5)$$

Where Y represents RGDP growth rate, Y_{t-1} lagged value of RGDP, X_{t-1} are regressors, p dependent variable lag order, q regressor's lag order, α the constant, and ε the error term. $p \geq 1$, $q \geq 0$, and the assumption here is that the lag order q is the same for all variables. However, for estimation purposes, the lag order q for every variable in a vector X_t was determined using Akaike Information Criteria.

Substituting variables in equation 4 into equation 5 gives the ARDL model below.

$$GDPgr_t = c + \sum_{i=1}^{p} \phi_i GDPgr_{t-1} + \sum_{i=0}^{q_1} \acute{\omega}_i H_{t-1} + \sum_{i=0}^{q_2} \gamma_i GCFgr_{t-1} + \sum_{i=0}^{q_3} \delta_i PPgr_{t-1} + \sum_{i=0}^{q_4} \rho_i EDS_{t-1} + \sum_{i=0}^{q_5} \Pi_i DSX_{t-1} + \sum_{i=0}^{q_6} \alpha_i EXR_{t-1} + \sum_{i=0}^{q_7} \beta_i INF_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Since variables were co-integrated, the need to specify the ARDL error correction model (ECM) arose. This is because when variables are cointegrated, the ECM version of the ARDL model becomes convenient for forecasting and unraveling variable's long run association from short run dynamics (Engle & Granger, 1987; Jordan & Philips, 2018; Kripfganz & Schneider, 2018; Pesaran et al., 2001). Therefore, the equation below, which is a general ARDL-ECM, was specified as a starting point.

$$\Delta Y_t = \Theta + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-1} + \sum_{i=0}^{q-1} \delta_i \Delta X_{t-1} + \pi_j X_t + \alpha ECT + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where Δ represents difference operator, Y_t GDP growth rate, Θ constant, $\pi_j X_t$ long-run representation, $\sum_{i=1}^{q-1} \beta_i \Delta Y_{t-1} + \sum_{t=0}^{p-1} \delta_i \Delta X_{t-1}$ short-run representation, α equilibrium adjustment speed, ECT error correction term, μ_t disturbance term and j=(1, 2, ..., n).

Replacing equation 6 variables into equation 7, the ARDL-ECM for estimation was specified below.

$$\Delta GDPgr_t = \Theta + \sum_{i=1}^{p-1} \beta_i \Delta GDPgr_{t-1} + \sum_{i=0}^{q-1} \alpha_i \Delta H_{t-1} + \sum_{i=0}^{q-1} \gamma_i \Delta GCFgr_{t-1} + \sum_{i=0}^{q-1} \phi_i \Delta PPgr_{t-1} + \sum_{i=0}^{q-1} \delta_i \Delta EDS_{t-1} + \sum_{i=0}^{q-1} \acute{\omega}_i \Delta DSX_{t-1} + \sum_{i=0}^{q-1} \varphi_i \Delta EXR_{t-1} + \sum_{i=0}^{q-1} \rho_i \Delta INF_{t-1} + \lambda_1 \Delta H_t + \lambda_2 \Delta GCFgr_t + \lambda_3 \Delta PPgr_t + \lambda_4 \Delta EDS_t + \lambda_5 \Delta DSX_t + \lambda_6 \Delta EXR_t + \lambda_7 \Delta INF_t + \rho ECT_t + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

3.5 Diagnostic Tests

3.5.1 Unit Root Test

When examining the link between economic variables, the characteristics of time series data make technique selection challenging. This stems from its features such as autoregressive, stationarity, trends, cycles, seasonality, and structural breaks. Nonstationary variables, for example, are known to produce spurious results if used in an OLS regression (Granger, 2003). Hence, a need to ensure variables are stationary before carrying out regression analysis. If time series is stationary, its statistical properties or the process generating it do not change over time. Ascertaining time series is stationary entails testing unit root. However, it is not required when performing an ARDL analysis, but variables are not supposed to be integrated of order two or more (Jordan & Philips, 2018). The econometrics literature proposes several unit-root tests. Some of these tests consider structural breaks in a series, while others do not. The conventional tests for unit root in a series are Phillips-Perron, and Augmented Dickey-Fuller tests, among others. The ADF was used in this study for the purposes of ascertaining that none of the variables had integration order of two or more. The ADF model for the unit root test is represented as follows.

$$\Delta x_t = \beta + \varphi x_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta x_{t-i} + \varepsilon_t \quad (9)$$

Where x is variable of the series under test, Δ is difference operator, β is constant, p is optimal lag length, φ and γ are coefficients, and ε is noise term.

In general, none of traditional unit root tests reflects whether time series suffer from structural breaks. Instead, they hypothesize that the current shocks produce temporary effects and do not vary the series' long-run movement (Nelson & Plosser, 1982). This implies that the variance, covariance and mean do not vary with time. Therefore, the series is deemed to satisfy the following conditions.

$$E(x_t) = \varepsilon_x \quad (10)$$

$$Var(x_t) = E\{(x_t - \varepsilon_x)^2\} = \delta_x^2 \quad (11)$$

$$Cov(x_t, x_{t+k}) = \mathrm{E}\{(x_t - \varepsilon_x)(x_{t+k} - \varepsilon_x)\} = x_t \quad (12)$$

The structural break(s) and unit root have some association (Perron, 1989). Therefore, the presence of structural break(s) may violate these conditions. The implication is that the conventional unit root tests are vulnerable if structural breaks are present in series. Failure to

consider structural break(s) may possibly lead to erroneous conclusion of the existence of unit root in a series (Perron, 1989). This is because traditional unit root tests confuse structural breaks to mean there is evidence of series being non-stationary thus making one accept the null hypothesis when in real sense time series is stationary (Perron, 1989). We can overturn results for these methods by establishing points when structural breaks occurred endogenously (Zivot & Andrews, 1992). Economic series can exhibit one or multiple breaks. Several methods have been devised to overcome conventional unit-root tests weaknesses. Zivot-Andrews and Clemente-Montañés-Reyes tests are some of these methods. These tests were implemented to find out the validity and reliability of ADF inferences.

Zivot and Andrews (1992) put forward a method that is utilized to establish unit root, taking into consideration one structural break. It supposes a structural change at level and also trend of series. The test builds on the models stated below.

$$\Delta X_t = \alpha + \varphi X_{t-1} + \beta t + \gamma DU_t + \sum_{j=1}^{q} d_j \Delta X_{t-j} + \varepsilon_t \quad (13)$$

$$\Delta X_t = \alpha + \alpha X_{t-1} + \beta t + \gamma DT_t + \sum_{j=1}^{q} d_j \Delta X_{t-j} + \varepsilon_t \quad (14)$$

$$\Delta X_t = \alpha + \varphi X_{t-1} + \beta t + \gamma DU_t + \sum_{j=1}^{q} d_j \Delta X_{t-j} + \varepsilon_t \quad (15)$$

Where DU_t is dummy variable, DT_t trend shift variable, q breakpoints optimal lags,

$$DU_t = \begin{cases} 1 & if\ t > TB \\ 0 & if\ t < TB \end{cases} \text{ and } DT_t = \begin{cases} t - TB & if\ t > TB \\ 0 & if\ t < TB \end{cases}$$

Equation 13 tests a single structural break in series at level. Equation 14 tests structural break of slope of trend. Equation 15 tests a single structural break at intercept and trend function. TB represents time of modification of mean. The hypothesis tested using these models is H_0: $\varphi = 0$ against H_1: $\varphi < 0$. When φ is equal to zero, series is deemed to contain unit root and fixed increment that excludes instances of structural break. When it is less than zero, the series is deemed to be trend-stationary with a single unknown breakpoint in time.

