NEXUS BETWEEN SELECTED MACROECONOMIC VARIABLES AND ECONOMIC GROWTH IN KENYA (1980-2019)

BY

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DECLARATION

Declaration by Candidate

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DEDICATION

I dedicate this wonderful work to Almighty God for giving me energy and resources. This work is dedicated to Moi University Business School for giving me an opportunity on this programme. I dedicate this work to my dear wife and family, my very good friends for the unreserved support, prayers and inspiration, their spiritual, wise inspiration, mentorship and academic foundation of pursuing a PhD.

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ABSTRACT

Economic growth has always been at the centre of human civilization. Challenges of economic growth dominate government policy and research agenda. Kenya Vision 2030 was the development blueprint in the country whose overall objective was to achieve a middle-income nation status in order to be globally competitive, prosperous and accord high quality of life to her citizens. Kenya's Vision 2030 projected that Gross Domestic Product growth should be 10% beginning 2012. However, this has not been achieved. Available evidence indicated contrasting views on nexus between selected macroeconomic variables and economic growth. The general objective of the study was to determine nexus between selected macroeconomic variables and economic growth in Kenya. Specific objectives were to determine effect of external debt, domestic debt, inflation rate and foreign exchange rate on economic growth in Kenya. The study was guided by Keynesian, Solow-Swan and Classical theories. Explanatory research design was used and adopted positivism philosophy, which is based on ontological principle and doctrine. A dataset comprising 40 annual observations from 1980 to 2019 in Kenya was utilized for the analysis. A customized Vector Error Correction (VECM) Model was applied to examine the long-term and short-term impacts of macroeconomic variables on gross domestic product. The results from VECM model indicated that R-square value was 58.62, Chi-square of 26.913 (p > Chi2 = 0.0494) showing that the model was fit for parameter estimation. Coefficient of external debt was 0.0003 with a p-value of 0.001<0.05, which was positive and statistically significant at 5% level of significance. Domestic debt reported a coefficient of -0.266, with a p-value of 0.019<0.05, that was negative and significant at 5% level of significance. The coefficient of inflation was $0.055, \text{p value} = 0.020 < 0.05$ positive and significant at 5% level of significance. Coefficient of exchange rate was -0.828 with a p-value of 0.001, which was negative and significant at 5% level of significance. The study concluded that external debt had a positive and significant effect which in essence could imply that external borrowing was used as intended as laid down in the borrowing schedules. The study showed that domestic debt expansion in Kenya had a negative and significant effect on economic growth rate. This study recommended that Kenyan government should consider minimizing domestic borrowing to avoid crowding out effect. Since increase in inflation rate increased economic growth rate, the policymakers in CBK need to obtain optimal level of inflation. Foreign exchange rate had a negative effect on economic growth in Kenya, implying Kenya government should encourage macroeconomic policies that strengthen stability of Kenya's foreign exchange rate against the major world trading currencies.

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ABBREVIATIONS

CPI	Consumer Price Index
DDT	Domestic Debt
DHMB	District Health Management Board
DHMT	District Health Management Team
EGR	Economic Growth
ERS	Economic Recovery Strategy for Employment and Wealth Creation
EXD	External Debt
EXR	Exchange Rate
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GNP	Gross National Product
HCE	Household Consumption Expenditures Growth
ICT	Information Communication Technology
INF	Inflation
INT	Real Interest Rate
KPSS	Kwiatkowski-Phillips- Schmidt-Shin
MPC	Monetary Policy Committee
NGOs	Non-governmental organizations
SGR	Standard Gauge Railway
SRA	Strategy for Revitalizing Agriculture
VAR	Autoregressive Model
VECM	Vector Error Correction Model

OPERATIONAL DEFINITION OF TERMS

Domestic Debt: Domestic debt is a portion of government debt that is to lenders within the country.

Economic Growth: Economic growth is defined as the annual percentage change in gross domestic product (GDP).

Exchange Rate: It is the price of one country currency in terms of another currency in this study, the Kenya shilling in relation to the US Dollar.

External Debt: A portion of a government debt that is borrowed from foreign lenders, including commercial banks, governments, or international financial institutions.

GDP: The value of money of all goods and services produced within a country excluding the net income from abroad.

Inflation Rate: Inflation is consumer price index reflected by annual percentages change in the cost of the average consumer of acquiring a basket of goods and services.

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter aims to delve into the study's background, problem statement, research objectives, and research hypothesis. It also highlights the significance of the study, the scope of investigation, and provides a summary of the research. The primary focus of this chapter is to examine the correlation between macroeconomic variables and economic growth in Kenya.

1.2 Background of the Study

Economic growth is the prime priority of macroeconomic policy in any country and Gross Domestic Product (GDP) is considered as a key indicator of this economic growth (Fioramonti, 2017). If GDP of a country increases sooner than the population, then it specifies that GDP per capita of that country is growing and the standard of living of people in that particular country is also improving (Chowdhury, Hamid & Akhi, 2019). GDP of a country is influenced by numbers of variables such as inflation, interest rate, exchange rate, domestic debt, foreign debt foreign direct investment, household consumption and so on.

Macroeconomic factors encompass external influences on the economy, which consequently have an indirect impact on economic growth (Nurlaily, Suhadak, Rahardjo & Hsu, 2013). These variables include interest rates, foreign exchange rates, money supply (both broad and narrow), inflation, foreign debt, domestic debt, and unemployment. Economic growth is defined as the increase in a country's total output (Wambui, 2012), representing the rise or fall in the overall value of a nation's goods and services, along with its annual income (Bednarczyk, 2014). Gross Domestic

Product (GDP) has long been utilized as a measure of economic development over time. Inadequate economic variables can constrain and jeopardize a country's economic progress (Nyamu, 2016).

Macroeconomics indicators are fundamental estimations or measurements of current economic growth in the economy. To accomplish the work of economic macro administration, the state, like other specialists, must do study, assess, and appreciate the primary elements influencing current macroeconomic behavior. As a result, the government must understand why and when recessions or inflation occur, as well as forecast these changes and the policy combination that will best alleviate any financial woes. In accordance with Wepukhulu and Otieno (2014), all countries confront economic risks. The study rules out the possibility of severe events, such as interest rates in the United States rising above what is predicted. The fragility of the Eurozone's recovery may spark concerns about the euro's viability; possessions and assess prices failing in China to the point of causing economic distress resulting to a decrease in economic growth or the development of geopolitical tensions, that could result an increment of oil prices and a global decline (Wepukhulu & Otieno, 2019).

It was anticipated that the United States would experience a typical growth rate of 2.7% from 2014 to 2018, closely resembling its historical performance around 3%. Conversely, the Eurozone was projected to have a growth rate below its usual standard. However, the current output is significantly lower than the earlier predictions made before the financial crisis. It has been observed that the monetary policy is highly simulative with near-zero interest rates, yet both the Eurozone and the US have struggled to achieve their past average growth rates. These challenges have

sparked a growing debate about the concept of "secular stagnation," which appears to be the new normal.

The United States was predicted to grow at an average rate of 2.7% during 2014 and 2018, a rate that's near to how the country has done in the past at 3%. The Eurozone, on the other hand, was expected to develop at a pace lower than its historical standard. The present level of production is already significantly lower than the earlier prediction made prior to the financial crisis, despite the fact that monetary policy is highly stimulating and interest rates are near zero, the Eurozone has been unable to produce its past average pace of growth, which is uncommon in the United States. As a result of these obstacles, a discussion concerning "secular stagnation" has erupted: what appears to be the new normal (Wepukhulu & Otieno, 2019).

African economies have shown immense growth and durability. This may be observed in the real output rise from 2017 to 2019. Whereas output growth was 3.6 percent in 2017, it increased to 4.1 percent in 2018 and 2019. Generally, the economic recovery has been stronger than expected, particularly among non-resource-intensive countries (African Economic Outlook, 2018). The recovery in growth in the economy could be a turning point for net product-exporting countries, where a protracted drop in export costs reduced export earnings and increased macroeconomic imbalances. Despite the fact that revenues declined as expenditures climbed in these nations, the current account balance and inflation increased in 2017 as a result of enhanced exchange rate policy (African Economic Outlook, 2018).

In 2016, the general fundamentals of the macroeconomic system remained constant. The target interest rate was kept at 10% in order to keep inflation at 6.3% on a single unit basis. Fiscal strategy was established with a focus on large-scale infrastructure

projects. However, government expenditure was excessive, and resource mobilization was ineffective, resulting in an 8% budget deficit (Muchai, 2016). Furthermore, the public debt-to-GDP ratio increased to 54%. The International Monetary Fund's debt sustainability study helps the country in managing debt concerns. The reduction in the balance of payments deficit, which fell from 1.7% in 2016 to 0.6% in 2017, was reflected in improved capital, current, and financial account balances (Government of Kenya, 2017).

As a result, Kenya's foreign exchange reserves scaled to 7.8 billion dollars, plus a precautionary agreement with the IMF totaling 1.5 billion dollars, which was reflected in the stable currency conversion rate (Ndikumana, 2016). In Kenya, the appraisal of economic progress in 2017 was mixed. The performance could be compared to the presidential crises and prolonged drought that occurred in the same year, causing turmoil in the macroeconomic climate. Inflation surged to around 8.8%; budgetary deficits were severe; yet, the current deficit increased to 5.9% of total GDP (Muchai, 2016). Therefore, there is need to establish how macroeconomic factors (inflation rate, foreign exchange rate, domestic debt and foreign debt) contributed to economic growth in Kenya.

1.2.1 Global Perspective of Macroeconomic Factors and Economic Growth

Supporters of growth and development analysts argue that sustained economic growth at the national, regional, and global levels is essential for combating social issues like poverty. This belief has led multilateral organizations such as the World Bank and the United Nations to increasingly focus on interventions aimed at promoting economic growth. In line with this, the United Nations Global Economic Outlook for 2015 projected a world economy growth rate of 3.1 percent for that year and 3.3 percent for

2016. However, achieving such economic growth is not a simple task, as it relies on both national and regional growth factors and international influences.

The world economy's positive growth hinges on the net effect of regions or nations experiencing positive growth outweighing those with negative growth. The aftermath of the 2008 Global Financial and Economic Crisis led to a contraction and an unprecedented explosive growth rate of 4.3 percent in 2010, followed by 3.0 percent in 2011. As a result, the world economy is still in the process of recovering from the impact of the crisis, evident in the subsequent lower growth rates of 2 percent in 2013 and 2.6 percent in 2014. Eichengreen (2018) evaluated real exchange rate volatility and economic growth using descriptive statistical analysis and regression modeling of panel data on data from 1985 to 2003 and discovered that real exchange volatility appeared to have a considerably negative influence on the increase in employment. In China, a similar study and procedure by Jinzhao (2012) corroborated the same finding. Rosoiu (2014) investigated unemployment hysteresis in the United States utilizing the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests confirmed Okun's Law.

In a research spanning from 1978 to 2010, Chang-Shuai and ZI-Juan (2012) examined the connection between the Chinese unemployment rate, economic growth, and inflation, employing the VAR (Vector Autoregression) and ECM (Error Correction Model) methodologies. The study's findings indicated the existence of a long-term stable equilibrium relationship among the variables of unemployment, inflation, and economic growth. However, in the short run, economic growth was positively associated to the unemployment rate, whereas inflation and the unemployment rate were negatively related to inflation. According to Qin and Wang (2013) on the

inflation rate and unemployment rate, the causal association between the inflation rate and the unemployment rate in China did not exist.

Kryeziu (2016) studied on the impact of macroeconomic factors on economic growth in Kosovo from 2004 to 2014. The study indicated that the observed results aligned with the theoretical discussions presented. Both budget deficit and inflation used as explanatory variables had a negative and significant influence on economic growth. In Malaysia, Kadir, Zaini and Zamburi (2019) studied the impact of macroeconomic variables on economic growth in Malaysia using annual data for the period 1987 to 2017. According to the study's findings, inflation and population have a positive impact on economic growth during the sample period, while unemployment and interest rate exerted negative effects on economic growth.

Thayaparan (2014) employed ADF (Augmented Dickey-Fuller) and Granger causality tests to evaluate the influence of inflation and economic growth on unemployment in the Sri Lankan economy. The findings demonstrated that inflation was negative and statistically significant on unemployment, whereas GDP, albeit positive, had no influence on unemployment. Taylan (2012) used the Vector Autoregressive model (VAR) to investigate macroeconomic variables and unemployment in Turkey. The study discovered that positive innovations to economic growth, export growth, and inflation lower unemployment.

1.2.2 Regional Perspective of Macroeconomic Factors and Economic Growth

The importance of economic growth in Africa cannot be underestimated with most countries experiencing low growth rates. Discussions around this area had taken centre stage in recent years among policy makers while focusing on developing countries. Kargbo (2017) conducted a study in South Africa to investigate the effects

of macroeconomic variables on the country's agriculture. The findings of the study indicated that real exchange rates, interest rates, inflation, and money supply (M3) shocks had substantial impacts on agricultural output, farm input prices, and the prices received by farmers. M3 and interest rate shocks tend to put agriculture in a cost-price squeeze. Agricultural price movements were a source of macroeconomic instability in the country. Real exchange rate shocks, in the long run, led to a favorable shift in relative prices towards agriculture, resulting in increased farm incomes and a faster pace of poverty reduction in the country.

In Nigeria, a study conducted by Solomon, Babatunde, and Olufemi (2018) investigated the relation between economic growth and macroeconomic dynamics. The findings indicated that inflation adversely affects economic growth, while interest rates, exchange rates, and unemployment positively impact it. The chosen independent variables were found to have no influence in the short run. Moreover, the Breusch-Godfrey LM and Breusch-Pagan-Godfrey tests revealed the absence of serial correlation or heteroscedasticity. However, it is crucial to note that achieving macroeconomic equilibrium alone may not guarantee sustained high rates of economic growth without essential organizational and structural reforms.

In Botswana, Mbulawa (2015) conducted a study to explore the impact of macroeconomic variables on the country's economic growth. The study provided support for the endogenous growth theory and the model of technology diffusion. It was observed that causality was unidirectional, moving from economic growth to foreign direct investment (FDI) and from gross fixed capital formation to economic growth. The study emphasized the importance of maintaining low inflation within the targeted range of 3-6% and fostering high levels of FDI to promote economic growth.

To achieve this, the implementation of tax concessions for investors and the removal of protectionist policies were suggested as potential measures to increase FDI. Additionally, the study highlighted the significance of training the labor force to enhance the absorptive capacity of new technology, which would contribute to further economic development in Botswana.

Ghana had been targeting a single digit average inflation rate. The monetary policy committee (MPC) of Bank of Ghana in 2011 reduced its monetary policy rate from 13.5% to 13% as a result of improvement in the economy even though such an improvement was not limited to only this period (Agalega & Antwi, 2013). As anticipated, this decision was expected to lead to a decrease in the interest rates of commercial banks, resulting in cheaper borrowing costs. Agalega and Antwi (2015) conducted a study investigating the impact of macroeconomic variables on the gross domestic product (GDP) using empirical evidence from Ghana. According to their findings, there existed a relatively strong positive correlation between GDP, interest rates, and inflation. However, it was revealed that inflation and interest rates could only account for 44 percent of the variations in GDP.

Additionally, the study highlighted that inflation and GDP had a positive relationship, while interest rates and GDP had a negative one. As part of the recommendations, the study suggested that the government and central bank should implement prudent monetary policies focused on reducing and stabilizing both micro and macroeconomic indicators, such as inflation targeting and interest rates, in order to bolster economic growth.

In examination of macroeconomic behavior and economic growth in Ghana, Agyapong, Adam, and Asiamah (2016) revealed that, over the long run, physical

capital, labor force, real effective exchange rate, and stock market prices positively influenced real GDP growth. However, the consumer price index, interest rate, money supply, and government expenditure had negative effects on real GDP growth in the long run as well. Similarly, in the short run, physical capital, labor force, real effective exchange rate, and stock market prices had positive effects on real GDP growth, while the consumer price index, interest rate, money supply, and government expenditure continued to have negative effects on real GDP growth.

1.2.3 Kenyan Perspective of Macroeconomic Indicators and Economic Growth

Otieno and Wepukhulu (2019) conducted a study in Kenya to examine the influence of macroeconomic determinants on economic growth. The findings indicated a significant negative relationship between unemployment and economic growth in the long run, although statistically insignificant. However, in the short run, the data revealed a positive but insignificant effect of interest rate spread on economic growth. Conversely, during the short run period, unemployment was found to have a considerable and negative effect on economic growth.

Kenya's real GDP growth rate in 2016 was 5.6%, driven by health, services, transportation, infrastructure, manufacturing, and agriculture. Services industry provided 66%, with infrastructure accounting for 56% and storage and transportation accounting for 10%. Industry generated 19% of economic growth, with the construction accounting for 8.2% and the manufacturing sector accounting for 6.2%. Finally, agriculture accounted for 15% of economic growth. However, actual economic growth fell by approximately negative 5 percent in 2017, owing to credit expansion being dampened by commercial bank lending rate caps, a presidential election crisis, and a prolonged drought. The data reveals that the economy remained

resilient increasing at 4.8% from January to June 2017. The African Development Bank expects economic growth to return to 5.6% and 6.2% in 2018 and 2019 respectively (African Development Bank, 2018).