On the other hand, Clemente et al. (1998) developed a unit root testing technique allowing two breakpoints in series. Based on this test, there are two models. These are AO and IO models. They capture instantaneous and steady shocks in mean of the series, respectively. The following hypotheses are tested.

$$H_0: Y_t = Y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + u_t \dots \dots \dots (16)$$

$$H_1: Y_t = \mu + d_1 DU_{1t} + d_2 DU_{2t} + \varepsilon_t \dots \dots \dots (17)$$

Where $DTB_{it} = \begin{cases} 1 & if\ t = TB_i + 1 \\ 0 & Otherwise \end{cases}$, $DU_{it} = \begin{cases} 1 & if\ t > TB_i \\ 0 & Otherwise \end{cases}$, (i=1, 2) and TB_i represent the time of modification of mean.

We first estimate the unit root hypothesis to determine whether existing breaks are captured by IO or AO model. To test unit root for the case where the innovational outlier caused two structural breaks, we estimate equation 18 below.

$$\Delta Y_t = \mu + \rho Y_{t-1} + \delta_1 DU_{1t} + \delta_1 DU_{2t} + d_1 DT_{b1,t} + d_2 DT_{b2,t} + \sum_{j=1}^{q} C_i \Delta Y_{t-i} + \varepsilon_t \dots \dots \dots (18)$$

To ascertain additive outlier best represents the shift, we do so in two phases. First, we eliminate the deterministic variable and test the following model.

$$Y_t = \mu + \delta_1 DU_{1t} + \delta_2 DU_{2t} + \tilde{Y}_t \dots \dots \dots (19)$$

Second, we estimate equation 20 below over pairs of TB_1 and TB_2, searching for a minimum *t*-ratio for $\rho = 1$. When this ratio is equal to one, we reject existence of unit root.

$$\Delta \tilde{Y}_t = \sum_{j=1}^{q} \omega_i DTB_{1t-i} + \sum_{j=1}^{q} \omega_i DTB_{2t-i} + \rho \tilde{Y}_{t-1} + \sum_{j=1}^{q} C_i \Delta Y_{t-i} + \varepsilon_t \dots \dots \dots (20)$$

3.5.2 Co-integration Test

Co-integration occurs when variables have long-run equilibrium connections (Gujarati, 2004). Co-integration allows us to model time series while preserving their long-run information. The individual time series can fluctuate, yet due to equilibrium forces, some are bound together (Kripfganz & Schneider, 2018). Therefore, the co-integration test investigates how time series might be paired so that the workings of equilibrium forces keep them from drifting too far apart. It is a concept simulating the long-run equilibrium of time series as they converge with time. It provides a stable statistical and economic foundation for the empirical ECM by combining the modeling variables' short- and long-run relationships. When there is no co-integration, one can work with variables in differences. However, the econometrics literature indicates that long-run information is lost. There are a couple of co-integration approaches put forward in the econometric literature. The ARDL co-integration or bound co-integration framework is one of them (Pesaran & Shin, 1995; Pesaran & Shin, 1996; Pesaran et al., 2001; Pesaran et al., 1999; Pesaran et al., 1997). This study applied this framework. It was used because no

requirement for time series to have same integration order (Jordan & Philips, 2018; Kripfganz & Schneider, 2018). Furthermore, the ARDL co-integration uses a single reduced equation. When co-integration exists, the ARDL model is reparametrized into ECM (Jordan & Philips, 2018; Kripfganz & Schneider, 2018; Pesaran et al., 2001).

3.5.3 Autocorrelation Test

The correlation between the successive disturbances in a model is presumed to be zero. The error term's value in any one period is supposed to be independent of its value in any previous period. Autocorrelation occurs when there is a correlation between successive disturbance terms. If the errors are serially correlated, the prediction based on regression estimates is inefficient. Therefore, the serial correlation was implemented.

3.5.4 Heteroscedasticity Test

The error terms are supposed to have constant variance in regression models. When the disturbance term's variance does not remain constant, the problem of heteroskedasticity arises. The presence of heteroscedasticity in a model poses severe econometric issues. In this study, the heteroscedasticity test was implemented to ensure the model is homoscedastic.

3.5.5 Normality Test

Statistical methods of data analysis such as regression, t-tests, and variance analysis assume normality. According to the central limit theorem, the breach of the assumption of normality presents minor problems when the sample size includes at least 100 observations. However, the econometrics literature indicates that normality should be observed regardless of sample size for meaningful conclusions. A wrongly selected data set's representative gives a wrong inference. Therefore, we test the data's normality to ascertain whether its mean is applicable as the data's representative. The normality test can be applied to regression models' residuals. The regression disturbances should be independent and identically distributed, with population mean being zero. When this assumption is violated, the regression estimates cannot exhibit minimum variance when estimators are unbiased. Jarque-Bera test was used to ascertain residuals were normally distributed.

3.5.6 Linearity Test

This test was implemented to establish whether a linear connection exists between dependent and independent variables. When linearity assumption is violated, the model suffers from

specification error. The improper model specification in time series analysis produces biased coefficients that reduce the power of empirical analysis explanation (Hanson, 2002). Specification errors can arise from omission of a variable(s), incorrect functional forms, and the correlation between independent variables and the error terms. Ramsey RESET test was implemented to ensure model was not mis-specified.

3.5.7 Stability Test

In regression models, it is assumed that data pattern of time series variables remains same over the period in which it was collected. Such an assumption makes it possible to fit a single linear regression model. The regression model is estimated and used for prediction if the parameters remain the same over the entire estimation and prediction period. When data pattern changes, fitting one linear regression model may be wrong. Therefore, before fitting a single or more than one regression model, a need to test and determine if there is a change in the structure or pattern of data arises. When the change in the estimated value of parameters is small, the model is stable. Brown et al. (1975) stated that long-run coefficients' stability is essential and depends on the recursive residuals because they are insensitive to slight or steady parameter estimate fluctuations. Models' suitability and stability are determined by cumulative sum and cumulative sum of square of recursive residuals. This study employed aforementioned to ensure that model is stable. The model parameters are free from structural instability when the CUSUM and CUSUMSQ plots are within 5% critical bands.

3.6 Data and Sources

Annual time series secondary data was used. RGDP growth, population growth, and exchange rates data were from UNESCO Institute for Statistics, gross capital formation growth and inflation rates from World Development Indicators, and external debt service to exports from KNBS Statistical Abstracts. No data manipulation was done to these variables. The external debt stock to GDP ratio was formed through dividing external debt stock from World Development Indicators by GDP from the UNESCO Institute for Statistics. The human capital formation variable was created by dividing the secondary school enrolment data from KNBS statistical abstracts by secondary school age going population from UNESCO Institute for statistics.