Since 2008, Kenya has experienced an annual economic growth rate of 3.5%, which is lower than the average growth rate observed in Sub-Saharan Africa (5.5%), except for South Africa. Notably, Kenya's economic growth rate is significantly slower than that of its East African neighbors, many of which have been recognized as some of the world's fastest developing nations. For instance, during the period from 2008 to 2011, Rwanda, Uganda, and Tanzania achieved growth rates of 7.9%, 7.2%, and 6.7%, respectively.

Kenya's low economic growth has resulted in low revenue from taxes for the government, resulting in budgetary shortfalls (CBK, 2018). The Kenyan economy's poor growth rate could be linked to the country's volatile macroeconomic climate over time. In Kenya, for example, the mean rate of inflation was 11% from 2008 to 2011. In 2008, the number of unemployed individuals was 10.93%, but it rose by 1.06% in 2011 (KNBS, 2011).

Additionally, the average interest rate from 2008 to 2011 was 14.56%, which was high compared to the average interest rate in 2018 of 13.47%. During this time period (2008-2011), the GDP was observed to expand slowly, whilst the Kenyan shilling fell against the US dollar. The average exchange rate in 2008 was 72.91, rising to 78.27 in 2009 and 103.23 in 2018. According to CBK (2019), the Kenyan shilling has recently fallen more against the US dollar.

1.2.4 Economic Growth and Public Debt in Kenya

The Cabinet Secretary to National Treasury has the legal authority to borrow money from the internal market on behalf of the government by issuing Treasury bills and Treasury bonds under the Internal Loans Act (Cap 420). The government's overdraft at the Central Bank of Kenya appears to be the only portion of internal debt borrowing that appears to be governed by law. It appears that domestic borrowing is not regulated by the law. This is distinct from borrowing abroad, where the External Loans and Credit Act, CAP. 422 of Kenyan laws limits the total amount of debt in relation to the principal amount to Ksh 500 billion or any greater amount that the National Assembly may approve by resolution (Vajs, 2014).

In the first United Nations Progress Decade, it was recognized that there was confirmation of an increasing amount of debt having a detrimental effect on economic development. Even while developing countries easily met the minimal goal of annual GDP growth of 5% by the 1970s, approximately half of official foreign exchange inflows were utilized to pay back debt to state lenders. The drop in formal government revenues throughout the era made it extremely difficult for governments to fulfill their debt, forcing them to reschedule it. Continuous cuts to official aid, rising levels of multilateral aid, particularly in sub-Saharan Africa, and a sharp rise in private sector liquidity as a result of the Eurodollar market expansion are all factors affecting the world's poorer and developing countries (Osewe, 2017).

Due to perceptions of bad governance and abuse of public resources, Kenya saw a continuous fall in development aid during the 1990s. In 1990s, Kenya experienced a debt crunch that made the government heavily indebted. The macroeconomic misconduct in the 1990s, like the Goldenberg scam, that defrauded citizens billions of

money and decreased donor inflows, aggravated the debt situation. To pay for its expenses, the government occasionally rescheduled its debt and used pricey short-term domestic borrowing (Mutuku, 2016).

However, Kenya's levels of private investment have been adversely affected by the stock of public debt's ongoing expansion. By raising the cost of capital, it has decreased investment both now and in the future (borrowing by the private sector). Additionally, when domestic debt is utilized to pay off external debt, it impacts on the present flow of resources in the economy. Public debt has hampered macroeconomic management and skewed the economy, which has negatively impacted Kenyans' social and economic standing. The state debt, which is currently projected to be 53% of GDP, has increased as a result of rising fiscal and balance-of-payments deficits, slowing export expansion, a reliance on primary exports, inflated currency rates, and negative real rate of interest (Sumbi, 2016).

Over the past ten years, Kenya's debt level has increased; as of now, it is 64.2 percent of GDP. On the other hand, despite a weak GDP growth rate, debt servicing has remained consistently high.

1.2.5 Inflation and Economic Growth in Kenya

The World Bank (2007) states that inflation rate is the annual rise in the cost of an economy's consumer goods and services. Therefore, inflation rate determines how consumer prices for commodities in the country have evolved. Utilizing Kenya's consumer price index, the cost of living is estimated as a percentage. The inflation rate serves as a key indicator for assessing price stability in the economy. In a situation where inflation is minimal, the currency rate is likely to increase as the value of the currency strengthens in comparison to other currencies (Kiruri, 2018). On the

contrary, when faced with significant inflation, the currency experiences depreciation, leading to a decrease in its value over time.

According to Ndung'u, (2018), the first ten years following Kenya's independence in 1964 were characterized by economic stability. When inflation was 3% on average and the exchange rate was fixed. With the first oil boom in the 1970s due to price shocks and issues with the balance of payments, inflation started to accelerate. This Devaluations and adjustments to the exchange rate went hand in hand with the increase of inflation. A notable turn of events in the 1990s included a slowdown in economic growth, a sharp increase in inflation, money growth, and interest rates, as well as a sharp decline in the value of the shilling. The time-period foreign aid embargo, rising fiscal deficits fueled by money printing, and the switch to a dual exchange rate regime with a parallel market were the main causes of the inflation's quick rise. The economy's growth rate did not follow a consistent or predictable trend over the 15-year period from 1995 to 2010. The real GDP growth rate was 4.3 percent in 1995 and 4.0 percent in 1996, respectively. The growth rate did, however, drastically decline in 1997, falling to a pitiful 0.2%.

Due in large part to strict monetary policy, the government was able to keep headline inflation within the single digit range during 1995 and 1996. In 1997, however, general election expenses caused inflation to rise to 11.9 percent. Additionally, higher inflation was noted in 2000, 2004, 2009, and 2010, primarily as a result of rising commodity prices. Between 1995 and 2001, there was no apparent slowdown in inflation despite real GDP growth. In other words, inflation and economic growth were not strongly correlated during this period. However, between 2002 and 2004, there was a positive correlation between real GDP growth and inflation. Faster

economic growth during this period was accompanied by a faster increase in the general price level. From 2008 to 2010, there was a negative relationship between inflation and economic growth. A decline in inflation from 15.1% in 2008 to 11.6% in 2009 was accompanied by an increase in economic growth from 1.5% to 2.6 percent. The data indicates conflicting tendencies in Kenya's inflation and economic expansion (Ndung'u, 2018),

1.2.6 Exchange Rate and Economic Growth in Kenya

According to Onyango, (2014), Kenya's economy is open and small, making it vulnerable to both internal and external shocks. As a developing nation, Kenya needs to formulate effective strategies to foster economic growth while simultaneously tackling challenges arising from the implementation of both microeconomic and macroeconomic policies. These plans include exchange rate, monetary, and fiscal policies. Given that it influences international transactions, exchange rate policy is quite significant. According to Stockman (1978), inflation rates and relative price levels have experienced less volatility over time than exchange rates. Kenya has seen several different exchange rate regimes due to exchange rate changes.

As a developing nation, Kenya needs to formulate effective strategies to foster economic growth while simultaneously tackling challenges arising from the implementation of both microeconomic and macroeconomic policies. The Kenyan shilling's exchange rate was fixed to the US dollar until 1974. The nominal exchange rate's movement in relation to the dollar was unpredictable between 1974 and 1981. At the end of 1982, the system of exchange rates was modified to a real crawling peg. This system was in place until 1990, when a dual exchange rate system was implemented. This system remained in place until 1993, at which point the official

exchange rate was abolished due to several devaluations. The shilling was then allowed to fluctuate freely, and the market rate was merged with the former official exchange rate.

The shilling exchange rate was only changed three times during this time, in 1967, 1975, and 1981, in an effort to keep exports competitive. A fixed exchange system was abandoned in favour of a crawling peg system in 1983, which involved discrete devaluations to accommodate for inflation and changes in the external payment environment. The balance of payment crisis of 1971-1972 prompted the implementation of foreign exchange controls, as the government opted for control measures instead of liberalization. This decision aimed to safeguard the currency rate and alleviate pressure on the balance of payments.

The value of the shillings has been established by the market ever since a floating exchange rate was adopted in October 1993. The CBK only intervenes in the foreign exchange market to moderate excessive movements in the exchange rate.

1.3 Statement of the Problem

Economic growth, which is measured by the annual increase in GDP, represents the total value of a country's economic activities. When Kenya gained independence, its economy was on par with current Asian economic powerhouses like South Korea, Hong Kong, Taiwan, and other newly industrializing countries. Notably, Kenya's gross domestic product in 1965 was comparable to South Korea's, standing at 2859.4 US dollars (World Bank, 2015). GDP per capita for the two countries began to diverge in the 1960s and widened significantly in the 1990s, when the economy of Kenya was devastated due to economic instability. Years later, the GDP per capita of East Asian countries is three times that of Kenya, while the Kenyan economy remains

characterized by significant impoverishment, joblessness, and inequities. In 2019, East Asia's GDP per capita was $11,494, while Kenya's GDP per capita was $1,909.30. Considering a burgeoning population that is projected to outrun its economic expansion due to the strain on resources in the nation, the country should double its present rate of economic growth in order to sustain good living standards for the citizens.

Different governmental regimes have adopted initiatives and issued policy papers aimed at stabilizing the economy. Notwithstanding these efforts, the country's real economic growth rate is characterized by cyclical fluctuations, as seen in Table 1.1 below. This necessitated a research to determine why these oscillations persist.

Table 1. 1: Kenya's GDP growth Rate

The table below shows the change of real GDP in Kenya between 2010 and 2019

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GDP growth rate	8.1%	45.1%	4.6%	3.8%	5%	5%	4.2%	3.8%	5.6%	5.1%

Source: Author (2021)

It is clear from the Table 1.1 above that over the 10-year period from 2010 to 2019; the growth rate of the economy did not show a steady or regular pattern. In the year 2010 real reached its highest 8.1% since 1971 before declining in 2011 to 4.51%. The real GDP rose in 2012 but declined in 2013 to 3.8 % attributed to general election in 2012.There was a constant growth of 5%in 2014 and 2015 this was the followed by substantial increase and decrease of real GDP till 2019.

The First Medium Term Plan (MTP) 2008-2012 marks the initial phase of Kenya Vision 2030, a comprehensive strategy aimed at transforming our nation into a

modern, globally competitive, and middle-income country by 2030. Its primary objective is to enhance the quality of life for all citizens. The plan places significant emphasis on equity measures, which are expected to play a vital role in fostering reconciliation and driving overall national economic growth to 10 per cent by 2012 today, however, the GDP growth rate is only 5.60% (Mwenzwa, & Misati, 2014).

Starting from 2008, Kenya has undergone an annual economic expansion of 3.5%, a figure that falls below the typical growth rate seen across Sub-Saharan Africa (5.5%), with the exception of South Africa. It's worth noting that Kenya's economic growth pace is notably less rapid than that of its fellow East African countries, many of which have gained recognition as some of the globe's swiftest advancing nations. For example, within the timeframe spanning 2008 to 2011, Rwanda, Uganda, and Tanzania achieved impressive growth rates of 7.9%, 7.2%, and 6.7%, respectively (Mahrous, 2016) Then the empirical question that arises is what went wrong with Kenya’s GDP?

The purpose of this research is to determine whether the selected macroeconomic variables have contributed to Kenya's poor rate of economic growth. Several scholars have examined the effect of macroeconomic factors such as inflation rates, interest rate percentages, and unemployment rates on economic progress and growth; however, little studies conducted have emphasized the overall effects of inflation rate, foreign exchange rate, foreign debt, and domestic debt and how they contribute to economic growth. A number of studies examined the macroeconomic variables separately in relation to economic growth, and where such studies examined an aggregation of these variables, some did not capture all of the variables of interest in their respective studies. The purpose of this study was to examine the short and long

run effects of external debt, domestic debt, exchange rates, and inflation rate on Kenyan economic growth.

1.4 Objective of the Study

The following objectives were employed;

1.4.1 General Objective

The general objective of the study was to analyze nexus between selected macroeconomic variables and economic growth in Kenya.

1.4.2 Specific Objectives

The study was guided by the following specific objectives:

1. To establish the influence of external debt on economic growth in Kenya
2. To examine the influence of domestic debt on economic growth in Kenya.
3. To determine the influence of inflation rate on economic growth in Kenya.
4. To investigate the influence of foreign exchange rate on economic growth in Kenya.

1.5 Research Hypotheses

The study sought to test the following research hypotheses

H_{01}: External debt does not have significant influence on economic growth in Kenya.

H_{02}: Domestic debt does not have significant influence on economic growth in Kenya.

H_{03}: Inflation rate does not have significant influence on economic growth in Kenya.

H_{04}: Foreign exchange rate does not have significant influence on economic growth in Kenya.

1.6 Significance of the Study

Establishing the connection between macroeconomic variables and economic growth in Kenya is essential in laying the groundwork for effective policy-making, particularly in the formulation of improved macroeconomic policies. These research findings hold particular importance for the treasury, as they provide valuable insights to develop policies that can stimulate economic growth in the country through the manipulation of macroeconomic variables. This, in turn, aids the treasury or ministry of finance in crafting suitable policies that can influence the level of economic activities positively. Findings of the research will be useful to investors as the ratio of the public debt as a percentage of GDP is employed in the determination of on the country's ability to repay its debts, which ultimately affects the costs of borrowing and bond yields. Specifically, the study informs investors on the bond market on factors leading to the floatation of government bonds and how this influenced the level of economic activities in the country.

Other researchers will find this study useful to them, because it serves as a foundation for future research in the same field. The study specifically expands knowledge of the scholars of macroeconomic variables and how these contribute to economic growth of selected sectors in Kenya. In addition, the study is expected to suggest areas for further research which are likely to be picked up by other researchers.

1.7 Scope of the Study

This research aimed to examine the relationship between macroeconomic variables and economic growth in Kenya. Specifically, it focused on assessing how external

debt, domestic debt (government debt), inflation rate, and foreign exchange rate impact economic growth in the country. The study covered a span of 40 years, from 1980 to 2019, during which secondary data were collected for analysis.

Prior to 1990, the primary features of this period were price restrictions and a fixed foreign currency rate regime. The 1990s saw the implementation of Structural Adjustment Programs under severe policy prescriptions from the International Monetary Fund, trade liberalization, and currency rate deregulation. The decade of the 2000s witnessed government deregulation and monetary constraint. During this time, fiscal policy was likewise abysmal. Between 1991 and 2010, there was a persistent balance of payment problem, as well as severe structural macroeconomic restraints GOK (Various).

From 1991/92 onwards, indirect monetary policy instruments were used, including monetary targeting, flexible exchange rates, interest rate liberalization, money market interest rates, and the use of open market operations Ouma *et al.*, (2006). After 2002, the NARC government also implemented huge fiscal stimulus and tough fiscal reforms. Consequently, the study period witnessed variations in policy tools and targeted variables. These variations formed the basis for conducting a structural break test in the economy for two distinct periods: 1990/91 and 1991/92-2010. Additionally, the study also involved assessing univariate structural breaks in the variables under investigation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

The section provides a comprehensive review of both theoretical and empirical literature on the influence of macroeconomic factors on gross domestic product from other studies around the world is reviewed. This review aims to gain an understanding of the existing knowledge, to critique and create a gap for the study. The chapter begins by presenting theories, then empirical literature, a summary of the reviewed literature and research gaps, analytical models used in the studies and finally the conceptual framework.

2.2 Concept of Economic Growth

Economic growth, undoubtedly one of the most crucial and captivating subfields of economics, has witnessed a significant surge in research attention over the last decade (Haller, 2012; Acemoglu, 2012). Gross Domestic Product (GDP) stands as the most widely used indicator to gauge a country's economic growth, and it is measured through the evolution of these key indicators (national revenues, savings, aggregate demand, total supply, rate of inflation, and rates of unemployment). Numerous economic data emphasize all macroeconomic growth explanations (Kira, 2013). There is ample evidence in the macroeconomic literature (Dutt, 2016) that demand side determinants affect a country's economic growth rates in a significant way. Most emerging nations, especially those in Africa, are implementing domestic macroeconomic structural adjustments to better their economies in an effort to address the majority of socioeconomic issues.

The words "economic growth" have been used interchangeably with "development," "modernization," "Westernization," and "industrialization." In other words, a change from a basic, low-income economy to a contemporary, high-income economy is taking place (Haller, 2012). The method and policies used by a country to enhance its citizens' economic, political, and social well-being are included in the context of the definition provided by Aron (2010), economic growth is characterized by an increase in real Gross Domestic Product (GDP) or real Gross National Product (GNP). While the rate of change in GDP is a widely used method to measure economic growth, a rising real GDP or GNP can also serve as indicators of economic growthhe term is also used to describe the rise in per capita income and the achievement of living standards comparable to those found in developed nations (Aron, 2010; Haller, 2012; Mankiw, 2014; D'Alisa, Demaria, & Kallis, 2014). So, in addition to improving the economy, development metrics like life expectancy, levels of poverty, and rates of literacy also tend to rise (World Bank, 2012).

There are numerous definitions of economic growth, even though it is hard to define economic growth in a single way (Haller, 2012). Furthermore, economists characterize growth as the expansion or contraction of the business cycle in the short term within the economy (Mankiw, 2014; D'Alisa, Demaria, & Kallis, 2014), rather than solely focusing on long-term production enhancement. Hence, economic growth can take a positive or negative direction, whether it is measured through changes in Gross Domestic Product (GDP) or other aggregate income per capita measures (Haller, 2012). The research on economic growth demonstrates that one of the widely used indicators of a nation's economic performance has been and continues to be GDP.