CHAPTER 4: DATA ANALYSIS AND EMPIRICAL RESULTS

4.1 Introduction

This chapter presents analysis of data and findings. Specifically, it presents descriptive statistics, optimal lag selection, diagnostic tests, and empirical estimation results.

4.2 Descriptive Statistics

Before analyzing data, descriptive statistics for variables were carried out to help understand the general features of the data. These descriptive statistics are reported in table 4.1 below.

Table 4.1: Descriptive Statistics Summary

Variable	Obs.	Mean	Min	Max	Std. Dev.	Variance	Skewness	Kurtosis
GDPgr	49	4.60	-4.70	22.20	4.16	17.33	1.80	9.35
H	49	18.71	6.95	40.17	8.69	75.43	1.20	3.50
GCFgr	49	5.35	-31.5	37.75	15.23	231.96	-0.26	2.995
PPgr	49	3.16	2.30	3.90	0.51	0.26	0.07	1.45
EDS	49	47.81	21.35	123.64	22.62	511.85	1.22	4.31
DSX	49	10.15	2.30	20.70	6.16	37.90	0.32	1.58
EXR	49	46.79	7.00	103.40	34.16	1166.70	0.11	1.42
INF	49	11.76	1.55	45.98	8.08	65.21	1.90	8.16

Source: Author computation using STATA 14.2

From table 4.1, all variables have 49 observations. All variables, apart from gross fixed capital formation, are positively skewed. The variables seem to be normally distributed because their skewness is within the accepted range of normal distribution of -2 and +2. However, some variables have a kurtosis outside the recommended range of -3 and +3 for normally distributed data. For example, the RGDP growth rate has a high peak with a Kurtosis of 9.35, followed by inflation with a Kurtosis of 8.16. Other variables that have Kurtosis outside the accepted range are human capital and external debt stock with Kurtosis of 3.5 and 4.31. Therefore, we cannot rule the normal distribution of RGDP growth rate, inflation, human capital, and external debt stock because their skewness and kurtosis measures contradict each other.

4.3 Optimal Lag Selection

It is imperative to assess optimal lag length prior to conducting unit root test and analyzing the ARDL model. This is because suitable lag length when analyzing ARDL ensures that error terms are Gaussian. Different criteria are available for selecting optimal lags. Table 4.2 below depicts the summary of results from these criteria.

Table 4.2: Summary of Optimal Lags Selection

lag	LR	FPE	AIC	HQIC	SBIC
0		4.0_e+10	47.1117	47.2308	47.4297
1	621.96	900981*	36.3734	37.4456*	39.2356*
2	122.49	1.3_e+06	36.4932	38.5184	41.8996
3	153.5*	1.6_e+06	35.9388*	38.9172	43.8895

Note: * denotes the lowest value used by each criterion for optimal lag selection

Source: Author computation using STATA 14.2

The Final Prediction Error Criterion, Hannan and Quinn Criterion, and Schwarz Bayesian Information Criterion selected one lag. In contrast, Likelihood Ratio and Akaike Information Criteria selected three lags. To determine which criterion to choose for lag selection, we consider the criteria with the lowest value (Kripfganz & Schneider, 2018). In this case, AIC has lowest value of 35.9388. Therefore, optimal lag selection was selected based on AIC.

4.4 Diagnostic Tests results

4.4.1 Results for Unit Root Tests

ADF test was applied to test unit root in the series. Also, following Perron (1989) assertion that traditional tests for unit root can establish presence of unit root because of structural break(s), Zivot-Andrews, and Clemente-Montañés-Reyes unit-root tests were conducted.

Table 4.3 below shows the results for ADF. From the results, it is evident that variables have a mixed integration order. For example, t-statistics for GDPgr, GCFgr, and INF are larger in absolute terms than their 5% significance level critical values. This means they are stationary at level, and therefore, their integration order is zero, I(0). On the other hand, t-statistics for H, PPgr, EDS, EDX, and EXR are smaller in absolute terms than their critical values at 5% significance level. Hence, they are non-stationary at level. However, they are stationary after differencing once, meaning their integration order is one, I(1).

Table 4.3: Results for ADF Test

Variable	t-statistic	5% Critical Value	p-value	Integration Order	Decision
			Level		
GDPgr	-4.231	-1.684	0.0001	I(0)	Stationary
H	-0.840	-3.520	0.9621		Non-stationary
GCFgr	-3.446	-1.684	0.0007	I(0)	Stationary
PPgr	-1.997	-3.524	0.6030		Non-stationary
EDS	-1.584	-1.684	0.0606		Non-stationary
DSX	-1.378	-1.684	0.0880		Non-stationary
EXR	-0.061	-1.684	0.4760		Non-stationary
INF	-3.051	-1.684	0.0020	I(0)	Stationary
			First Difference		
H	-2.905	-1.685	0.0030	I(1)	Stationary
PPgr	-2.019	-1.685	0.0252	I(1)	Stationary
EDS	-3.383	-1.685	0.0008	I(1)	Stationary
DSX	-2.705	-1.685	0.0050	I(1)	Stationary
EXR	-3.384	-1.685	0.0008	I(1)	Stationary

Source: Author computation using STATA 14.2

Zivot-Andrews, and Clemente-Montañés-Reyes tests revealed existence of significant structural breaks. Zivot-Andrews's test results confirm that the ADF test results are valid. GDPgr, GCFgr, and INF are stationary at level. In contrast, H, PPgr, EDS, EDX, and EXR are stationary after differencing once, just like the case with ADF. These results are depicted under in Table 4.4.

Table 4.4: Results for Zivot-Andrews Test

H_0: Unit root with a structural break

Variable	Break Year	t-statistic	5% crit. value	Integration Order	Decision
			Level		
GDPgr	2003	-7.58	-5.08	I(0)	Stationary
H	2001	-3.07	-5.08		Non-stationary
GCFgr	1979	-7.99	-5.08	I(0)	Stationary
PPgr	2006	-3.34	-508		Non-stationary
EDS	1995	-4.59	-5.08		Non-stationary
DSX	1981	-2.16	-5.08		Non-stationary
EXR	1993	-4.33	-5.08		Non- stationary
INF	1995	-5.42	-5.08	I(0)	Stationary
			First Difference		
H	2006	-7.13	-5.08	I(1)	Stationary
PPgr	1994	-8.08	-5.08	I(1)	Stationary
EDS	1994	-10.12	-5.08	I(1)	Stationary
DSX	1994	-6.54	-5.08	I(1)	Stationary
EXR	2002	-6.90	-5.08	I(1)	Stationary

Source: Author computation using Eviews 12

Under two structural break considerations emerged a slight difference. Estimating Clemente-Montañés-Reyes IO and AO models revealed that all variables had at least two structural breaks. All structural breaks of the variables were significant except the structural break for GCFgr of 1977 and 1990 under the AO model and 1977 under the IO model. Unit root test using IO and AO models agreed with ADF results except for PPgr. In both models, it did not become stationary even after the first difference. For this variable, it was concluded that it could be stationary at first difference as proposed by ADF and Zivot-Andrews if more breaks were allowed. Results for INF in the AO model indicated that it is stationary after first difference, contradicting IO model, Zivot-Andrews, and ADF results that reported this variable is stationary at level. Therefore, this study disregarded the AO model results for this variable. EDS and EDX are not stationary even at the first difference in the AO model. Again, the study

disregarded these results and adopted the IO model, Zivot-Andrews, and ADF results. These results are reported in tables 4.5 and 4.6 below.