In keeping with this idea, Sabillion (2017) Economic growth is characterized as an increase in the quantity of goods and services produced within an economy over a defined time period, often a year (Sabillion, 2017). The majority of the history of humanity, the author noted, has seen extremely slow or non-existent economic growth in most nations. But starting in 1750, there was a significant divergence that led to exponential growth in Great Britain, enabling the people of Western Europe to achieve previously unheard-of levels of wealth. The reasons for this rise and why Great Britain was the first country to industrialize have been hotly discussed by economists (Sabillion, 2017).

The aforementioned examples demonstrated how GDP has traditionally been used to gauge economic growth. Thus, GDP is viewed as a gauge of market activity, but it is also frequently employed as a measure of overall quality of life. However, the gross domestic product (GDP) possesses several limitations that can hinder its effectiveness as a measure of a nation's wealth and progress, especially in assessing the standard of living of its people. Due to the international economic system's strong performance between 2004 and 2007, for instance, the worldwide financial crisis caught many people off guard. Temporary banking industry profits, rising debt levels, and the real estate bubble during this time created an inaccurate picture of the genuine state of the economy. As a result, it is clear that we need to take steps to make GDP a more accurate indicator of both economic performance and social progress (Stiglitz, Sen, & Fitoussi, 2010). Despite these drawbacks, the GDP is difficult to replace because it offers a single total that can be compared across countries. Additionally, you can determine if the global economy is increasing or decreasing with just one figure.

Since GDP is often used to gauge a nation's prosperity, a greater assessment of quality-of-life elements that go beyond production measurement is required. Health, education, living standards, political standing, social contact, and environmental safety are some of these aspects (Stiglitz et al., 2010). The economist writers also emphasize that since income and consumption are more directly related to these metrics than output, shifting the focus away from production will help make GDP a more helpful indicator of economic growth. Additionally, it is worth noting that the index also considers the distribution of income. There is a crucial need to improve the measurement of government services, particularly those that play a vital role in society and significantly impact economic activity, like education. In order to better reflect change, GDP could be improved by extending income metrics to non-market activities and by displaying how people spend their time over time and across national boundaries (Stiglitz et al. 2010).

2.2.1 Concept of External Debt

Ibrahim and Faik (2014) in case of Peru and all Latin America investment in agriculture show that in times of high debt in the region. They have a direct effect on low agriculture output and performance with decreased ability to import necessary equipment like fertilizers. Rigorous monetary policy tends to reduce the supply of credit to the agriculture sector (Oshadare *et al*, 2018). In research on the financial sector and debt crisis, Reinhart and Rogoff (2010) investigate if banking crises can be linked to sovereign debt crises. As they affirm banking crises in many cases either precede it coincide with a sovereign debt crisis. As banking sector faces the crisis it automatically affects currency value negatively making the unfavorable situation in terms of borrowers' solvency who have big amounts of debt in foreign currencies. In the opposite situation when sovereign debt leads to banking crisis authors also finds

solid arguments. After inconvenient situations in the financial field and international capital, control could lead to the government making healthy banks to buy government debt in huge quantities and including the bank in the chain. If the chain faces a collapse in any stage banks' balance sheets can be affected directly and easily.

Saungweme and Mufandaedza (2013) investigated agriculture as one of the most important sectors in Zimbambwe in terms of contribution to GDP and employment productivity. The findings indicate that external debt exerts a significant negative impact on agricultural productivity in the country, both in the short and long term. Reasons for negative relationship arise from countries internal position. An increase in external debt affects budget deficit, which in turns under allocate recourse for other sectors cutting the share of finance part from real sectors like agriculture.

Yeap (2012) implemented another case analysis. He conducted a study focusing on the influence of the external debt burden on the growth of Nigeria's agriculture and manufacturing sectors. After applying the co-integration test, he finds out that the agriculture sector's production has an inverse relationship with debt servicing, suggesting that the higher debt amount leads to higher debt servicing and negatively affecting the agriculture sector. However, talking about the manufacturing sector's output, the author finds a direct relationship with external debt and contributing to Nigeria economy's growth. It was also offered that any increase in external borrowing has to be maintained very carefully to provide the use of additional money in an appropriate way (Okuneye, B. A & Ajayi, F. O, 2021).

Kasidi and Makame (2013) stresses that in Kenya during the oil crisis, the external indebtedness increased significantly (1979-1980) and manifested its effect on agricultural output leading to an increase in food imports through borrowing.

Blavy (2016) analyzing debt and productivity issues in Jamaica found that high debt is linked to macroeconomic uncertainty and an output structure that relays just on major sectors leaving low space for productivity growth. In addition, public investment tends to be crowded out by debt service and negatively affects productivity growth even more. Amateng and Amaoko (2002) points out that economic and financial reform that also take into account lowering external debt level sectors productivity growth. After these reforms, Indonesia economy had nearly 5 percent growth with the leading trading sectors being services, finance and agriculture.

2.3.2 Concept of Domestic Debt

For emerging nations like Kenya, who confront far more obstacles than rich nations in accelerating their economies' growth in order to reduce their debt loads, sustained economic growth is extremely important. External debt makes up the majority of the public debt structure in developing nations. But lately a lot of developing nations have modified their debt structures by implementing policies that replace publicly issued debt from outside with debt that is issued domestically. The economy may be severely impacted by domestic debt. A considerable portion of government revenues is allocated to servicing domestic debt, resulting in reduced funds available for development initiatives. Regarding this matter, the negative impact on economic growth from repaying internal debt may outweigh the significance of the overall internal debt amount. Additionally, the expansion of domestic borrowing, coupled with a substantial portion of debt held in short-term securities, leads to rising interest rates in shallow financial markets (Dadi *et al*, 2023).

Domestic debt can have both positive and negative effects on economic growth. Both classical and Ricardian perspectives can be employed to analyze the implications of domestic debt on economic growth. According to the conventional wisdom, an economic downturn would result from a tax cut funded by borrowing internally. The tax reduction would encourage consumer spending right away. Both short-term and long-term effects of increased consumer expenditure are felt by the economy. Increased consumer spending would, in the short term, increase output as well as employment by increasing demand for products and services. The rise in private savings is insufficient to offset government dissaving since the marginal inclination to consume is higher than the marginal propensity to save. As a result, the country's real interest rate rises, attracting foreign investment. In the long-term, an increased interest rate would deter investments, displacing investment from the private sector. The capital stock is less due to lower domestic savings. Foreign debt would increase as a result of the foreign inflow. Over time, as the price level adapts to the increased overall demand, the economy returns to its natural rate of output. Consequently, the reduced investment leads to a lower steady state capital stock and output level. As a result, when looking at the long term, the overall effect will be lower total output, which would eventually lead to lower consumption and decreased economic welfare. The phenomenon where each generation leaves a reduced overall stock of capital, thereby placing a burden on the next generation, is commonly referred to as the "burden of public debt" (Meltzer, 1951; Modigliani, 1961; Ferguson, 1964).

According to the Ricardian perspective, future taxes are equated with the national debt. The projected total of future taxes equals the current deficit if consumers are reasonable and forward-thinking. Therefore, switching between taxes and deficits doesn't have an impact on overall wealth. Government debt growth has no impact on

consumer spending. Because the rational consumer anticipates future tax increases when faced with current deficits, the economy's overall savings are unaffected. A rise in private savings parallels a decline in government dissaving. The national income is unaffected due to unchanged total savings, investment and interest rates, as well as both. Domestic bond proponents highlight the benefits of deeper and more efficient capital markets, which boost the volume and effectiveness of private investment, on growth, inflation, and savings. They believe that having low levels of non-inflationary domestic debt boosts private savings and financial intermediation, which benefits economic growth (Barro, 1974).

2.2.3 Concept of Inflation Rate

Low rates of inflation and strong, sustainable economic growth are two of the primary goals of macroeconomic policy in many nations. A widely accepted principle in macroeconomics is that low inflation is crucial for economic growth. However, the exact nature of the connection between inflation and economic growth remains a topic of extensive attention and debate (Munir & Mansur, 2009). Different philosophical traditions offer varying evidence supporting this relationship. For instance, structuralists assert that inflation is necessary for economic expansion, while monetarists argue that inflation hinders it (Mallik & Chowdhury, 2001).

Inflation has been demonstrated to have various adverse effects on economic activity and overall growth. Firstly, individuals and businesses attempt to safeguard their wealth from inflation, which results in the wasteful expenditure of time and resources. Consequently, these inefficiencies lead to the misallocation of resources and a general deterioration in macroeconomic performance. A key consequence of inflation is a reduction in savings, which, in turn, leads to diminished investments, thereby

impacting the level of economic growth. The uncertainty surrounding future price levels further discourages investment, resulting in a lower capital stock within the economy. Moreover, inflation reduces the returns on investments, prompting investors to favor short-term capital ventures rather than committing to long-term investments. Additionally, investors tend to gravitate towards assets that can serve as a hedge against inflation, such as property and equity, rather than investing in productive assets like plants and equipment (Jones & Manuelli, 2015).

Additionally, this could result reduction in the economy's production capacity as a result of inflation hedges can lead to slower economic growth. Labor discussions, fueled by inflation, waste resources and raise nominal salaries, resulting in inactivity and, as a result, stifling growth. Because of the volatility of inflation rates, typical contract lengths are reduced, resulting in continual and unnecessary contract renegotiations. This ongoing process depletes critical resources. Furthermore, decreasing domestic and international competitiveness has a detrimental influence on investment and, as a result, economic growth. Elevated inflation adversely affects the competitiveness of a country's products sector in international trade with partner nations, leading to reduced trade and imbalances in the balance of payments, often resulting in a current account deficit (Ambler, 2013). Consequently, reduced investment flows into the country's goods sector, thereby limiting the country's ability to effectively lower its current account deficit. Moreover, reduced competition in the international market leads to a decrease in profitability within the traded goods sector, prompting a reallocation of resources from the traded goods sector to the non-traded goods sector. This reallocation of resources may have an additional impact on economic performance.

Inflation has a significant impact on the economy, and one of its effects is understating the real value of depreciation. This leads to higher profits being declared, resulting in companies paying more taxes on their profits. Consequently, this can put companies at a disadvantage when they intend to make additional investments. According to Modigliani (2018), inflation incurs various costs on the economy, leading to the wasteful expenditure of time and resources, ultimately contributing to a decline in economic growth. Stockman (2015) discusses an economy where individuals divide their wealth between two assets - money and capital stock. In times of higher inflation, consumption tends to decrease while investment increases due to the anticipation of higher returns on investment compared to holding money. Nevertheless, due to the low return on money, the net return diminishes, resulting in lower levels of investment and capital stock. Consequently, economic growth is adversely affected by reduced consumption, decreased investment, and a decline in capital stock.

Inflation models and economic growth since 1960s focused on the asset substituting mechanism, or the idea that greater inflation made holding capital more alluring than holding money. This led to a higher capital intensity, which in turn increased economic development during the transition period (Fisher, 1993). However, economic growth rates started to slow down in the 1970s in nations with high inflationrates. Contrary to the prevailing notion that inflation positively affects economic growth, high inflation and hyperinflation in Latin American countries during the 1980s led to the creation of a perspective that inflation has a detrimental impact on economic growth (Erbaykal & Okuyan, 2008). Fisher (1993) noted that periods of high inflation have a tendency to impede economic growth. This is because inflation affects resource allocation negatively by causing a shift in relative pricing.

On the contrary hand, periods with low inflation levels allow for greater pricing and wage flexibility, which fosters economic expansion (Lucas, 1973). It makes sense to consider the ideal amount of inflation for an economy if high inflation is detrimental while low inflation is advantageous.

Therefore, economic policy with the objective of increasing growth and monetary policy with the objective of price stabilization should be organized and efficiently enforced. For governments, sustaining sustained economic development and market stability concurrently may be difficult to achieve. Some economic principles, amid Keynesian theory, emphasize that low inflation is a catalyst for economic development (Mubarik, 2005). However, rising price levels will eventually evolve into high price levels and macroeconomic instability due to realistic expectations and inflationary spirals, which are detrimental to economic development (Ocran, 2007; Khan and Senhadji, 2001).

2.2.4 Concept of Exchange Rate

Exchange Rate (ER) is the price of one currency in relation to another. It conveys the exchange rate of the country's currency with regard to foreign currencies (Azid et al., 2015). Compared to nominal, Real Exchange Rate (RER) is often acknowledged as an important macroeconomic policy variable in the sense that it indicates a country’s international competitiveness. The RER is the Nominal Exchange Rate (NER) adjusted for price changes (inflation) in the domestic relative to those of trading partners. The NER management depends on the RER, and the RER is influenced, among others, by NER (Montiel, 2017; Thapa, 2012). This is due to the close correlation between real and nominal exchange rates where NER often drives the RER. In addition, usually changes in RER tend to be highly persistent or permanent.

A stable long-term economic growth requires stable trade and foreign exchange markets to ensure a stable ER system and favourable terms of trade in addition to appropriate basic physical capital stock. However, often (real) ER misalignment affects economic growth. In developing countries, ER misalignment has often taken the form of overvaluation which adversely affects the tradable goods by lowering producers' real prices. The RER misalignment, for instance, occurs in markets in which actual ERs are not allowed to adjust to changes in economic fundamentals (Thapa, 2012), consequently reducing the incentives and profits, leading to decline in investment and export volumes.

2.3 Theoretical Review

The sub section provides an explanation of the underlying theories a structured body of reasoning about a particular subject or phenomena is referred to as a theory.

2.3.1 Classical Theory

Economic shifts influenced economic ideas more than ever between the end of the 18th and the beginning of the 19th century. The rate of economic expansion skyrocketed, and some thinkers of the period later became the first economists. They created the classical economic growth theory, which describes how economies and markets function (Reid, 1989). The David Ricardo, Adam Smith, and Robert Malthus economic theories from the eighteenth and nineteenth centuries are combined to form the classical theory of economic growth (Park, 2006). But although Adam Smith's theory of self-interest and Jean-Baptiste Say's (1767–1832) law of the equality of market demand and supply served as the economic foundation for classical economics, John Locke's (1632–1704) vision of the natural order provided the philosophy. The 'Father of Economics' Adam Smith (1723–1790) established a

significant portion of the market theory that is now accepted as mainstream theory. According to Adam Smith (1723–1790), market forces secured the manufacturing of the proper goods and services.

Producing them would result in this since producers would seek to profit from doing so. Public welfare would improve the rivalry of organized production to suit the public if there was no government interference, creating a laissez-faire atmosphere. According to fiscal and monetary policies that use public borrowing, inflation control, and optimal exchange rates, this served as the foundation for the free market economy without government intervention (Reid, 1989; Blanchard & Johnson, 2014). These Smithian ideas are still covered in almost all economics courses because they are so essential. According to the classical economic growth theory, increases in real GDP rates are only ephemeral, and if real GDP per person exceeds the subsistence level, a population explosion lowers it down to that level (Park, 2006). In other words, according to the theory of classical economic growth, population growth will lead real GDP per person to temporarily increase. As a result, the population boom will result in a drop in real GDP per capita.

Contrary to the classical theory's presumption, historical evidence shows that population growth rate and income per person are not closely correlated, and that population expansion does not cause incomes to drop back to subsistence levels. Every economy has a steady state GDP, according to the hypothesis. Furthermore, any departure from that steady state, according to classical economics, is just transient and will soon lead to equilibrium. This is predicated on the idea that population will rise in response to an increase in GDP. A growing population places a greater demand on the available resources, which has a negative impact on GDP. GDP will eventually

return to its steady state level. The population will decline when GDP drifts below the steady state, which will result in less demand for resources. The GDP will thereafter increase until it reaches its stable state. The belief that production involves labor, manufactured means of production, and natural resources is another distinguishing aspect of the classical approach (Blanchard & Johnson, 2014; Todaro & Smith, 2009).

Consequently, technological advancement and population increase are used by classical economics to explain the process of economic expansion. According to their theory, technical advancement (which depends on capital accumulation) rises initially then ultimately collapses when a decline in profit rates prevents additional capital accumulation (Park, 2006). The production function, technological advancement, investment, the factors that determine profit, the size of the labor force, and the wage system are therefore the fundamental elements of the classical theory of development and stagnation, according to Adam Smith (1723–1790).

In accordance with the Classical Model, increasing economic growth rates can be accomplished by increasing labor, capital, and other production components. The economy can only reach a steady equilibrium income with continuing increases in saving and investment while simultaneously reducing population growth because all of these components have diminishing marginal returns (Park, 2006; Todaro & Smith, 2009). A policy which encourages increased investment and savings while also slowing population growth, however, is challenging to put into practice, in particular countries that are developing.

Smith, Ricardo and Malthus all postulated the identical production function, which can be written as:

$Y = f(K, L, N, S)$…… 2.1

As a result, output is influenced by the amount of capital, labor force, land, and technology. It seems appropriate to use land in the generalized classical growth model as the supply of known and economically useful resources because, according to Smith (1723–1790), it is not the quantity of arable land and its fertility that determines the country's output but rather the total supply of known and usable natural resources.

The majority of other classical economists hold that the production function is linear and homogeneous, which indicates that it has constant returns to scale, meaning that the output would double upon doubling the quantities of all factors of production (Sowell, 2016). On the other hand, Adam Smith (1723–1790) supported rising returns to scale as a result of better labor division. The issue that needs to be addressed would be how the output would react to an increasing supply of labor with a fixed supply of land if the term "land" is limited to cultivable land only, the supply of which is fixed (Sowell, 2006). Additionally, the majority of classical economists held that the rise in land availability would not result in a consistent change in output. They discussed four distinct output responses depending on the stage of production, namely increasing marginal returns (where an increase in the variable input leads to in a raise in the variable input's marginal product), decreasing returns (when additional units of an input result in a smaller increase in output), diminishing average returns (where the average output increases by less from additional units of an input used), and diminishing overall returns (where the total output increases by more than the average from additional units of an input used).

According to them (Classical Economists), technological advancement is a capital absorbing force and as such, capital accumulation is a requirement for a consistent

advance in technology. They emphasized investments and savings as the main drivers of capital accumulation. This can be expressed as an equation:

$S = S(I)$……..…. 2.2

In the traditional model, "investment" refers to net investment, which is the net increase in the capital stock. The belief that investment activity is based on the profit expectations of the entrepreneurs, which are significantly impacted by the rate of profit, is a result of the classical economists' belief that profit is the only factor that drives all productive activity. The following is expressed in equation form, where R represents the profit and net investment, by definition, equals the growth in the capital stock:

$I = dK = I(R)$ …… 2.3

Before the Great Depression, the Classical model was widely used. It claims that the economy is relatively open and that prices and wages can change at will in response to changes in demand over time. To put it another way, when circumstances are good, prices and wages rise swiftly, and when things are bad, they freely decline (Blanchard & Johnson, 2014).

Despite being aware of the importance of entrepreneurs in the production process, classical economists never gave them a prominent position inside their framework. In addition, capital has grown into a significant component in agriculture and is now gradually replacing land, which is counter to what the classical economists had envisioned. A decline in the rate of earnings is avoided as a result. Growth brought on by rising returns has even kept profit rates from declining in the industrial sector. As a result, the amount of investment has not decreased. The scholars of classical

economics were correct to note that investment and savings were crucial for technical advancement, but this connection was not as strict as it appeared in their model (Walter, 1984).

This model's main premise is that there is always full employment in the economy, which implies that everybody who desires a job is able to find one and that all resources are being utilized to their maximum potential. According to this line of reasoning, if competition is permitted to exist, the economy will inevitably move toward full employment, or what economists refer to as potential output. According to traditional economists, when a recession happens, the economy will take care of itself since they contend it is self-correcting. As a result, the conventional economic framework can be thought of as an equation that describes why employment remains full, or at least tends to. However, it does not fully describe all of the economic realities and specifics that can impact the labor market, the employment-wage relationship, and unemployment (Blanchard & Johnson, 2014).

Keynesian economics, in contrast to Classical economics, exhibits some skepticism regarding the capacity of free markets to automatically restore lost economic equilibrium. The business cycles is best compared to an elevator that can move up, down, or remain stationary, as opposed to how classical economic models had preferred to depict it—as something like to a see-saw that would always right itself (Blanchard & Johnson, 2014).

Therefore, the theory explains economic growth that can be attained through market mechanism without government intervention in form of policies that is foreign exchange vividly.

2.3.2 Solow-Swan Neoclassical Theory

Solow-Swan Neoclassical Growth Theory is advancement by neoclassical economists after Heckscher-Ohlin theory and normally this framework is adopted in the analysis of economic growth. Most modern dynamic macroeconomic models are based on the system defined in Solow's (1956) and Swan's (1956) papers, two seminal papers introducing the Solow-Swan model, or simply the Solow model for the more popular of the two economists. Solow-Swan Neoclassical Growth the , which serves as the foundation for what is now known as the neoclassical theory of growth, attempts to provide a theoretical basis for comprehending global production growth and the persistence of regional disparities in per capita output. Solow expanded the Harrod-Domar model by incorporating labor as a factor of output, requiring decreasing returns to labor and capital separately, and constant returns to scale for both factors combined, and, eventually, by introducing a time varying technology variable distinct from labor (Awokuse *et al*, 2009).

Under these assumptions, in the long run, production per capita tends to converge to its steady state regardless of initial conditions. The only potential sources of growth are sustained exogenous increases in primary variables, such as population growth, and exogenously given technological advancements. Additionally, the long-run growth rate remains unaffected by changes in savings or investment rates. An increase in the saving rate only has a level effect, leading to a higher steady-state value of capital per worker, rather than influencing the growth rate. Consequently, growth is considered exogenous, meaning that the actions of economic agents do not impact the economy's steady-state growth rate. Regarding simple hypotheses, assuming a constant labor growth rate in the Solow model is not a realistic approximation of reality. The primary concern is that the population grows exponentially over time,

leading to an unrealistic scenario of population tending to infinity, which is clearly impractical (Jhingan, 2011).

As far for the assumption of a constant labor growth rate, in the Solow model is not a reasonable approximation to truth. The key issue is that population rises exponentially and thus tends to infinity as time passes, which is obviously impractical. Solow and Swan created an alternative model, known as the logistic growth model, by adding an additional quadratic term with a negative coefficient in the exponential model. The effect of changes in the population growth rate is a natural question asked in the Solow model. Following the works of Accinelli and Brida (2007), who investigated the Ramsey model with logistic population growth, neoclassical economic growth model is introduced by modeling population growth with the logistic population growth function. The model is shown to be represented by a two-dimensional dynamical system with a unique non-trivial steady state equilibrium, the solution of which is shown to be globally asymptotically stable and writable in closed-form using Hypergeometric functions.

According to Jhingan, (2011) if we consider a closed economy L_t which produces a single commodity which is ether consumed or invested, and is produced by labor, L_t and capital K_t as in the Cobb-Douglas production function.

$Y_t = K_t^{\alpha}(A_t, L_t)^{1-\alpha}$ ……...…….…... 2.5

Y_t, is the flow of output while A_t is the level of technology in the economy. The physical tends to accumulate over time through investment in the economy. Then Gross domestic investment I_t is defined by two components; net investment which is the variation in the capital stock, K and the loss by depreciation D_t that is $I_t = K_t +$

D_t. The rate of depreciation of physical capital is assumed to be constant such that $D_t = K_t + D_t$. Given that the economy is closed, the aggregate savings S_t and investment are equal to each other every period that is $S_t = I_t$. Additionally, let us suppose that the savings to evolve over time as a constant fraction s of output $S_t = sY_t$, thus

$K_t = sY_t - \delta K_t$…………………………………………………….….. 2.6

Assuming that the economy is that there is full employed, such that jobs and labor supply coincide, total population as an input in the production function and technology is given in terms of per effective capita variables.

$\frac{Y_t}{A_t L_t} = \left(\frac{K_t}{A_t L_t}\right)^{\alpha} \Rightarrow y_t = k_t^{\alpha}$……..…………………………………………… 2.7

Where:

$\frac{Y_t}{A_t L_t}$ and K_t $=k_t / A_t L_t$ denotes income per unit of effective labor and the stock of capital. Taking the derivative of equation 2.2, then,

$K_t = \frac{d(K_t / A_t L_t)}{dt} = \frac{K_t}{A_t L_t} - \left(\frac{A_t}{A_t} + \frac{L_t}{L_t}\right) K_t$…………………...………………… 2.8

Combining equation 2.4, 2.6 and 2.7 gives equation 2.8 as;

$k_t = sk_t^{\alpha} - \left(\delta + \frac{A_t}{A_t} + \frac{L_t}{L_t}\right) k_t$…………………………………….……...….. 2.9

Technological progress A_t grows at a constant rate $g > 0$, contrary to the Solow-Swan model and population growth rate is not constant, but given by the logistic law of population growth;

$\frac{L_t}{L_t} = a - bL_t, a > b > 0$……..…. 2.10

From equation 2.8 and 2.9, if the logistic population growth law is included, the economy of this is modified Solow model and the system is described by two nonlinear differential equations

$$\begin{cases} \dot{k}_t = \quad sk_t^{\alpha} - (\delta + g + a - bL_t)k_t \\ \dot{L}_t = (a - bL_t)L_t \end{cases} \quad \text{…….……..... 2.11}$$

According to Nomor and Iorember (2017), changing the enhanced Solow model in equation 2.5 to meet with North's assertion that a country's long-run economic success is determined by its institutions, i.e. the policies like inflation adjustment that they enact; the modified equation becomes;

$Y_t = K, A, L, DDT, EXD, INF, EXR$ ...……..... 2.12

Where; Y_t = Economic growth, K=capital, A=Technology, L=labor, DDT= Domestic debt, INF= Inflation and EXR = Exchange rate

2.3.3 Debt –Overhang Theory

Economic development, specifically external borrowing, is rife with the perceived negative relationship between foreign debt and investment, which leads to lower capital accumulation (Beck, 2012). As stated by Krugman (1988), the debt overhang model proposes that if the projected debt is going to exceed the nation's ability for repayments, expected debt-service costs are likely to reduce future inward and outward investment because the expected return on productive investment projects, which make up a significant portion of economic support, is very low. As a result, local and international investment will eventually decline, which would slow

economic growth (Wamboye, 2012).This claim is shown by the debt Laffer curve in Figure 2 below, which shows how higher debt stocks typically have lower payback possibilities.

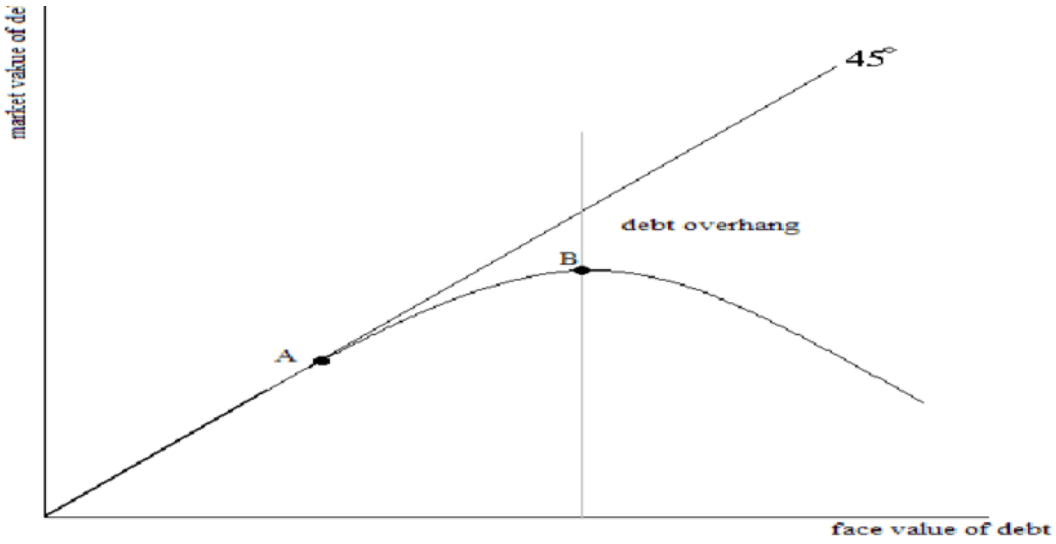


Figure 2. 1: Debt Laffer curve
Source: Author (2021)

Figure 2.1 showed that the relationship between market value and face value of public debt is 1-to-1 up to a certain point (point A), because when debt was low, creditors expect to be paid in full. Agénor and Aizenman (2005) demonstrated that when the point A is reached due to an increase in the nominal value of debt, the default risk rises, meaning that the likelihood of repaying the loan is less than one. As nominal value exceeds point A, market value starts to grow more slowly. This is demonstrated by the fact that the more a country's debt, the more difficult it is to fund because the possibility of default rises. As a result, accumulating debt reduces the market value, and marginal profitability of debt starts to decline right up to point A. If the debt level exceeds a certain threshold (point B), increasing the nominal value will not compensate for the fall in market value, and the country will suffer from debt overhang.

The debt overhang theory was first demonstrated by Cohen (1989) who showed that there is a link between a country's ability to service debt and the current level of public debt. Krugman further showed that when a country accumulates too much debt, that is when payment obligations exceed its ability to pay, payment obligations act as a marginal tax rate. If the state succeeds to obtain better results than those expected, benefits will return to creditors and not to the state. In these circumstances, the government may be discouraged from improving economic growth because the benefits go to creditors rather than to the country. The Laffer curve was used to maximize tax revenue in order to minimize or reduce the fiscal deficit. Given the rapid rise in public debt in recent decades, economists have looked into the debt Laffer curve as a method that lenders can use to determine the solvency of a debtor country (Tatu, 2014) (Mendoza & Gonzalez, 2022).

According to Onyango (2014) effective use of external borrowing would promote both structural and industrial expansion in the economy. Similarly, according to Krugman (1988), if there is a chance that future debt will be higher than current national debt, the projected cost of debt servicing will discourage further foreign and domestic investment because the expected return on successful investment projects will be insufficient to support the economy.

This will ultimately deter additional domestic and international investment (Kiprotich, 2015). Chowdhury (2001) has further supported this theory with an emphasis on describing and explaining the consequences of external debt on the growth of various economic sectors such as; the real estate industry, this study finds importance in the debt overhung hypothesis. The hypothesis is crucial to this study's efforts to find links

between a nation's capacity to pay off its debts and the effects that does so has on economic expansion.

This theory largely explains the effect of external debt in the growth of a country as the country is unable to service its external debts at the expense economic growth.

2.3.4 Financing Gap Theory

The notion of a funding gap has infested developed countries, greatly promoting so-called international borrowings. The financing gap is the difference between the funds available from domestic sources and the total investment requirement; one way to close this gap is to borrow from abroad. The Theory of Financing gap was widely used in 1960s following the work of Rostow (1960); The Stages of Economic Growth which opined that for any country to develop it must pass through several stages. Rostow further argued that there is an inverse relationship between investment and economic growth and development and the necessary condition is that investment must increase 5% to 10% of income, meaning that if a developing nation lacks adequate domestic capital for investment, it must make up the difference through international assistance or external debt (Rostow, 1960).

The theory explains domestic borrowing without affecting the level investment by the private sector that may cause crowding out effect.

2.3.5 Keynesian Theory

According to the Keynesian theory of economics hypothesis, which was put forth by John Maynard Keynes (1883–1946), government spending and taxation are employed to boost the economy. In order to control the level of demand, according to his view, the government should actively participate in economic activity. Fiscal policy or

demand-side economics through public borrowing and lower taxation during an economic downturn are other names for this approach. The core tenet of Keynesian economics, it is contended, lies in the conviction that economic growth may be achieved more effectively by pursuing policies that promote growth in the face of existing barriers than by just attempting to remove these barriers in the hope that development will then take place. These rules are frequently referred to as demand-side management regulations (King, 2002).

According to the Keynesian viewpoint, economic stimulation comes from government expenditure combined with decreased taxes. The unemployment rate is decreased as a result of this stimulus. Increasing output reduces inflation. The larger number of goods and the competitive prices prevent prices from rising at an inflationary rate. The Keynesian hypothesis holds that government spending to stimulate the economy prevents a deficit by increasing the amount of taxes collected from a given number of workers. Keynes (1936) noted that full employment does not always exist in the economy. Therefore, the economy may perform above or below its potential. The Great Depression resulted in widespread unemployment, a large number of failed firms, and a significantly underperforming economy. As a result, economy fluctuates between being robust and weak. The Keynesian model recognizes this precisely (Keynes, 1936).

Everybody may be fully employed when the economy begins in a balanced condition, but a surge in demand for goods and services causes the economy to briefly rise over this level. This is known as expansion. A logical Keynesian approach to growth can also be found, and it is based on three fundamental ideas: the economy may not tend toward full employment; investment decisions are independent of saving decisions;

and the autonomous components of demand may influence the rate of economic growth (Cornwall & Cornwall 2002: 205). Effective demand, which gives the demand side a vital role in promoting economic growth is consequently crucial in impacting the economic system's growth trajectory and thereby pushing it toward full employment (Dutt & Skott 2005).

The absence of continuous market clearing is the fundamental aspect of Keynesian macroeconomics. As a result, by definition, a Keynesian model is a non-market clearing model—one in which prices fail to shift quickly enough to clear markets within a certain amount of time. The prediction that, in response to a decline in nominal demand, the aggregate price level will decline less than proportionately over an extended period of time, during which the actual price level is above the equilibrium price level consistent with the maintenance of the initial equilibrium level of real output, is a feature shared by almost all Keynesian models (Keynes, 1936).

One of the most fundamental ideas in the macroeconomics is that fluctuations in output can be caused by supply or demand shocks, or, more specifically, by productivity, labor supply, or structural changes on the one hand, or fiscal and monetary policies on the other. Keynesianism places a strong emphasis on how fiscal policy may help to stabilize the global economy. More specifically, Keynesian theory contends that increased government expenditure during a recession helps hasten the recovery of the economy. According to Keynesians, waiting for markets to clear as recommended by traditional economic theory is a mistake (Keynes, 1936).

The emphasis on aggregate demand is at the heart of demand side economics. The sum of consumer spending, business investment in capital goods, government spending, and net exports is known as aggregate demand. Governments can lessen the

effects of other low aggregate demand components by increasing spending. In order to increase demand for products and services, the government can step in. Demand determining the level of national output is one of Keynes' key tenets (Keynes, 1936). According to Keynesians, consumer demand for goods and services is the primary factor influencing total economic activity and resulting in short-term variations. According to demand side economics, the greatest way to increase economic activity is to provide the poor and middle classes more purchasing power, which will increase demand for products and services (Bade & Parkin, 2013).