Table 4.5: Clemente-Montañés-Reyes Test (IO model) Results

Variable	Break Dummy	Break Year	t-stat.	p-value	Rho (ρ) t-stat.	5% crit. Value
			Level			
GDPgr	DU_1	1989	-3.73	0.001	-6.83	-5.49
	DU_2	2001	4.08	0.00		
H	DU_1	2005	4.97	0.00	-3.22	-5.49
	DU_2	2012	4.49	0.00		
GCFgr	DU_1	1977	-0.88	0.39	-8.74	-5.49
	DU_2	1991	2.32	0.03		
PPgr	DU_1	1985	-4.97	0.00	-3.88	-5.49
	DU_2	2012	-2.69	0.01		
EDS	DU_1	1981	3.82	0.001	-7.18	-5.49
	DU_2	1992	-6.94	0.00		
DSX	DU_1	1980	4.15	0.00	-4.95	-5.49
	DU_2	1999	-3.95	0.00		
EXR	DU_1	1991	4.24	0.00	-4.19	-5.49
	DU_2	2007	3.09	0.04		
INF	DU_1	1991	5.73	0.00	-6.93	-5.49
	DU_2	1993	-6.28	0.00		
			First Difference			
H	DU_1	1988	-1.35	0.19	-7.97	-5.49
	DU_2	2004	4.16	0.00		
PPgr	DU_1	1991	-3.26	0.002	-4.25	-5.49
	DU_2	1996	2.87	0.007		
EDS	DU_1	1992	-7.54	0.00	-10.15	-5.49
	DU_2	1998	5.97	0.00		
DSX	DU_1	1992	0.76	0.46	-11.04	-5.49
	DU_2	2000	-0.92	0.36		
EXR	DU_1	1992	0.04	0.97	-9.43	-5.49
	DU_2	2010	0.34	0.73		

Source: Author computation using STATA 14.2

Table 4.6: Clemente-Montañés-Reyes (AO model) Results

Variable	Break Dummy	Break Year	t-stat.	p-value	Rho (ρ) t-stat.	5% crit. value
			Level			
GDPgr	DU_1	1990	-2.44	0.02	-8.47	-5.49
	DU_2	2000	1.92	0.06		
H	DU_1	1979	4.97	0.00	-3.16	-5.49
	DU_2	2009	14.11	0.00		
GCFgr	DU_1	1976	-0.05	0.96	-7.18	-5.49
	DU_2	1990	0.62	0.54		
PPgr	DU_1	1989	-9.85	0.00	-2.62	-5.49
	DU_2	1997	-7.13	0.00		
EDS	DU_1	1984	3.50	0.001	-1.61	-5.49
	DU_2	1991	-3.46	0.001		
DSX	DU_1	1981	8.39	0.00	-4.47	-5.49
	DU_2	2000	-6.91	0.00		
EXR	DU_1	1994	14.94	0.00	-2.94	-5.49
	DU_2	2012	4.25	0.00		
INF	DU_1	1991	2.96	0.006	-3.53	-5.49
	DU_2	1996	-3.78	0.001		
			First Difference			
H	DU_1	1987	-0.71	0.48	-6.13	-5.49
	DU_2	2003	3.14	0.003		
PPgr	DU_1	1983	-4.04	0.00	-2.93	-5.49
	DU_2	1995	1.83	0.07		
EDS	DU_1	1991	-2.38	0.02	-4.02	-5.49
	DU_2	1997	1.51	0.13		
DSX	DU_1	1991	-0.49	0.63	-1.83	-5.49
	DU_2	1999	0.07	0.94		
EXR	DU_1	1991	1.45	0.15	-7.72	-5.49
	DU_2	2005	-0.77	0.45		
INF	DU_1	1989	1.74	0.09	-9.25	-5.49
	DU_2	1993	-2.31	0.03		

Source: Author computation using STATA 14.2

4.4.2 Results for Co-integration Test

Purpose of carrying out co-integration analysis is determining if variables have long-run link. ARDL bound co-integration was applied in this case. Table 4.7 below depicts results obtained after carrying out this test. In this test, the null hypothesis contemplates a situation where there is no level relationship. For the purposes of decision-making, when F-statistic is less than I(0) critical values acceptance of null hypothesis is done, but when it is greater than I(1) we reject. We yield inconclusive outcomes when they lie between I(0) and I(1) critical values.

Table 4.7: Results for ARDL Bound Co-integration

H_0: No cointegration				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	24.31	10%	2.03	3.13
		5%	2.32	3.5
		1%	2.96	4.26

Source: Author computation using Eviews 12

The F-statistic from table 4.7 above is 24.31, greater than I(1) critical values. This is true at all significance levels as can be observed from table 4.7. As a result, it was not possible to accept H_0. The results, therefore, prove presence of co-integration amongst the variables. When variables are co-integrated, the ARDL model is usually reparametrized into ECM (Jordan & Philips, 2018; Kripfganz & Schneider, 2018). Thus, the study proceeded to report the ARDL-ECM results.

4.4.3 Results for Autocorrelation Test

To scrutinize whether successive disturbance terms suffered from autocorrelation, Breusch-Godfrey LM test was applied. Its result is reported below in Table 4.8.

Table 4.8: Results for Breusch-Godfrey LM Test

F-statistic	0.576074	Prob. F (2,22)	0.5704
Obs*R-squared	2.289154	Prob. Chi-Square (2)	0.3184

Source: Author computation using Eviews 12

The results indicate an insignificant p-value of F-statistic and observed R^2 of 0.5704 and 0.3184, respectively. This illustrates the inexistence of autocorrelation in residuals. Therefore, the acceptance of the null hypothesis was done at all significance levels.

4.4.4 Results for Heteroskedasticity Test

Breusch-Pagan-Godfrey test revealed that the model's residuals are homoscedastic. This is because its observed R-squared p-value of 0.3683 is insignificant at all levels of significance. These results are depicted below in Table 4.9.