It takes a combination of consumption, investment, government expenditure, and net export to build the Keynesian framework of economic growth. The model, like any model, is built using a lot of simplified assumptions. The four aggregate expenditures consumption expenditures, investment expenditures, government purchases, and net export shows how the determinants operate in the model.

$Y = C + I + G + (X - M)$ ……..…….. 2.4

Where C = is the consumers expenditures on commodities

I = Investment spending

G = Government expenditures on goods and services

X = Exports of commodities

M = Imports of goods and services

Now think about a few particular factors that affect each of the four major expenditure categories:

Consumption: Given their size and diversity, consumption by households are influenced by a wide range of factors. These are a few of them:

Physical wealth is the material, tangible possessions of the household sector, especially durable goods like cars, furniture, and kitchen appliances. An increase in physical wealth generally reduces consumption expenditures. If consumers have recently purchased a lot of durable goods, then they have less need to buy more, with a subsequent decrease in consumption and aggregate demand. Financial prosperity comprises money stocks, bonds, mutual funds, bank accounts, and other assets that grant customers a claim on products, resources, or productive assets. Consumption and aggregate demand rise when consumers become more financially stable because they have a tendency to spend more freely (Mohr & Fourie, 2008; Blanchard & Johnson, 2014).

Another important factor affecting consumption is interest rates. High rates of interest diminish consumption and total demand, while lower interest rates have the opposite effect because they increase the cost of borrowing and because many durable items are bought with borrowed money.

Another key factor is expectations about the state of the economy. Households seek for the best deals when they can. Consumers are more likely to purchase more now if they anticipate rising prices (rising inflation), which increases consumption spending and aggregate demand (Mohr & Fourie, 2008; Blanchard & Johnson, 2014).

Investment: Of the four expenditure categories, investments have a reputation for being the most unpredictable due to a wide range of external factors. The first three factors are similar to factors that affect consumption (Mohr & Fourie, 2008; Blanchard & Johnson, 2014). Interest rates operate similarly for consumption and investment. Investments in capital expenditures are typically financed using borrowed money. When the rates of interest change, both the cost of borrowing and the

investment's total cost alter. Less investment and a decline in overall demand are the results of higher interest rates (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Capital goods are a part of the physical riches that the business sector possesses. Similar to how it applies to consumption expenses, this determinant also applies to investment expenses. The material wealth in this situation is capital, the thing being invested in. If a company sector has lately invested heavily in a large amount of capital goods, it is less likely to make capital goods investments. A rise in capital will inevitably result in a fall in investment and overall demand (at some point) (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Future economic expectations play a significant role in determining how much money is spent on investments. Businesses are more likely to increase investment now, despite the existing circumstances, if they anticipate increased sales and profits as a result of an economy that is strengthening. It goes without saying that this increases overall demand (Mohr & Fourie 2008; Blanchard & Johnson 2014). The costs of capital are yet another important factor influencing investment. Invoking the basic law of demand, the business sectors reduces the amount of capital it demands when capital costs rise. As a result, investment spending and overall demand decline (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Lastly is technology, the requirement for capital investments are increased by technological advancements. To deploy a new technology, one needs new capital as well as different capital. Investment and overall demand always rise as a result of technological advancements (Mohr & Fourie 2008; Blanchard & Johnson 2014).

The public sector operates under its own set of regulations. They actually set the rules. But the public sector must adhere to one inevitable principle: when expenditure increases (or reduces) on government purchases, aggregate demand also increases (or falls). Government purchases rise along with overall demand if elected officials choose to spend large sums of money on the military, education, space program, roadways, or any other useful endeavor (Mohr & Fourie, 2008). In addition, the following factors could persuade the government to alter its spending patterns:

At the level of the federal government, there always exists a chance that fiscal policy will be utilized to try to balance out instability brought on by other spending. The public sector is frequently tempted to increase spending when overall demand declines as a result of lower spending from the household or corporate sectors. In contrast, the government is likely to spend less if total demand rises to the point that inflation is triggered (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Government spending nearly always has political factors coming up to the surface. Maybe the political winds are shifting in favor of lowering the federal deficit. Such a force might reduce overall demand and government spending. Or perhaps a fairly vociferous and well-funded interest group persuades government decision-makers to increase funding for worthwhile initiatives like the space program, national security, or environmental quality. Government spending and overall demand will inevitably rise as a result (Mohr & Fourie, 2008; Blanchard & Johnson, 2014).

State and local taxes: Tax collections are a major factor at the state and municipal levels, which make up nearly two-thirds of all government purchases. State and local government spending goes up when tax revenues go up, which typically happens when the economy is doing well. Additionally, tax receipts decline along with

purchases by state and municipal governments in a bad economy (Mohr & Fourie, 2008; Blanchard & Johnson, 2014).

Numerous factors can affect the net-export spending contribution to aggregate demand because of the inherent diversity of the international market (which comprises well over a hundred unique national governments, approximately six billion people, and hundreds of thousands of diverse foreign firms). Here are a few examples, however (Mohr & Fourie, 2008; Blanchard & Johnson, 2014).

One factor is the condition of other countries' economy. When the economies of other countries are strong, their citizens have a tendency to purchase more items, especially those made in other nations. This improves aggregate demand and increases exports from the home economy to them (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Net exports are also affected by currency exchange rates. The cost of one country's currency in relation to another is known as an exchange rate. The relative costs of exports and imports are impacted by variations in this rate. Exports, imports, net exports, and aggregate demand all shift as those relative prices do (Mohr & Fourie 2008; Blanchard & Johnson 2014).

Another important factor is the variety of trade obstacles, taxes, restrictions, and subsidies that countries typically utilize to acquire an advantage in the game of international commerce. At least temporarily, tighter import restrictions tend to boost net exports and subsequently aggregate demand. Over time, other countries often respond by enacting their own export limits, which might lower overall demand (Blanchard & Johnson, 2014).

Most Keynesians believe that when the possibility of persistent excess capacity is included in the model, the Keynesian growth model can provide such a consistent framework (Mohr & Fourie, 2008; Blanchard & Johnson, 2014). Specifically, much of development theory can be divided into the emphasis placed on three fundamental sources of economic growth. First, there are ideas that emphasize how a lack of saving limits growth and provide ways to increase saving. Theories that emphasize a inadequate investment and, hence, the existence of excess capacity. Third, there are ideas (Mohr & Fourie, 2008; Blanchard & Johnson, 2014) that emphasize insufficient labor absorption and the necessity to create or utilize labor by deploying capital-saving technologies.

Keynesian economists use public policies that seek to attain full employment and price stability to advocate government intervention.The government employs fiscal and monetary policies to achieve desired level of economic activities. Thus, during recession the government employs expansionary fiscal policy it can either borrow internally or externally. Keynesians do hold that the money supply and real GDP are indirectly related. They contend that an expansionary monetary policy lowers interest rates by increasing the amount of loanable funds available through the banking system. Interest rates, exchange rates and price normally move in the same direction. According to Keynes when money supply is increased in less developed countries, inflation will not increase since the resources are under- utilized. Through investment the output (economic growth increases) and the level of unemployment reduces. This clearly shows that the theory links the explained and all the explanatory variables that the study undertook.

2.4 Empirical Review

This section reviews the empirical literature related to analyze the relationship between macroeconomic variables and economic growth in Kenya. Specifically, the study examines external debt, domestic debt, inflation rate and foreign exchange rate and they relate with economic growth.

2.4.1 External Debts and Economic Growth

Several studies have examined the influence of external debts on gross domestic product of selected sectors both developed and developing countries. Putonoi and Mutuku, (2013) on effects of public debt on economic growth in Kenya from 2000-2013 found that accumulation of external debts leads to the problem of debt overhang. This, in turn, deters investment in different sectors of the economy and whose ultimate result is low performance. In a similar study, Akram (2011) stated that high level of external debts dampens the capacities and performance of most developing countries. However, this study noted that debt overhang, which characterizes large accumulation of foreign debts, affects reforms in the economy; stable monetary policies, exports promotion and leads to a decline in some trade barriers which make the economy friendlier, and thus, trade performance. Furthermore, debts reduce the ability of the government to invest in the production and promotion of exports, infrastructural development, and establishment of the skilled workforce. To fund the development and expansion of the economy, Ali & Mustafa (2012), national budgets depend on external debt, making public debt an area of concern among policymakers, especially in developing countries.

According to Gyimah, (2002), the most critical consideration that a country or corporation must weigh when pursuing any international loan is the denomination of

the currency to be lent based on its growth, the following three main factors, a country might choose to boost its currency from the foreign market. First, for hedging purposes, this protects an entity from volatility in foreign currency exchange rates (Khattak, 2008). Second, Euromarket financing can be cheaper compared to local market borrowing since an individual can obtain amnesty from most states' capital controls and other taxes. Thirdly, this ensures, for speculative purposes, that the country has ample reserves in the form of foreign currency to enable it to take any opportunity for foreign investment that may occur (Gordon, 2007).

Evidence from developing countries, Sub-Saharan Africa (SSA) indicate that one of the causes of low economic performance and difficulties experienced by these countries is large debt service payments due to huge external debt stock (Babu, Kiprop Kalio, and Gisore, 2015). The study from 1990 to 2010 concluded that SSA countries are vulnerable to huge foreign loans, not just for saving gap, but also for foreign exchange gap due to a reduction in exports. Similar findings were reported by Mbah, Agu and Umunna, (2016) who argued that external debt size relative to the size of the economy is huge in most developing countries and apart from triggering capital flight, it also dampens private investment.

A study by Reinhart and Rogoff (2010) found no relationship between external debt stock and the performance of education and agricultural sectors in both developing and developed countries. This study held that public debt of 90 percent of the GDP has no strong effect, but when the debt surpasses this mark, sectoral performance and hence, GDP is reduced by 1 percent. Conflicting findings were reported by Panizza and Presbitero (2012) who discovered that there was a negative relationship between economic performance and debt burden. This study applied an instrumental variable

(IV) model on the Organization for Economic Corporation and Development (OECD). The reason for IV was that changes in the exchange rate in the presence of foreign currency causes a direct and mechanical effect on the ratio between debt and GDP (debt-GDP ratio).

Kumar and Woo (2010) conducted a study to examine the impact of external debts on the growth of the economy in both developing and developed countries 1990 t0 2007. Ordinary Least Square (OLS), fixed effect and dynamic panel regressions were used. The findings indicated that debt growth affects economic growth negatively. The study established that a 10 percent additional debt reduces the growth of the economy by 0.2 percent per annum. Further, authors revealed that a negative and statistically significant link was established when the debt is more than 90 percent of GDP and that the effect was common among countries with low productivity, low investment, and low stock of capital. Moreover, the debt effect seemed to be more pronounced in developing countries than in advanced economies.

Uma, Eboh and Obidike (2013) argued that servicing of huge external debts leads to decline in the economic growth rate by reducing the performance of vital sectors of the economy such as agriculture, education and most importantly, infrastructure. This study employed a time-series analysis. The study further argued that external borrowing entices the economy to increase its dependence on foreign aid which is unhealthy for development. A study on the effect of external debt on the performance of various sectors of the economy finds that external debt service deprives the economy of the needed resources for investment into agriculture, infrastructure and education which ultimately leads to negative performance (Muritala & Abayomi, 2011).

Edet Nkpubre (2012) studied the relationship between external debt servicing payments and economic growth in the Philippine for the period 1981 to 2005. Results showed that economic growth was not very much affected by external debt servicing. This was probably because external debt servicing in the Philippines was not yet a threat in economic growth and thus, the Philippines should not fear of experiencing debt overhang in the near future.

A study by Rais and Anwar (2012) concluded that external debts are vital for emerging economies. By employing the ordinary least square method (OLS), this study found that foreign borrowing denies a country of resources necessary for investment into vital sectors of the economy and hence poor performance. The study reported that most foreign loans are too expensive for most developing countries and therefore, dampens sectoral economic performance in the long run. However, this study demonstrated that external loans could only benefit the economy in the short-run, with negative consequences in the long-run because of the burden of debt servicing. In addition, utilization of external debt could explain the nature of the relationship between external loans and economic growth.

Moki (2012) had found out that indebtedness impacts the GDP of developing countries positively through the conversion of foreign loans into capital and other essential inputs. On the contrary, this study noted that if there is misallocation or diversion of foreign loans to consumption, the development of the economy is affected negatively through insufficient investment. On the other hand, Ogunmuyiwa (2011) concluded that external debt condition 1970-2007 for many LDCs, the majority of which are in Africa, have become extremely different. This means that even the use of traditional mechanisms of rescheduling and debt resection, coupled

with continued provision of concessional financing and conformist sound economic policies may not be sufficient to reach sustainable external debt levels without the support from foreign partners.

An empirical analysis of Kenya's foreign public debt servicing and economic growth was conducted by Shittu, & Nawaz, (2018) using time series data collected annually spanning the years 1970 through 2003. The study used a single growth equation model that was estimated using the Ordinary least Square (OLS) approach. The study's conclusions showed that Kenya has a significant amount of official external debt, the majority of which comes from multilateral sources. Over time, there has been an increase in the buildup of external debt, and indications of the burden of debt began to rise significantly in the early 1990s. The study employed Co-integration and Error Correction Model technique to establish equilibrium in both the short-run and long-run. In the short-run model, the empirical results showed significant signs as expected for the coefficients of external debt to GDP, savings to GDP, and debt service to GDP. However, the coefficients of interest to GDP and labor force growth were found to be statistically insignificant.

Kamau (2001) carried out research to examine the impact of external debt service on economic growth in Kenya. Utilizing the OLS model and analyzing time series data spanning from 1970 to 2000, the study revealed a negative relationship between Kenya's economic growth and its external debts. Likewise, Polly (2009) employed the VAR model to investigate Kenya's economic dynamics from 1970 to 2007. The study indicated that external debt servicing had a negative association with both economic growth and investment in Kenya. Still in Kenya, Otieno (2015) in his study, "Financing options for Development 1980 2010 " states that developing countries

including those in sub-Saharan Africa prefer external borrowing to domestic borrowing due to low-interest rates than the market interest rates, longer maturities, source of foreign exchange to shield local currencies and avoiding crowding out effect.

Emerging countries' debt rates have remained largely constant at about 35% of national income, representing a favorable and balanced economy. Balassone et al., (2011), in developed and emerging countries, debt crises are highly observed. This is manifested by high ratios of debt to GDP. Nautet and Meensel (2012) have suggested that developing countries were not able to contain higher levels of debt owing to poor institutions and regulations, poorly diversified markets and unfavorable trade conditions. In comparison, the overall borrowing levels in East Europe and Asia are comparatively smaller compared to the average in developed countries (UN, 2009), but Despite this, it is essential to note that public debt remains a significant concern in developing countries (Muhanji, 2010).

The global financial crisis of 2008 and the subsequent economic recession had a significant impact on debt levels. For instance, in the United Kingdom, the debt ratio increased by 40 percent of GDP in 2007 and further escalated by 84 percent of GDP in 2011. In the United States, the debt ratio surged from 60 percent to approximately 100 percent of GDP, while in Japan, it rose by 50 percent of GDP during the same period (Nautet & Meensel, 2012). Developing nations also experienced a rise in the debt ratio, which was attributed to the loss of income caused by the global recession.

2.4.2 Domestic Debt and Economic Growth

Putunoi, & Mutuku (2013) investigated the relationship between domestic debt and economic growth in India using co-integration and Granger causality tests. The study

covered data from 1959 to 2010, and the findings provided support for the Ricardian equivalence hypothesis concerning domestic debt and economic growth. According to the Ricardian equivalence, the method of financing government spending, whether through debt or tax increases, has an equivalent effect on the overall level of demand in the economy. Christensen (2015) performed a cross-country survey to assess the importance of domestic debt markets in sub-Saharan Africa. The study utilized a newly compiled dataset covering 27 countries in the region over a 20-year period from 1980 to 2010. The study revealed that the domestic markets in these countries tended to be relatively small, characterized by short-term nature and limited investor participation. Furthermore, the research highlighted that domestic interest rate payments posed a considerable burden on the budget, leading to significant crowding-out effects.

In a separate investigation, Abbas (2020) and Abbas and Christensen (2010) conducted an examination of the ideal domestic debt levels in low-income countries, covering 40 sub-Saharan African countries and emerging markets from 1975 to 2004. The results indicated that maintaining moderate levels of marketable domestic debt as a percentage of GDP had substantial positive effects on economic growth rate. Nonetheless, the study underscored that surpassing the threshold of 35% of total bank deposits in debt levels had a negative effect on economic growth.

Singh (1999) conducted a study examining the impact of various methods, including domestic debt, on economic growth in India from 1959 to 2013. The research utilized co-integration techniques and Granger causality tests to investigate the relationship. Two theoretical viewpoints were considered concerning domestic debt and economic growth: the traditional view proposing long-term negative effects of domestic debt on

growth, and the Ricardian Equivalence hypothesis suggesting the neutrality of domestic debt towards growth.

Maana and Mutai (2008) conducted an analysis of the economic impact of domestic debt on Kenya's economy. The study specifically focused on how domestic debt affected private sector lending, utilizing the ordinary least square technique with annual data from 1996 to 2013. Contrary to the notion of crowding out private sector lending, the research findings indicated that domestic debt had no significant negative impact on lending by the private sector in Kenya. This outcome was attributed to the substantial level of financial development in the country.