Table 4.9: Results for Breusch-Pagan-Godfrey Test

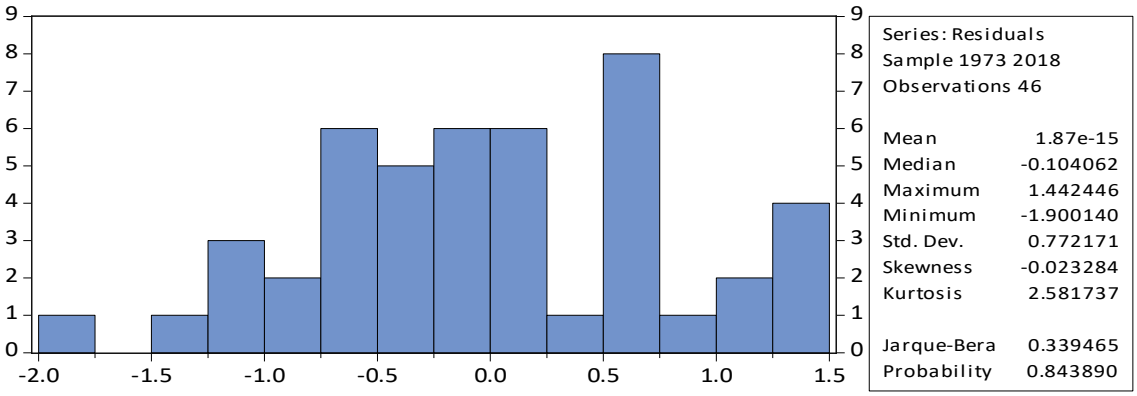
F-statistic	1.099233	Prob. F (21,24)	0.4086
Obs*R-squared	22.55249	Prob. Chi-Square (21)	0.3683

Source: Author computation using Eviews 12

4.4.5 Results for Normality Test

Figure 4.1 below presents summary of normality test results. Jarque-Bera returned a test of 0.3395 with a probability of 0.84389. This statistic is insignificant at all levels of significance. Therefore, the residuals are normally distributed.

Figure 4.1: Results for Normality Test



Source: Author computation using Eviews 12

4.4.6 Results for Linearity Test

RESET test is normally employed in order to assess whether linear regression models are specified well. This test was implemented, and its results are shown below in Table 4.10.

Table 4.10: Results for Model misspecification Test

	Value	Probability
t-statistic	0.041298	0.9674
F-statistic	0.001705	0.9674

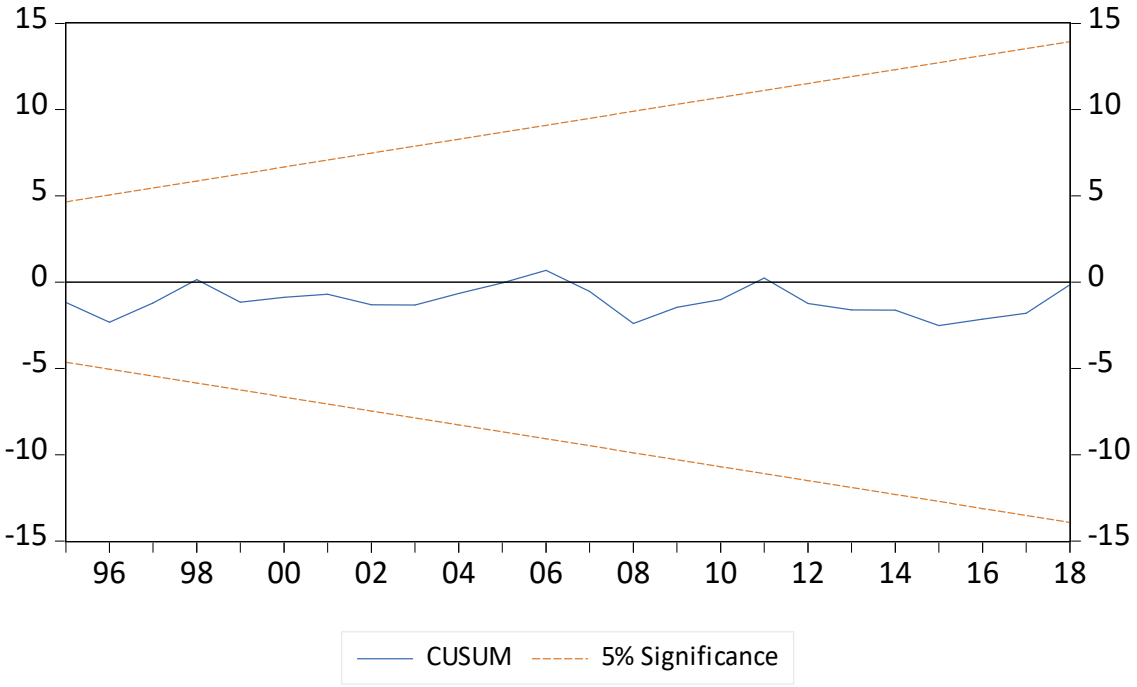
Source: Author computation using Eviews 12

The p-values of F-statistic and t-statistic indicate that they are insignificant at all levels of significance. Therefore, the model is well specified.

4.4.7 Results for Stability Test

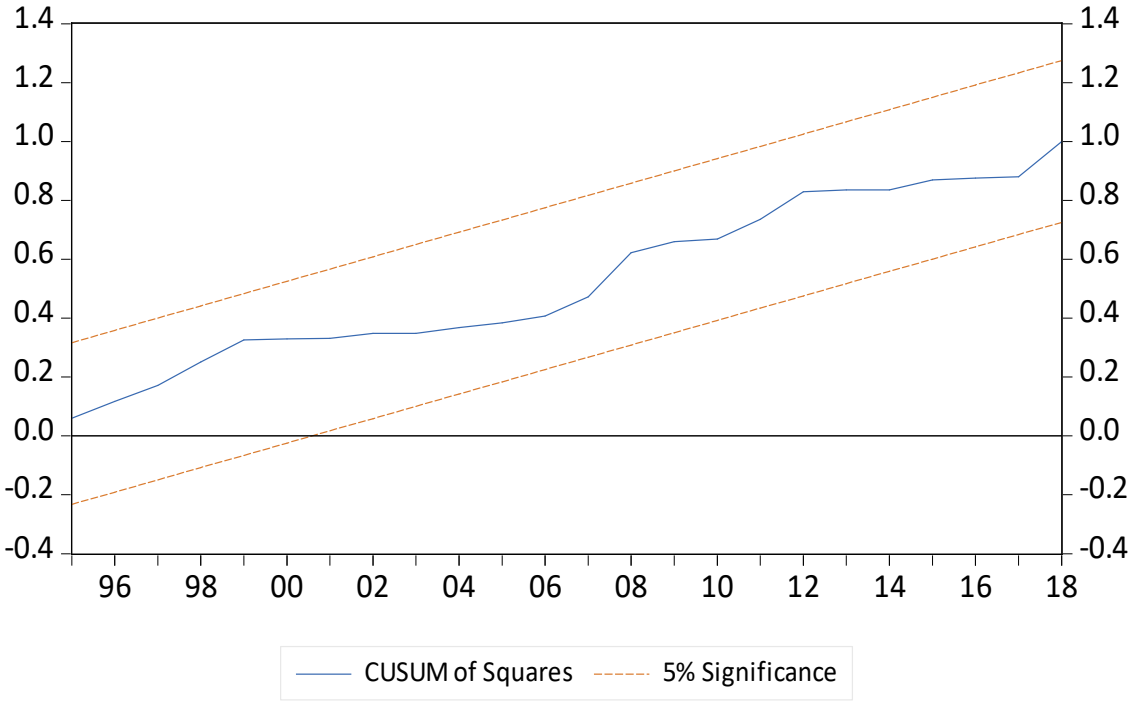
The model's stability is dependent on the stability of its parameters which are susceptible to structural changes. The structural changes cause parameter instability hence the model. In effect, the results of such a model suffering from instability become unreliable and inferences made invalid. Considering this, the study scrutinized stability of parameters through conducting CUSUM and CUSUMSQ tests. In these tests, the CUSUM and CUSUMSQ plots are supposed to be within 5% critical bands to conclude that the model parameters are stable. Figures 4.2 and 4.3 below report the results for CUSUM and CUSUMSQ tests, respectively.