The study explored the impact of domestic debt on real output, employing a modified Barro growth regression model. The findings indicated that although there was a positive effect, it was statistically insignificant, suggesting that an increase in domestic debt had a limited influence on economic growth during the period under examination.

In light of these findings, the study suggested that the government should implement broader reforms aimed at promoting investment in Treasury Bonds and encouraging institutional investors. By doing so, Kenya's economy could potentially benefit and mitigate any negative implications related to internal debt.

Munyingi, (2013) conducted a study to investigate the influence of domestic debt on economic growth in Kenya. The research utilized the Ordinary Least Squares Method (OLS) to analyze yearly time series data spanning from 1981 to 2012. To evaluate the characteristics of the macroeconomic time series data regarding normality and unit root, the Jacque Bera (JB) and Augmented Dickey Fuller (ADF) tests were employed,

respectively. Cointegration analysis was performed using the Engel-Granger residual, and it indicated evidence of cointegration at a 10% significance level. The study's findings indicated that the growth of domestic debt in Kenya during the analyzed period had a positive impact on economic growth, albeit statistically insignificant. In light of these results, the study recommended that the Kenyan government should focus on promoting sustainable domestic borrowing practices by exploring alternative avenues for financing the budget deficit instead of relying solely on increased domestic borrowing.

Meme and Muturi (2016) investigated the correlation between government domestic debt and stock performance in Kenya. The primary objective of the study was to discern the relationship between domestic government debt and stock market performance. The study had specific objectives to determine the impact of treasury bonds, treasury bills, commercial bank advances to the government, and central overdraft on stock market performance in Kenya. The research findings revealed that treasury bonds and treasury bills had a negative but statistically insignificant influence on stock market performance. Conversely, the central bank overdraft to the government and commercial bank advance to the government had a positive and significant impact on stock market performance. The overall model was found to be significant at 5% significance level.

2.4.3 Inflation Rate and Economic Growth

Based on neoclassical growth theory, Mundell (2013) and Tobin (2015) showed how inflation affects economic growth. They contend that if inflation causes the nominal interest rate to rise, investing is better than consuming. In turn, this will result in a rise in accumulation of capital, which will fuel economic expansion. The well-known

Mundell-Tobin Effect is this. Sidrauski (2011) developed a theoretical framework to investigate the relationship between inflation and economic expansion. In his model, money is considered highly neutral, meaning it has no real influence on the steady state. However, his subsequent theoretical analysis illustrates that, in most situations, inflation leads to a decrease in the steady-state capital stock.

On the other hand, Stockman (2011) formulated a long-term equilibrium growth framework by assuming a cash-in-advance constraint. The theory runs counter to the Mundell-Tobin Effect's result. Investment and real money balances are complementary in Stockman's (2011) model, however they are substitutes in Mundell's (2013) and Tobin's (2015) models. This hypothesis states that people will receive a financial return on their investment in the future. Inflation will therefore cause a decline in investment and real money balances. In turn, inflation will have a detrimental impact on economic expansion.

Nevertheless, during the 1990s, the majority of empirical studies also revealed a negative correlation between inflation and economic growth. De Gregario (2012) conducted a specific examination of 12 Latin American nations, analyzing data from 1950 to 1985. Utilizing Generalized Least Squares (GLS), he found a detrimental relationship between inflation and growth. Similarly, Fisher (2013) examined data panels from 93 countries to investigate how macroeconomic factors, including inflation, influence growth. His findings indicated that inflation and economic growth are inversely related, with inflation impeding economic growth by hindering investment and output expansion. In addition, he discovered that excessive inflation is inconsistent with long-term economic progress by analyzing clear outlier nations.

Barro (2015) conducted a study using panel data encompassing more than 100 countries from 1960 to 1990 to investigate the impact of inflation on economic growth. He discovered from the empirical study that the estimated effect of inflation on economic growth is notably detrimental. He only got statistically significant results, though, when he incorporated substantial inflation data in the sample. Based on his calculations, Barro (2015) found that a 10-percentage increase in average annual inflation leads to a decline in the per capita GDP growth rate by 0.2 to 0.3%. Sarrel (2016) investigated the possibility of a nonlinear relationship between inflation and economic growth using data panels from 87 countries spanning from 1970 to 1990. His research unveiled a significant structural division in the relationship between growth and inflation. His findings indicate that the estimated structural rupture happens when the inflation rate is around 8%. He discovered that, below this level, inflation does not appear to have a substantial effect on economic expansion. Sarrel (2016) also discovered that inflation rate above 8% slows down economic growth.

During the period 1960–1989, Paul, Kearney, and Chowdhury (2007) investigated the relationship between inflation and growth across 70 different nations. The study revealed that in 40% of these nations, there was no causal link between economic growth and inflation.As a result, they identified a unidirectional association, which is either inflation to growth or vice versa, in the remaining nations, and observed bidirectional causality in 20% of the countries.

For 26 nations that suffered an inflation crisis between 1961 and 2012, Bruno and Easterly (2018) Conducting an empirical study, the researchers examined the relationship between inflation and economic growth. The findings indicated that an

inflationary crisis typically occurs when inflation rises to approximately 40% or more. However, they also observed that predicting the impact of low and moderate inflation on economic growth is challenging. For both developing and developed nations, Khan and Senhadji (2011) investigated whether threshold effects existed in the link between inflation and economic growth.

Using a panel data set encompassing 140 nations from 1960 to 1998, the researchers found evidence suggesting the existence of an inflation threshold that adversely affects economic growth. Among industrialized nations, the acceptable inflation rate was projected to be 1 to 3 percent, while for underdeveloped nations, it was 11 to 12 percent.

Mallik and Chowdhury (2011) conducted a study on four South Asian nations, investigating the short-run and long-run patterns of inflation and economic growth using an error correction model. They discovered a favorable and statistically significant long-term relationship between inflation and growth for all four nations. Additionally, they emphasized that economic growth is more responsive to changes in inflation rates than inflation is to changes in economic growth rates.

Similarly, Ahmed and Mortaza (2015) explored the relationship between inflation and economic growth in Bangladesh from 1980 to 2005 using the same methodology as Mallik and Chowdhury (2011). They also examined whether there was an inflation threshold in the country and used the method developed by Khan and Senhadji (2011) to determine the inflation threshold level. The empirical investigation revealed a long-run, statistically significant inverse relationship between inflation and economic growth, with the predicted inflation level at 6 percent.

In Turkey, Erbaykal and Okuyan (2018) studied the relationship between inflation and economic growth. They employed the Bonds test approach proposed by Pesaran et al. (2011) to analyze the long-term association between the variables. While they found a statistically significant short-run correlation between inflation and economic growth, there was no statistically significant long-run correlation.

Mallik and Chowdhury (2001) observed a significant correlation between inflation and economic growth for four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka). However, the current challenge is not merely establishing the existence of a relationship between the two phenomena, but rather that inflation can exert both positive and negative effects on economic development (Mamo, 2012). Barro (1995) emphasized that high inflation leads to a reduction in spending, which negatively impacts the economy. The significance of predicting inflation for economic growth is highlighted by Mamo (2012). Observational studies investigating the correlation between inflation and economic growth have suggested bidirectional causality, unidirectional causality, or no causality between the two factors. Umaru I Zubariu (2011) stated that inflation is caused by GDP. Datta (2011), in a study on growth and inflation in Malaysia 1975to 2005, found that there is causality between inflation and economic growth in the short term, indicating that inflation affects economic growth, but in the long term, inflation affects inflation.

The existence of a definitive relationship between inflation and economic development remains uncertain. Drukker et al. (2005) categorize four key literature forecasts about the impact of inflation on output and growth for 138 industrialized and non- industrialized countries from 1950 to 2000. This study supports a seminal work conducted by Khan and Senhadji (2001), who not only investigate the relationship

between high and low inflation and economic growth but also propose that all developed and developing countries have a threshold amount of inflation.

In the face of increased inflation, various scenarios emerge, each with its own set of consequences. The first possibility involves an increase in the growth rate due to higher depreciation, which reduces the capital tax paid. Conversely, the second effect results in a decrease in the rate of growth. As the money supply expands, nominal interest rates also rise, leading to lower depreciation tax credits and ultimately a higher cost of capital.

The third scenario depends on how inflation influences the labor-leisure choice. If cash goods and credit goods can be replaced for each other, an increase in the price of cash goods will shift consumption away from cash goods and towards credit goods. This initial change causes a decrease in the growth rate, followed by a subsequent increase (Hodge, 2016).

However, if cash and credit goods are considered complements, an increase in the price of cash items reduces consumption of both cash and credit goods, leading to a rise in demand for leisure goods. Consequently, the pace of growth is reduced (Jones & Manuelli, 2011).

Additionally, the inflation rate has a positive association with the level of economic uncertainty. Higher inflation is linked to larger variations in inflation, which increases uncertainty (Jackman, Mulvey, & Trevithick, 2014). Uncertainty about the inflation rate affects purchasing, selling, borrowing, and investing decisions. The unknown future prices discourage investment, resulting in a smaller capital stock in the country. Investors may still be willing to invest, but they expect to be rewarded for the higher

risk associated with increasing uncertainty, making borrowing more expensive. This higher risk premium leads to elevated real interest rates, further discouraging investment and reducing the capital stock.

Furthermore, individuals may redirect their time and resources away from regular productive pursuits to focus on income redistribution to protect their income against inflation. While this behavior is intended to safeguard income, it can have a negative impact on overall productivity and economic progress.

Chang-Shuai and ZI-Juan (2012) conducted a research project exploring the interrelationship among Chinese level of unemployment, economic growth, and inflation using the VAR (Vector Autoregression) and ECM (Error Correction Model) methods from 1978 to 2010. The findings revealed the presence of a long-term stable equilibrium relationship among these variables. In the short term, the study found a positive correlation between economic growth and the unemployment rate, while inflation and the unemployment rate displayed a negative correlation with each other.

Antwi, Mills, and Zhao (2013) conducted research on the impact of macroeconomic factors on economic growth in Ghana 1989 to 2010. The researchers employed error correction model (ECM) and carried out tests such as Augmented Dickey Fuller (ADF), Johansen co-integration and found that long run economic growth in Ghana is explained by positively and significantly by physical capital, foreign direct investment, foreign aid, and government expenditure however inflation negatively affected economic growth in the long run. Taylan (2012) conducted a study focusing on macroeconomic variables and unemployment in Turkey, utilizing the vector autoregressive model (VAR). The research revealed that positive shocks to growth, export growth, and inflation have the effect of reducing unemployment. Conversely,

shocks to interbank interest rates, exchange rates, and money supply were found to increase unemployment.

Thayaparan (2014) conducted an examination of the impact of inflation and economic growth on unemployment in Sri Lanka 1990-2012, employing ADF and Granger causality tests. According to the regression results, the coefficient of inflation has a negative and statistically significant influence on unemployment, whereas the coefficient of gross domestic product is positive but has no meaningful effect on unemployment. Finally, the analysis shows that only inflation significantly reduces unemployment, while GDP has a favorable but negligible effect on unemployment. causation studies revealed that there is only unidirectional causation between inflation and unemployment, but bidirectional causality between unemployment and GDP and inflation and GDP in Sri Lanka.

In a review conducted by Saymeh and Orabi (2013) on the impact of interest rate, inflation rate, and GDP on the real economic growth rate in Jordan.The study utilized the GARCH model and found that inflation causes interest rate changes. However, they observed that all other variables (Real GDP, nominal GDP) are independent of each other. This differs from the findings of Hussain and Shahnawaz (2011) in Pakistan.In the study by Limam (2015), unidirectional causality was identified, running from inflation to economic growth in Mauritania.

Nwoye, Obiorah, and Ekesiobi (2015) conducted an investigation into the impact of Nigeria's macroeconomic environment on the performance of the national economy 1975 to 2015. Using the OLS method, they identified a significant relationship between the country's national currency exchange rate to the US dollar, inflation rates, monetary policies, and the extent of GDP growth in the country. However, Agwu

(2014) obtained different results during a survey focused on factors contributing to economic growth in Nigeria. The data for the study spanned from 1981 to 2012. To achieve the study's objectives, Vector Error Correction Mechanism (VECM) was employed to investigate the short-run and long-run factors influencing economic growth. The findings revealed that government expenditure and oil revenue positively contribute to economic growth, whereas interest rates and inflation have a notable negative impact. In light of these results, the researcher emphasizes the importance of sustainable growth policies that target corruption prevention.

Benjamin and Lydia (2012) conducted an assessment on how monetary policy is transmitted in Kenya, utilizing quarterly data to estimate a Bayesian vector autoregressive (BVAR) model with the Kalman filter. The analysis incorporated several analytical innovations. The study revealed that, on average, for every 30 basis points of monetary policy tightening using the policy rate, there was a corresponding 1 basis point reduction in the headline consumer price index.

Mahmoud, (2015) explored the relationship between inflation, economic growth, progress of the economy, and government expenditure in the context of Cameroon. This study employed econometric tools to investigate the interconnections among these elements. The study's findings revealed the existence of a long-run association between the economic growth and progress of the economy, government expenditure, and inflation. Furthermore, the study revealed that in the short term, both the inflation indicator (CPI) and government disbursements had a direct impact on the progress of the economy. However, in the long term, although CPI granger caused the current government expenditure, no direct link was observed between the two.

Himani and Bansal (2016) investigated correlation between economic factors and economic growth in India, the study focused on exploring the impact of several key macroeconomic variables on India's economic growth. The study considered Money Supply, Inflation, and Exchange rate as the independent variables, while growth was used as the measure of economic growth. The findings of the study revealed that Money Supply had a positive impact on economic growth, while Exchange rate had a negative effect on GDP. On the other hand, the relationship between inflation and GDP was found to be insignificant and negative.

Chowdhury, Hamid, and Akhi (2019) conducted a study in Bangladesh, examining the influence of macroeconomic variables on economic growth. The study focused on investigating the impact of various macroeconomic variables on the country's economic growth, using GDP growth (GDP) as the indicator of economic performance. Inflation (INF), real interest rate (INT), exchange rate (EXR), and household consumption expenditures growth (HCE) are selected to represent the macroeconomic variables for the period of 1987-2015. The study revealed that GDP demonstrated a positive correlation with all the variables except for the real interest rate. The findings showed that the independent variables accounted for 75.60% of the variability in GDP, and the relationship was statistically significant at a 95% confidence level. Consequently, the study concluded that macroeconomic variables have a significant impact on the economic growth of Bangladesh.

2.4.4 Foreign Exchange Rate and Economic Growth

Selimi & Selimi (2017) examined the potential impact of introducing a different exchange rate strategy to promote rapid economic growth in Meercedonia from 1990 to 2010. The OLS (Ordinary Least Squares) approach was employed to estimate the

regression equation and establish a model that examines the relationship between exchange rates and economic growth. The dependent variable in this model was real GDP, representing economic growth. Several independent variables were considered, including real exchange rate, consumer price index, trade openness, monetary aggregate (M2), current account balance, and real interest rate. Additionally, an artificial variable (dummy) was incorporated to explore the impact of global financial crises. To conduct a comprehensive analysis of the link between real exchange rate and economic growth, a dynamic VAR model and Granger causality test were applied. The empirical findings indicated a positive effect of the real exchange rate on economic growth. Consequently, substantial evidence supports the current fixed regime of the exchange rate, which ensures macroeconomic stability for the country.

Considering factors such as euroization, exchange rate pass-through effect, and credibility, introducing a floating exchange regime is expected to bring about more costs than benefits for the economy. This conclusion is bolstered by the experience of the 2008 global financial crisis, which revealed the continued lack of complete credibility of the national currency and limitations in monetary and fiscal policies for the country.

Kurtishi-Kastrati et al. (2016) conducted a study aimed at investigating the influence of exchange rates on the level of economic advancement in Macedonia. The research focused on testing the extent to which exchange rates affected economic growth, utilizing the Granger causality test and VAR model. Additionally, the researchers employed the OLS approach to establish and present a regression model for analyzing the impact of exchange rates on the economy's growth. The study's findings suggested that exchange rates had a direct and significant positive impact on the economic

growth of Macedonia. These results supported the current fixed regime in place, which is believed to contribute to the macroeconomic stability of the country.

In the study "Exchange Rate, FDI, and Economic Growth in Malaysia: An ARDL-ECM Approach 1970-2018," Pashtoon et al. (2002) investigated the relationships between exchange rate, foreign direct investment (FDI), and economic growth. The study utilized an ARDL-ECM (AutoRegressive Distributed Lag Error Correction Model) approach, considering Gross Domestic Product (GDP) as the dependent variable and analyzing both short-term and long-term integration of the factors.

However, the long-term ECM test results indicated that the relationship was not statistically significant. Nonetheless, the study found that FDI had a positive and significant impact on Malaysia's economic growth, unlike the exchange rate, which did not show a significant effect. As a result of these findings, the study recommended exercising caution in maintaining low inflation and implementing an effective monetary control mechanism to ensure exchange rate stability, which in turn can foster economic growth in Malaysia.

In a study conducted by Jakob (2016), the consequences of different exchange rate systems on the economic progress were explored, with a sample size of 74 selected world - wide countries. The study incorporated the following control variables; index of human capital, inflation, government spending, and gross capital formation. The study's outcomes revealed an inverse and significant correlation between exchange rate fluctuations and their impact on overall economic progress. It was observed that the confidence to conduct business in a country depended on the stability of its currency. When the currency remained stable, confidence was high, but if the

currency became unstable, confidence declined. As a result, higher economic output could be achieved in a context of currency stability.

Eichengreen (2018) conducted a study to examine the relationship between the real exchange rate and economic growth between middle-income and other countries. The research employed both descriptive analysis and panel data regression analysis, using data from 1985 to 2003. The findings revealed that real exchange rate volatility had a significantly negative impact on economic growth. Similarly, Jinzhao (2012) conducted a similar study in China using the same method, and the results confirmed the negative impact of real exchange rate volatility on employment growth.

Brigitta (2015) conducted an analysis to investigate the impact of exchange rate regimes on economic growth. The study gathered data from seventy-four countries, primarily consisting of developing nations. The researcher employed a combination of descriptive analysis and a multiple regression model to analyze the results. The findings indicated a significant positive relation between fixed exchange regimes and economic growth in the economy, while controlling for variables such as inflation rate and gross capital formation as a percentage of GDP. These results were consistent with the findings of Livio, Elitza, and Maurizio (2016), who conducted a review on the effect of exchange rate on economic growth using external instruments. The study employed country-specific instruments to examine how global capital flows interacted with individual countries' financial openness and official reserve growth rate. The findings revealed that a real appreciation (depreciation) of the exchange rate had a significant impact on annual real GDP growth, surpassing the effects reported in previous literature. However, this effect was observed specifically in developing countries and those with pegged exchange rate regimes.

Adeniran, Yusuf, and Adeyemi (2014) examined the influence of exchange rate fluctuations on the economic growth of Nigeria1986 to 2013. The research employed the OLS method, correlation, and regression analysis in their investigation. The research findings indicated that both the interest rate and inflation rate had a negative impact on economic growth, although this effect was not highly significant. Additionally, the study found that the exchange rate had a positive impact on economic growth, but this impact was also not considered significant.

2.5 Summary of Literature and Research Gap

Numerous empirical studies have explored the role of macroeconomic variables in contributing to economic growth. For instance, Eichengreen (2018) examined the relationship between the real exchange rate and economic growth using descriptive analysis and panel data regression analysis with data from 1985 to 2003. The study found that real exchange rate volatility had a significantly negative impact on both unemployment and economic growth.

In a study by Chang-Shuai and ZI-Juan (2012) on the Chinese unemployment rate, economic growth, and inflation, the researchers utilized the VAR (Vector Autoregression) and ECM (Error Correction Model) techniques for the period between 1978 and 2010. They found a long-term stable equilibrium relationship among the variables of unemployment, inflation, and economic growth. However, in the short term, economic growth showed a positive correlation with the unemployment rate, while inflation and the unemployment rate exhibited a negative correlation.

Qin and Wang (2013) investigated the inflation rate and unemployment rate in China and pointed out that the causal relationship between the two variables was ineffective.

In Ghana, Antwi, Mills, and Zhao (2013) analyzed the influence of macroeconomic factors on economic growth using error correction model (ECM) and various tests. The study found that long-term economic growth in Ghana was explained by physical capital, foreign direct investment, foreign aid, inflation, and government expenditure.

Thayaparan (2014) examined inflation and economic growth's impact on unemployment in Sri Lanka using ADF (Augmented Dickey-Fuller) and Granger causality tests. The study revealed that inflation had a negative and statistically significant effect on unemployment, while GDP (economic growth) showed a positive relationship with unemployment, but it was not significantly impactful.

Brigitta (2015) investigated the impact of exchange rate regimes on economic growth using data from seventy-four countries, primarily comprising developing nations. The researcher found a significantly positive correlation between fixed exchange rate regimes and economic growth, controlling for variables such as inflation rate and gross capital formation as a percentage of GDP. Livio, Elitza, and Maurizio (2016) conducted a review on the real exchange rate and economic growth using external instruments with data from over one hundred and fifty developing countries, supporting the positive impact of fixed exchange rate regimes on economic growth.

Limam (2015) identified a unidirectional causality running from inflation to economic growth in Mauritania, suggesting that inflation influences the economic growth in that country. However, the results of Mbulawa (2015) in Zimbabwe challenged these findings and contradicted the notion of unidirectional causality between inflation and economic growth in that specific context.

Adeniran, Yusuf, and Adeyemi (2014) conducted a study to examine how exchange rate fluctuations affect Nigerian economic growth. They employed the OLS method, correlation, and regression analysis in the investigation. The findings indicated that both interest rate and inflation rate had a negative impact on economic growth, although this effect was not deemed highly significant. Nwoye, Obiorah, and Ekesiobi (2015) conducted an investigation into the impact of Nigeria's macroeconomic environment on the performance of the national economy, revealing a distinctive relationship between the country's national currency exchange rate to the US dollar, inflation rates, monetary policies, and the extent or level of GDP growth in the country. On the other hand, Agwu (2014) attained different results when they conducted a survey on determinants of economic growth in Nigeria.

The available literature on the impact of macroeconomic variables on economic growth presents varying findings. Some studies have focused on individual examination of these variables in relation to economic growth, while others have taken an aggregate approach but have not fully considered all the relevant variables of interest in their research. This study aims to address these limitations by investigating various macroeconomic variables, namely inflation rate, exchange rate, domestic debt, and external debt, to assess whether they drive economic growth in Kenya. In undertaking this research, the study aims to fill the existing knowledge void and establish a definitive connection between macroeconomic variables and economic growth within the context of Kenya

The study was motivated by the World Bank and IMF's (2015) policy proposal that less developed countries must create and implement strict fiscal and monetary policies to progress, maintain economic stability, and eradicate poverty. Since Kenya has

embraced these policy recommendations, it is crucial to determine how the performance of Kenya's trade and exports is impacted by exchange rate volatility. Additionally, the study deviates from previous research by employing both VECM and impulse response functions to provide a graphical overview of the movement of economic growth due to shocks in the endogenous system.

2.6 Theoretical Framework

The theoretical literature with respect to this study was informed mainly by Keynesian theory. Keynes holds that the total economic expenditure strongly influences the economic output in the short run and most especially during the recession periods. According to the theory, the total demand does not necessarily add up to the economy's productive capacity. However, it is affected a variety of variables and in some cases, it is unpredictable, influencing inflation, the rate of production and the rate of employment (Adhikari, 2014). The theory holds that inefficiency in the macroeconomic factors is highly influenced by the decisions made by the private sector. As a result, this calls for quick policy response from the public sector. With an aim of ensuring stability in the business cycle the central bank is expected to carry out monetary policy measures, on the other hand, the government is also expected to perform fiscal policy actions. This theory was adopted to describe the influence of inflation on GDP growth. As indicated by the theory, decrease in demand leads to inefficient macroeconomic results in the economy. On the other hand, inflation is experienced when demand is high. However, the inflation rate can be lessened through application of economic policy specifically through the use of the monetary policy by the central bank in addition to use of the fiscal policy by the government. This helps in ensuring stability in production over the business cycle. Other monitory and economic policies include policies on domestic debt, external debt, foreign

exchange rate and inflation. This study will be guided by the Keynesian theory of economic growth to establish the relationship between macroeconomic variables and economic growth in Kenya.

2.7 Conceptual Framework

A conceptual framework is a concise description of the phenomenon under study accompanied by a graphical visual depiction of the major variables of the study (Cooper & Schingler, 2006). Young (2009) indicated that a conceptual framework is a representation of response and predictor variables in a diagrammatic form. In this study the conceptual framework demonstrates the relationship between macroeconomic variables and gross domestic product in Kenya. In the conceptual framework, external debt, domestic debt, inflation rate and foreign exchange rate are the independent variables while gross domestic product is the dependent variable.

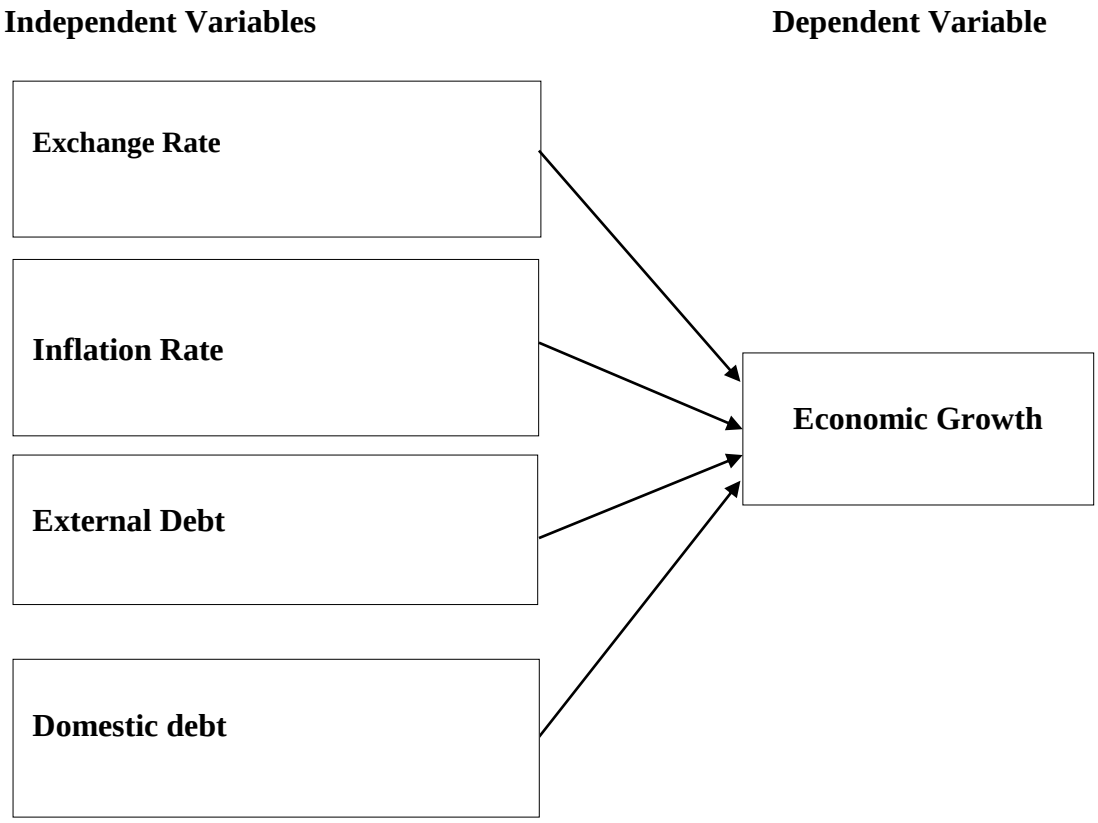


Figure 2. 2: Conceptual Framework
Source: Author (2021)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter details the research methodology that was employed in answering the research question. In particular, the chapter comprises of the research design, research philosophy and sampling and data sources. In addition, the chapter details the theoretical framework, empirical model, description of variables and estimation techniques that were used.

3.2 Research Design

Research design is a research framework selected by the researcher. The design helps researchers to concentrate on study methods that are appropriate for the topic and to set up the study to be effective (Gliner, Morgan & Leech, 2011). This study utilized an explanatory research design, specifically a time series approach. It is time series as it involves repeated measures of a given entity (Kenya in this case) that are taken at evenly spaced intervals over time which in this case, is yearly. An explanatory research, which is also known as causal research design, is normally conducted in order to identify the extent and nature of cause-and-effect relationships (Adrian, 2010). Explanatory studies focus on an analysis of a situation or a specific problem to explain the patterns of relationships between variables. According to Creswell (2014), exploratory studies are a valuable means of understanding what is happening; to seek new insights; to ask questions and to assess phenomenon in a new light. In addition, Greener (2008) indicates that explanatory research has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insight, eliminating impractical ideas and forming hypotheses.

3.3 Research Philosophy

A research philosophy refers to a belief on how the data about the study situation should be collected, analyzed and utilized (Bhattacherjee, 2012). The study adopted positivism research philosophy which is based on ontological principle and doctrine, implying that reality and truths is not only free but, also independent of the observer (Madill & Gough, 2016). Positivism is based on the belief of a stable reality which can be described from an objective perspective (Greene, 2008). In this case, the phenomena being studied is not interfered. Positivism rests on the notion of a stable reality that can be objectively described (Greene, 2008). In this approach, the phenomena under study are not interfered with. Positivism involves manipulating reality by varying a single independent variable to identify patterns and establish relationships between elements in the social world. For this study, positivism aligns well with the goal of analyzing observable reality specifically, examining the relationship between macroeconomic variables and economic growth in Kenya. The researcher autonomously gathered data and applied statistical tools for analysis, adhering to the principles of positivism.

3.4 Model Specification

Vector Error Correction (VEC) Model was tailored to examine the correlation between macroeconomic variables and economic growth in Kenya. One of the primary distinctions of the VEC Model lies in its requirement for the series to be co-integrated, while the VAR model necessitates non-cointegration. The presence or absence of co-integration dictates which of the two models between VAR and VECM should be fitted for the study's data set. Vector autoregressive (VAR) is a model in econometrics that captures values and interdependencies between multiple time series and generalizes univariate (ARs) models. It is a system of equations equal to the

number of variables within the model (Brooks, 2008). Also, each variable is taken as endogenous, and in the VAR system, each variable is a function of its own lagged values (past values) and lagged values of other variables in the model.

If the series is non-stationary and not co-integrated, the researcher differenced the data to induce stationarity before estimating the VAR model. If the series are co-integrated, then the following model from Brooks (2008) is adopted.

$Y_t = \alpha_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \cdots \beta_p Y_{t-p} + \varepsilon_t$ 3.16

Where;

Y_t = the model variables, four by a 1-dimensional vector of the model's endogenous variables.

α_0 = is the model intercept, i.e., four by a 1-dimensional vector of constant.

$\beta_1, \beta_2, \beta_2$ and β_p is a four by 4-dimensional autoregressive coefficient matrices of the established parameter that relate to lagged values of the variables to their current values. ε_t = is a four by a 1-dimensional vector of stochastic error term normally distributed with noise properties$N(0, \sigma^2)$, $t-1, t-2, \ldots, t-p$ is the number of lags.

VAR model is not used to capture the dynamics within if the series are not co-integrated. In such cases, the VEC model is employed describe the relationships. Therefore, VECM is described as a restricted VAR model used for stationary and co-integrated series. In the long-run, co-integrated series share equilibrium, while in the short term, the series may deviate from the equilibrium as they respond to their own shocks where the VEC model is used to correct the short term deviations. The VECM model takes the following form;

$$\Delta X_t = \alpha\beta X_{t-1} + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \Gamma_3 \Delta X_{t-3} + \cdots \Gamma_p \Delta X_{t-p} + \varepsilon_t \text{……..3.17}$$

Where

α= is coefficients of the adjustment's matrix,

β = is co-integrating equations matrix coefficients

Γ= is short run coefficients

X_t = model endogenous variables.

3.5 Data Collection

This study used annual time series data from 1980 to 2019 giving a total of 40 observations. Economic growth, inflation, external debt, and exchange rate were collected from the World Bank's International Debt Statistics Database, while external debt was taken from the World Bank's International Debt Statistics Database Reports. This was also supplemented from annual publications (Annual Public Debt management Reports) from National Treasury. Domestic debt was obtained International Debt Statistics of World Bank Database and Central Bank of Kenya. Table 3.1 summarizes the description and source of variables.

Table 3. 1: Description and Source of Variables

Description	Description	Measurement	Source
Exchange rate	It is the price of one country currency relation to another Kenya shilling in relation to the US Dollar	Measured in percentage	International Debt Statistics of World Bank Database
Inflation	Inflation is measured by the consumer price index, which represents the annual percentage change in the cost of an average consumer's basket of goods and services.	Measured in percentage	International Debt Statistics of World Bank Database
External Debt	This refers to the total debt that a country owes to foreign creditors, which is owed by the country's residents.	Measured in US Dollars	International Debt Statistics of World Bank Database and Kenya's Annual Public Debt Management Reports
Domestic Debt	Domestic debt is part of government debt that is to lenders within the country	Measured in US Dollars	International Debt Statistics of World Bank Database and Central Bank of Kenya
Economic Growth	Economic growth is defined as the annual percentage change in gross domestic product (GDP)	Measured in percentage	International Debt Statistics of World Bank Database

Source: Author (2021)

3.6 Unit Root Tests

Time series data could exhibit trending or non-stationarity at its mean and using such kind of data without removing unit root leads to spurious regression. In this context, stationarity implies a time series data that has constant mean, variance and covariance. Non-stationarity behavior in time series data implies that its variance, covariance and mean is not constant implying that the results can only be studied for the period under consideration and therefore, cannot be generalized for the other time periods. Unit root in time series is a stochastic trend in which the process is a random walk (Ijomah & Enegesele (2017). If a time series has unit root, it has a pattern that is unpredictable while stationarity implies a shift in time that does not cause any change in distribution (Raza, Rathee, Zhou, Cecotti & Prasad, 2019). It is therefore important to determine the form of trend in the data and trending exists, then appropriate form of de-trending must be applied. In this study, conventional unit tests in times series such as Phillips-Perron and Augmented Dickey Fuller unit root tests were applied. Zivot Andrews test was also used to check for unit in presence of structural breaks. Gujarati (2004) suggested that employing multiple tests enhances robustness and efficiency in confirming whether a variable is stationary or not.