Figure 4.2: Results for CUSUM



Source: Author computation using Eviews 12

Figure 4.3: Results for CUSUMSQ



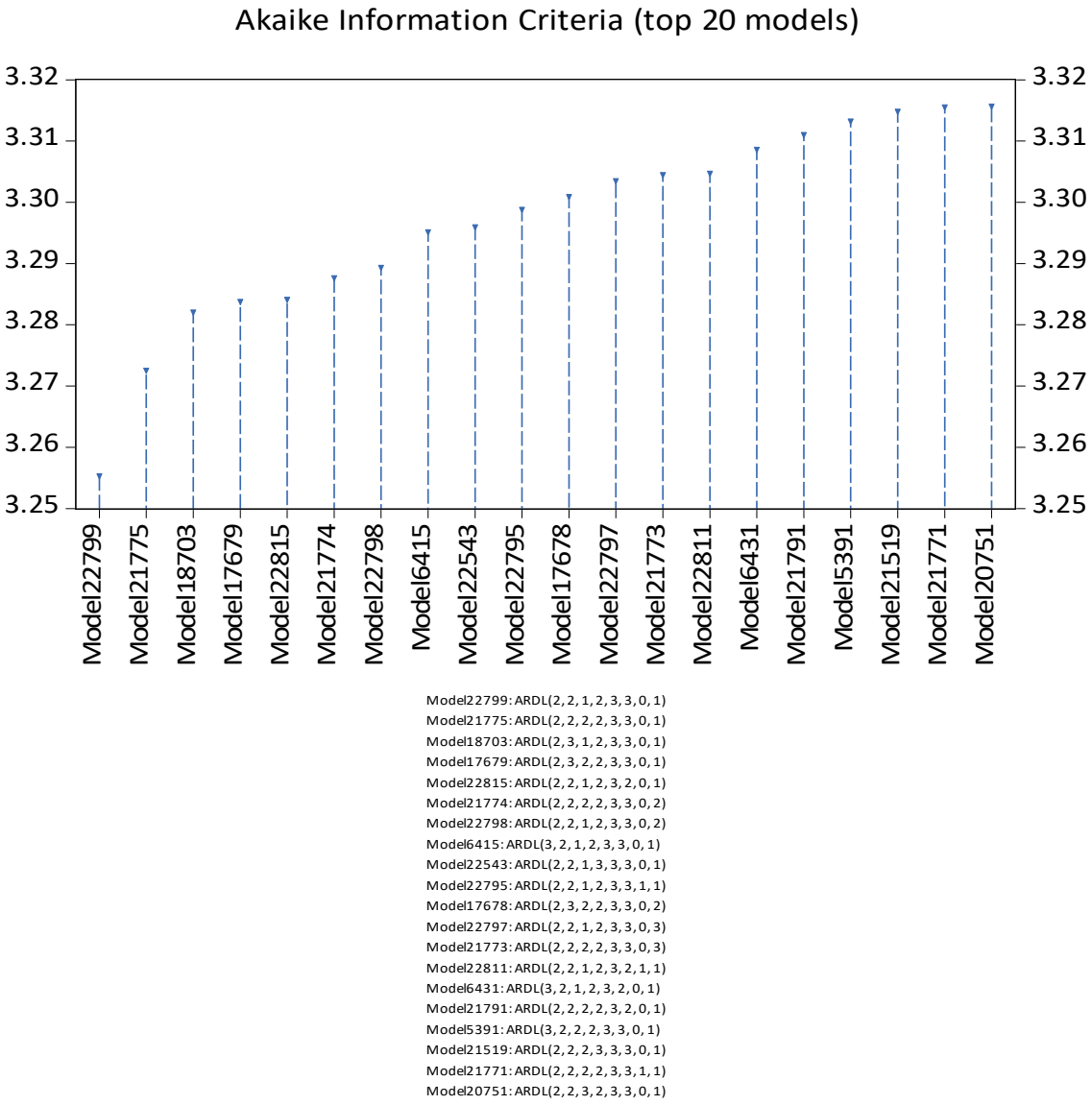
Source: Author computation using Eviews 12

The plots of both tests are within 5% critical band, suggesting stability of parameters. Hence, the model is stable and can be utilized to draw policy inferences.

4.5 ARDL Model Selection Summary and Empirical Estimation Results

After conducting unit root tests, results established none of variables had integration order of two or higher. The best model was chosen using AIC. The variables were arranged in the following order in the command: GDPgr, H, GCFgr, PPgr, EDS, DSE, EXR, and INF. AIC chose ARDL(2,2,1,2,3,3,0,1) model. The summary of the top 20 models based on AIC is shown in Figure 4.4 below.

Figure 4.4: Summary of Model Selection



Source: Author computation using Eviews 12

Presence of co-integration amongst variables was confirmed by use of ARDL Bound test. As a result, ARDL(2,2,1,2,3,3,0,1) model was reparametrized into ARDL(2,2,1,2,3,3,0,1)-ECM. After that, the long-run connection between variables was estimated. Furthermore, other diagnostic tests were implemented, and no econometric flaws in model residuals were found. The results for the ARDL(2,2,1,2,3,3,0,1)-ECM are depicted below in Table 4.11.

Table 4.11: Results for ARDL(2,2,1,2,3,3,0,1)-ECM

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable: GDPgr					
Long-run:	H	0.232536	0.063975	3.634826	0.0013
	GCFgr	0.155541	0.022056	7.052015	0.0000
	PPgr	-5.202642	3.141098	-1.656313	0.1107
	EDS	0.147186	0.031832	4.623849	0.0001
	DSX	-0.456138	0.093344	-4.886633	0.0001
	EXR	-0.100175	0.047566	-2.106025	0.0458
	INF	-0.338751	0.053727	-6.304989	0.0000
Short-Run:					
	C	21.38729	1.360839	15.71625	0.0000
	$\Delta GDPgr_{t-1}$	0.138947	0.055090	2.522171	0.0187
	ΔH_t	0.232962	0.125675	1.853689	0.0761
	ΔH_{t-1}	-0.383818	0.125008	-3.070333	0.0052
	$\Delta GCFgr_t$	0.077580	0.007562	10.25927	0.0000
	$\Delta PPgr_t$	0.201262	2.740710	0.073434	0.9421
	$\Delta PPgr_{t-1}$	10.33465	2.665892	3.876618	0.0007
	ΔEDS_t	0.123749	0.020440	6.054133	0.0000
	ΔEDS_{t-1}	0.077344	0.018036	4.288345	0.0003
	ΔEDS_{t-2}	-0.046791	0.019361	-2.416771	0.0236
	ΔDSX_t	-0.363831	0.045989	-7.911315	0.0000
	ΔDSX_{t-1}	0.237898	0.052027	4.572574	0.0001
	ΔDSX_{t-2}	0.094005	0.044568	2.109253	0.0455
	ΔINF_t	-0.234927	0.021600	-10.87638	0.0000
	ECT_t	-0.949160	0.059892	-15.84786	0.0000
	R^2	0.933557	Mean dependent var		-0.234783
	Adjusted R^2	0.903551	S.D. dependent var		2.995643
	S.E. of regression	0.930334	AIC		2.950973
	SS resid	26.83116	SBIC		3.547270
	Log-likelihood	-52.87239	HQIC		3.174350
	F-statistic	31.11199	Durbin-Watson stat		2.235270
	Prob(F-statistic)	0.000000			

Source: Author computation using Eviews 12

It can be observed in table 4.11 that resulting F-statistic is highly significant and therefore independent variables in this model jointly have statistical power to explain endogenous variable. The value of R^2 and adjusted R^2 are 0.9336 and 0.9036, respectively. It implies that the independent variables in this model account for 93.36% of the variations in GDPgr. Therefore, the goodness of fit of this model is good. Furthermore, value of DW statistic of 2.235 signifies that the model's residuals are not affected by the first-order autocorrelation because it falls within the normal range of 1.5 to 2.5. The coefficient of ECT denoting the speed of equilibrium adjustment is negative (-0.9492) as hypothesized by theoretical literature and

highly statistically significant. This is an indication that model is not explosive, and the long-run adjustment is valid. The disequilibrium that happens in earlier periods will indeed be rectified in subsequent periods, making model converge to equilibrium eventually.

4.5.1 Interpretation and Discussion of Long-run Estimate Results

The EDS is statistically significant at 1% significance level, with long-run coefficient being positive. Furthermore, it reveals that increasing it by 1% produces a corresponding increase in GDPgr of 0.147% in the long run, everything else being equal. Therefore, long-term effects caused by proceeds of external borrowings on Kenyan economic growth is positive. This is because raising Kenyan external debt relative to GDP raises pace of economic growth. This corroborates Robert Solow's contention that increasing capital relative to labor promotes growth because labor is more productive when working with more capital. In addition, as more debt is committed, the capital stock grows. This scenario continues, provided some of the debt is utilized in funding productive investments. Accordingly boosting the growth in long run. The result is similar to those of Chowdhury (2006), who assessed if external debt causes an economic downturn in emerging countries and found debt positively affected economic growth in South Korea, Bangladesh, and Indonesia. However, they contradict Ibrahim (2015) findings that external debt stocks negatively impact economic growth in East African nations and also, Were (2001) and Mukui (2013) findings in Kenya.

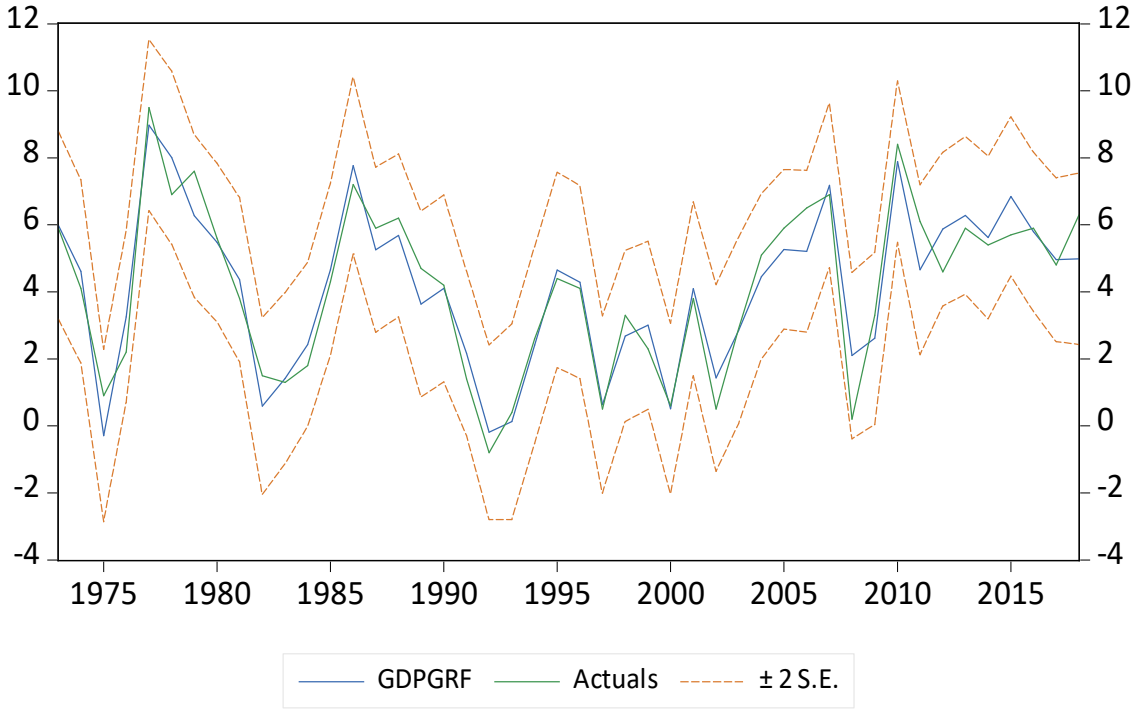
The EDX has a negative coefficient that is statistically significant at 1%. Specifically, it reveals that increasing it by 1% decreases the GDPgr by 0.456% in long run ceteris paribus. Negative coefficient of debt service suggests that as productivity increases, perhaps because of acquiring extra resources from abroad, a considerable amount is diverted to external debt payment, thus lowering economic growth. This is consistent with theoretical arguments that debt service depletes government revenues meant for development. These results are similar to those of Karagol (2002a, 2002b) in Turkey, who established debt servicing's got negative impact on economic advancement. Other studies yielding same outcomes are those of Bauerfreund (1989), Geiger (1990), Savvides (1992), Cunningham (1993), Afxentiou (1993), Afxentiou and Serletis (1996), and Fosu (1996). Also, a similar study carried out in Kenya by Musyoka (2011) and Mukui (2013) found debt servicing having a negative association with economic progress. The findings refute Amoateng and Amoako-Adu (1996), who studied South Sahara countries and realized a positive connection between debt servicing and economic advancement. Also, results disagree with Were (2001), who asserts that repaying externally sourced finances got positive effects on Kenya's economic expansion.

Other variables have their coefficients statistically significant at 1% significance level except PPgr and EXR. PPgr is insignificant, while EXR is significant at 5% significance level. H and GCFgr have long-run coefficients of 0.233 and 0.156, respectively. A 1% increase in H and GCFgr produces a corresponding rise in GDPgr of 0.233% and 0.156%, respectively, in the long run, other things held constant. The positive association between capital formation and GDP growth supports economic growth theories that hold capital a crucial production element. That when the capital formation is boosted, output improves. Furthermore, human capital development is having positive effects on growth. This supports theoretical ideas that development of human capital by training and skills advancement leads to greater productivity, and as a result, economic growth. In contrast, PPgr, EXR, and INF coefficients are -5.203, -0.1, and -0.339, respectively. Eventually, a 1% rise in PPgr, EXR and INF reduces GDPgr by 5.203%, 0.1%, and 0.339%, respectively, ceteris paribus. The population growth rate negatively affects economic growth in Kenya. This agrees with Headey and Hodge (2009). In their study covering developing nations, they found it adversely affects economic growth. These negative effects are perpetuated by diminishing returns from the growing labor force (Headey & Hodge, 2009). However, the negative effects are insignificant. Theoretical literature posits that increasing the exchange rate depreciates the local currency relative to foreign currencies. It then makes goods that are produced within the country cheap and imported ones relatively costly, pushing up demand for domestic goods hence exports. However, negative coefficient of exchange rate, in this case, contradicts these arguments. This can be attached to existence of persistent severe exchange rate volatility in the country, which in effect lowers the value of the Kenyan shilling, stifling investment.

4.5.2 Forecasting

Figure 4.5 below shows the forecasted real GDP growth and actual GDP growth rate plots, while Table 4.12 shows the forecasting evaluation.

Figure 4.5: RGDP Growth Rate Forecasting



Source: Author computation using Eviews 12

Table 4.12: Forecasting Evaluation
Forecast sample: 1973 2018

Theil Inequality Coef.	0.080086
Bias Proportion	0.000000
Variance Proportion	0.026206
Covariance Proportion	0.973794

Source: Author computation using Eviews 12

In Table 4.12 above, the Theil Inequality Coefficient is 0.08, the bias proportion is zero, the variance proportion is 0.026, and the covariance proportion is 0.9738. The closer the values of Theil inequality are to zero, the better the model's predictive power. In this case, it is close to zero, and the systematic errors are zero, as indicated by bias proportion. Also, the variance proportion is small. It is always expected that covariance proportion carries the more significant errors for good predictive models. Since 97.38% of the errors are unsystematic, we conclude that this model performs well in predicting the RGDP growth rate values.

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses summary of empirical findings, conclusions, recommendations, and suggestions for further studies.

5.2 Summary of Empirical Findings

The findings indicate that coefficient of the ECT capturing long-run dynamics between co-integrating series adjusts errors causing disequilibrium at high speed. The short-run dynamics are adjusted to long-term equilibrium at a speed of 94.92% per year. This indicates that almost all errors that cause the growth rate to depart from equilibrium in this model are adjusted in the following year. In particular, the disequilibrium errors are addressed in 1.054 years.

The study's main objective was to empirically examine effects of external debt on economic growth in Kenya. Particularly, it aimed to examine effects of external debt stock and debt service on Kenya's economic growth and draw policy recommendations. The findings reveal that external debt stock to GDP ratio positively affects RGDP growth while external debt service to exports ratio negatively affects it. Significantly, negative effects of external debt service surpass positive effects of debt stock. When external debt service to exports ratio improves by 1%, it reduces RGDP growth by 0.456% compared to 0.147% increase of growth induced by the same proportion of debt stock to GDP ratio.

The positive effect of external debt stock to GDP ratio on RGDP growth implies that as it is increased relative to GDP, the growth improves. In implication, it signifies absence of debt overhang in Kenya. Technically, the debt threshold that would cause the country to suffer from the harmful effects of external debts has not been reached. The positive link between debt and economic growth in Kenya can be viewed in three ways. First, it may be attributed to effective debt utilization and management; second, debt supplied much-needed capital to stimulate the economy; and third, it may have been used on productive ventures. The adverse effects of external debt service warn the country that it is eroding the gains from external borrowing. It signals the presence of some crowding-out effects on private capital ventures. Furthermore, these negative effects are amplified by the exchange rate that has significant adverse effects on economic growth. As the exchange rate rises, it does not increase the exports as expected, demonstrating that the exchange rate in Kenya is so volatile. High volatility of the exchange rate, in effect, makes the value of Kenyan shilling so low that some firms start closing or scaling

down production because raw materials and sub-assemblies from abroad become dear. As a result, productivity shrinks hence national income. Additionally, the Kenyan external debts are foreign currencies denominated. Therefore, volatility of the exchange rate has inflating effects on external debt services. Consequently, external debt servicing's net effects overshadow the net effects of actual borrowed funds because they cannot generate sufficient income to cover interest payments.

Ordinarily, debt repayment capability decreases when external debt stock exceeds a specific limit. Therefore, positive effects of external debt stock on RGDP growth are an indication that Kenya has not reached this threshold level. Excessive debt causes uncertainty that may destabilize the macroeconomic environment in an economy. This discourages domestic agents because they start perceiving external creditors as profiting more than them. Therefore, they engage in ventures with quick returns or forgo some investments. In addition, foreign investment is discouraged because the rising debt level is construed to mean more tax. Therefore, negative effects of the debt service on economic growth in Kenya could be attached to the uncertain environment in economy due to the rise in debt stock. Additionally, while the external debt seems to be utilized in initiatives that enhance productivity, the adverse effect of external debt servicing on economic growth indicates some element of misallocation of these debts. As a result, there is leakage in the circular flow of income in Kenya through paying the external debt's principal and interest. To seal this leakage, there is a need to ensure the external debt is employed in sectors that enhance the productivity of other sectors.

5.3 Conclusions

The study concludes that external debt contributes positively to economic growth. The findings underscore the importance of debt stock in supporting economic growth. However, debt repayment appeared to wipe out the gains. Notably, the benefits of debt stock are outweighed by the cost of the debt payment. This indicates some degree of ineffectiveness in external debt usage. Therefore, it is necessary to stabilize this by ensuring the external debt funds are channeled to worthwhile projects and utilized optimally to guarantee sustained returns in the long run. Since Kenya is a developing country, it needs external debt to bridge the savings gap. However, the acquisition of external debt should be complemented by prudent debt management.

5.4 Policy Recommendations

In Kenya, policymakers should be careful on the issue of external debt accumulation and new acquisition. This is because acquiring and accumulating considerable external debt would compel the country into high debt ratio regimes linked with more subpar economic growth. Based on the findings, the study recommends the following policy issues. First, the government should make sure that debt funds are always channeled to productive ventures and resorting to external debt only when addressing long-run development rather than managing short-run concerns. Second, to generate more revenue, the economy must be diversified. As a result, the need to borrow will be minimized, and debt accumulation will be decreased. Third, steps to boost capital formation should be implemented since higher capital creation enhances investment. Thus, raising the rate of economic growth. Fourth, external loans should be sought when required in critical capital areas and must be stringently monitored. Fifth, the government should develop and execute export-oriented policies to expand the country's export base as well as lowering the country's elevated level of fiscal deficit. Sixth, steps to stabilize the country's exchange rates should be implemented to mitigate its negative effects on the economy.

5.5 Recommendations for Further Studies

This study suggests related research to be conducted utilizing simultaneous equations. Furthermore, because the link between the proceeds of external borrowings and economic growth may be nonlinear, it is recommended that future studies consider this aspect.

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