Therefore, stationarity of data is very important because it ensures avoidance of spurious regression which could lead to misinterpretation of the results and hence wrong conclusions. This study applied Augmented and Philips Perron method of unit root tests.

3.6.1 Augmented Dickey Fuller Test

The ADF (Augmented Dickey-Fuller) test statistic is derived from the t-statistic of the coefficient φ obtained through OLS (Ordinary Least Squares) estimation, as proposed

by Dickey and Fuller (1979). Although it does not follow an asymptotic standard normal distribution, it possesses a nonstandard limiting distribution. The ADF test involves estimating equation 3.2 on a time series model to account for serial autocorrelation, auto-covariance, and covariance, as mentioned by Pfaff (2008).

$$\Delta y_t = \alpha + \beta_t + \gamma_{t-1} + \delta \Delta y_{t-1} + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \text{……....……………………… 3.2}$$

Where Δy_t is the first difference of each variable, α is a constant, β is the coefficient if time trend, p represents the lag order of the autoregressive process which allows for the formulation of higher-order autoregressive processes., ε is the error term.ADF tests two hypotheses $H_0 : \phi = 0$ that is the serieas contains unit root versus alternative hypothesis; $H_1 : \phi < 0$ H1: $\varphi < 0$ that the series is stationary or trend stationary. The Augmented Dickey-Fuller test is constructed using the t-statistic of the coefficient φ obtained from Ordinary Least Squares (OLS) estimation, as proposed by Dickey and Fuller (1979).

The calculated t statistic is given as;

$$D = \frac{\widehat{\emptyset}}{SE(\widehat{\emptyset})} \text{ ……………………………………………………………..…. 3.3}$$

The critical values are obtained through simulation, as demonstrated by Dickey and Fuller (1979), for example. If equation 3.3 contains a unit root, it can lead to spurious regression results unless appropriate techniques are employed.

3.6.2 Philips Perron Test

As stated by Daw and Hatfield (2018), conducting regression analysis using Ordinary Least Squares (OLS) may result in the issue of serial correlation. To address this

concern, Phillips and Perron (1988) introduced two alternative statistics. These statistical methods are adaptations of the Dickey-Fuller test, with adjustments made to address serial correlation non-parametrically by utilizing Wang and Wu's (2012) heteroskedasticity and autocorrelation-consistent covariance matrix estimator. In the Augmented Dickey-Fuller test, lags of the first differences ΔY_t of the variables are incorporated into the regression to account for the issue of serial correlation.

$$\Delta Y_t = \emptyset Y_{t-1} + \sum_{j-1}^{p-j} \alpha_{v\Delta}^{*} Y_{t-j} + v_t \ldots\ldots 3.4$$

In this case; Δ is the difference operator, $p = 1$ and $\Delta y_t = (p-1)y_t + \mu_t$ The Phillips-Perron test entails fitting a model with integrated order one (I (1)), and the resulting output is utilized to calculate the test statistics. This test is an extension of the Dickey-Fuller unit root test, involving the fitting of the regression equation 3.4. The main purpose of the Phillips-Perron test is to examine the null hypothesis that the series contains a unit root, contrasting it against the alternative hypothesis that the data does not have a unit root.

3.6.3 Zivot-Andrews Unit Root Test with Structural Breaks

According to Baum, (2015 first generation unit root tests, such as the Dickey–Fuller, Augmented Dickey–Fuller and Phillips–Perron tests have been shown to have relatively low power to reject their null hypothesis: that the series is non-stationary (I(1)) rather than stationary (I(0)). Any sort of structural break in the series is likely to cause a failure to reject, even if the series is stationary before and after the structural break. Structural Break is an abrupt change in economic time series because of sudden change which can be as result of unique economic phenomenon such as technological change, legislative or institutional changes or change in economic policies such as

changes in prices in an economy. The following equations were estimated. Model A allows a one-time change in the level of the series, Model B permits a one-time change in the slope of the trend function of the series and Model C allows both changes. The regression equations corresponding to these three models are as follows:

$$\text{Model-A: } \Delta Y = \mu + \beta_t + \alpha Y_{t-p} + \varphi DU_t + \sum_{i=1}^{p} C_i \Delta Y_{t-i} + \varepsilon_t \quad \ldots\ldots 3.5$$

$$\text{Model-B: } \Delta Y = \mu + \beta_t + \alpha Y_{t-p} + \gamma DT_t + \sum_{i=1}^{p} C_i \Delta Y_{t-i} + \varepsilon_t \quad \ldots\ldots 3.6$$

$$\text{Model-C: } \Delta Y = \mu + \beta_t + \alpha Y_{t-p} + \varphi DU_t + \gamma DT_t + \sum_{i=1}^{p} C_i \Delta Y_{t-i} + \varepsilon_t \quad \ldots\ldots 3.7$$

Where DU_t and DT_t are break dummy variables for a mean shift and a trend shift, respectively. The shift occurs at each possible break point: $T_B (1 < T_B < T)$. This is stated formally as:

$$DU_t = \begin{cases} 1 if, t \geq T_B \\ 0, Otherwise \end{cases} and \quad \ldots\ldots 3.8$$

$$DT_t = \begin{cases} t - T_B \, if, t \geq T_B \\ 0, Otherwise \end{cases} \quad \ldots\ldots 3.9$$

Where p is the number of optimum lags determined for each possible break point by one of the information criterion. The null hypothesis is $\alpha = 0$, which implies that the series exhibits a unit root with a drift and excludes any structural break points. The alternative hypothesis is $\alpha < 0$, which implies that the series is trend-stationary with an unknown one-time break.

3.7 Diagnostic Tests

To ensure the credibility of the estimated outcomes, the study conducted various multivariate linear regression assumption tests, including checks for normality, serial correlation/autocorrelation, multicollinearity, and heteroskedasticity.

3.7.1 Normality Test

The study examined the normality of the variables by employing the Jarque-Bera test. This test assessed the null hypothesis of normality against the alternative hypothesis of non-normal distribution. Lomnicki (1961) and Jarque and Bera (1987) introduced a test for non-normality, which relies on the skewness and kurtosis of a distribution. The test was applied to verify the following pair of hypotheses:

$$H_0: E(v_t^s)^3 = 0 \; and \; E(v_t^s)^4 = 3 \; versus \; H_1: E(v_t^s)^3 \neq 0 \; or \; E(v_t^s)^4 \neq 3 \ldots\ldots \; (3.18)$$

The test statistic that was used is given in 3.18 as follows;

$$JB = \frac{T}{6}\left[T^{-1}\sum_{t=1}^{T}(v_t^s)^3\right]^2 + \frac{T}{24}\left[T^{-1}\sum_{t=1}^{T}(v_t^s)^4 - 3\right]^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.19$$

This statistic involves asymptotic $X^2(2)$ distribution only if the null hypothesis is true. The null hypothesis of the test is that the series is normally distributed. This hypothesis is accepted for normal series and rejected otherwise for not normal distributions. Normality test is conducted so that the regression coefficients of the OLS in the study are Best Linear Unbiased Estimators $(BLUE)$ (Weisberg, 2005). For a normal distribution, the JB statistic is expected to be statistically indifferent from zero.

$Ho: JB = 0$ (Normally distributed)

$H1: JB = 0$ (Not normally distributed)

Rejection of the null for any of the variables implies that the variables are not normally distributed, and a logarithmic transformation is therefore necessary.

3.7.2 Autocorrelation Test

This test verifies the existence or absence of serial correlation within the model. Endogeneity is one of the factors that can lead to serial correlation. The null hypothesis of this test posits that there is no serial correlation, while the alternative hypothesis suggests the presence of serial correlation. The study used Lagrangian Multiplier (LM) test (Durbin& Watson, 1992).

3.7.3 Multicollinearity Test

Multicollinearity exists if a single independent variable highly correlates within a set of other independent variables. This affects the prediction ability of the regression model, estimation and statistical significance of regression coefficients. The common criteria to test for multicollinearity include correlation matrix and Variance Inflation Factor (VIF) values (Khoi et al., 2013). To examine VIF for the explanatory variables

The quantity, $\frac{1}{\left(1-R_j^2\right)}$ is called the jth variance inflation factor, where R_j^2 is the squared multiple correlations for predicting the jth predictor from all other predictors. It predicts whether there is a weak or strong linear correlation among predictors. As multicollinearity increases, regression model coefficients become unstable. Multicollinearity is absent when VIF values are below 10 or 1/VIF values are more than 0.1 according to this test.

3.7.4 Breusch-Pagan –Godfrey Test for Heteroscedasticity

When the variability of the error term fluctuates with changes in the values of the independent variable, it indicates a deviation from the assumption of homoscedasticity. The White test statistics are employed to test for heteroscedasticity. This involves expressing the sum of errors as a function of the explanatory variables in the model and performing a regression based on Ordinary Least Squares (OLS). When there is no presence of heteroscedasticity in the model, all the coefficients are expected to be equal to zero. To investigate whether the variance of the error term is constant, the study conducted the Breusch-Pagan-Godfrey Test for Heteroscedasticity. It estimates the following equation 3.20 with k degrees of freedom (Halunga et al., 2017)

$N * R^2$ ……..…….3.20

Where n is the sample, R^2 is the coefficient of determination of the squared regression from the original regression

The null hypothesis of the test is expressed as:

$Ho: E(u^2|x_1, x_{2.....+}\ x_k) = E(u^2) = \partial^2$……....3.21

The test is implemented by regressing Y on X's to generate squared residuals. In the second step, the squared residuals are regressed on X's. The hypothesis is rejected if the $p - value$ chosen alpha (say 0.05), implying that heteroscedasticity if present in the series.

3.8 Correlation Analysis

The Pearson product moment correlation coefficient was calculated in this study and is often simplified as Pearson's correlation which is denoted *r* (*Puth*, Neuhäuser & Ruxton, 2014). It quantifies the magnitude and direction of the relationship between two continuous variables. Pearson correlation estimates a line of best fit through the data of two variables, and the Pearson correlation coefficient, *r,* shows how far all these data points are to this line of best fit (how well the data points fit this new model/line of best fit). The value of Pearson correlation values range from -1 for a perfect negative linear relationship to $+1$ for a perfect positive linear relationship and 0 for no linear relationship between two continuous variables in a study. The Pearson correlation coefficient is calculated by estimating equation 3.1

$$r = \frac{\sum_i (x_i - y_i - \overline{y})}{\sqrt{\sum_i (x_i - \overline{x})^2}\sqrt{(y_i - \overline{y})^2}} \quad \text{3.1}$$

3.9 Hodrick and Prescott Filters

Hodrick-Prescot Filter is a tool that is used to separate the cyclical and trend in a time series data; $y_t = \tau_t + c_t$ where; τ_t is the trend component which may be non-stationary while c_t is a cyclical component. Hodrick-Prescot Filter aims to calculate the cyclical component c_t within a specified range of periods and the trend τ_t is calculated as $\tau_t = y_t - c_t$. It is used to remove undesired aspects from time series data, such as trends and seasonal components Hamilton, J. D. (2018). Hodrick-Prescot Filter suits time series as it is applicable to a series that it has one or more-unit roots in their autoregressive representations and further its simplicity in calculation and transparency.

The filter is defined as the solution that optimizes equation 3.10

$$min[\sum_{t=1}^{T}(y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1}\{(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})\}^2] \ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.10$$

The smoothening parameter λ is set to a pre estimated value and if the value of $\lambda = 0$ the solution degenerates to $\tau_t = y_t$ and the filter excludes all the frequencies $C_t = 0$, the solution degenerates to $\tau_t = y_t$ and as λ tends to infinity, the solution approaches the least squares to fit $\tau_t = \beta_0 + \beta_1 t$

3.10 Johannsen's Test for Co-integration

Co-integration is a crucial phenomenon in economics. In this study, Johansen's test for co-integration was utilized to ascertain whether there is co-integration among the variables. As indicated by Johansen (1995), large values of trace statistics from Johansen's tests provide evidence against the null hypothesis that there are r or fewer cointegrating relations in the VECM. With eigenvalue statistics, eigenvalues utilized when computing the log likelihood at the optimum and assuming that these eigenvalues are ordered from greatest to smallest, it follows that if there are $r < k$ cointegrating equations, and have rank α and β the remainder of the eigenvalues beyond *r*.

Co-integration tests are conducted in case of non-stationary series to find whether there exist long run relationships. This study used Johansens test for cointegration. It is used to determine if there is at least one cointegrating equations and more specifically the validity of the number of cointegrating relationship by maximum likelihood estimates (Hansen & Seo, 2002). The null hypothesis asserts that there are no cointegrating equations in the series, whereas the alternative states that there are at least one cointegrating equation with the highest eigen value of $K_0 + 1$ instead of $K > K_0$. If the null hypothesis is rejected this implies that there is only one combination of

the non-stationary series that yields a stationary process. Johansens test takes the following form,

$$y_t = \mu + \prod y_{t-1} + \sum_{t=1}^{p-1} \Gamma \Delta y_{t-1} + \varepsilon_t \quad \text{.....3.11}$$

Where; $\prod \sum_{t=1}^{p} \mathrm{A}_i - \mathrm{I}$ and $\Gamma_i = -\sum_{j=i+1}^{p} \mathrm{A}_j$ 3.12

If the coefficient matrix Π has reduced rank $r < n$ then there exist a nxr matrices β and α each r such that $\Pi = \alpha\beta'$ and β_t' is stationary. In this case r is considered the number of cointegration equations while the α are the adjustment parameters in the VECM model and β is the cointegrating vectors. It can be shown that for a given r, the maximum likelihood estimator of β shows the combination of y_{t-1}that yields the r largest canonical correlations of Δy_t with y_{t-1} after correcting for lagged differences and deterministic variables when present.

For trace equation 3.12 was estimated which is given as;

$$J_{trace} = -T \sum_{i=r+1}^{n} In\left(1 - \hat{\lambda}_i\right) \quad \text{.....3.13}$$

While for maximum eigen values is given by equation 3.13

$$J_{max} = -T \sum_{i=r+1}^{n} \left(1 - \hat{\lambda}_i\right) \quad \text{..... 3.14}$$

Where T is the sample size and $\hat{\lambda}_i$ is the canonical relations. Since Johansens test is an improve of Engle and Granger test for cointegration, it has the potential of detecting multiple cointegrating equations for multivariate analysis and that it treats each variable as endogenous variable

3.11 Structural Stability of Coefficients

Model misspecification in time series analysis can lead to biased results. Therefore, it is crucial to test the model's validity and reliability to ensure the accuracy of the generated coefficients. Structural reliability of coefficients in this study is formed by companion matrix in equation 3.15. This is obtained by eigen values by using matrix eigen values in the form of $r + c_2$ is $\sqrt{r^2 + c^2}$ (Lutkepohl 2007) (Hamilton, 2018). In a stable VAR model, the modulus of each eigenvalue is strictly less than 1. Additionally, when plotting all the values, they should lie inside the unit circle.

$$A = \begin{pmatrix} A_1 & \dots & A_P \\ 1 & \dots & 0 \\ 0 & \ddots & 0 \\ \vdots & \cdots & \vdots \\ 0 & \cdots & 0 \end{pmatrix} \quad \text{.....3.15}$$

3.12 Granger Causality Test

According to Ozturk, & Acaravci, (2013), without knowledge of the direction beforehand, the presence of co-integration requires the existence of causality in at least one direction. Co-integration approach checks whether there are long-term correlations between variables, but it does not show which way the associations are causal. Therefore, it was necessary to conduct an error correction modeling-based causality test that included an error correction term that was obtained after co-integrating the relevant variables in order for this term to introduce the lost information through differencing in a statistically acceptable manner and aid in determining the long-term causality.

ECM was also conducted for the additional channel it provides for determining causality, which is not possible with Granger (1969) and Sims (1972) test techniques (Abbas & Choundhury, 2012). Error correction (ECM) analysis also provides unique

short-run and long-run results. By estimating P values that were intended to evaluate the joint significance of the coefficients of lagged terms of each explanatory variable, short run causality was determined. In order to assess long-term causality, the relevance of the one-year lagged error correction term (t-value) was studied. The short-run dynamics (or direction of causality) between the variables in the co-integration equation were studied by generating an error correction model.

Co-integration indicates the possibility of causality but does not indicate the direction of causality. The Granger Causality test was used in this investigation. Gujaratti (2004) describes the test as a valuable descriptive tool for time series data.

3.13 Impulse Response Functions

The impact of shocks on the variables' adjustment path was demonstrated through impulse response functions. We can generate IRFs in a tabular or graphical format because the predicted VAR appeared to be steady. An impulse response, more broadly speaking, is any dynamic system's response to an outside change.

According to Lutkepohl (2015) The Granger Causality does not provide complete information, particularly on the interactions between system factors. The comprehension of the causal relationship between variables will be enhanced by knowing how one variable responds to an impulse produced by another variable in a system that may contain many other variables. Tracing the path of an external shock to one system variable and its impact on any or all other system variables allows for the identification of the reaction. If the variable with the impulse does not Granger Cause the set of all the other variables in that system, the impulse effect is absent.

3.14 Model Stability Tests

When a model is estimated, it is presumed that its parameters would remain constant throughout the whole research time. The parameter stability or constancy assumption is this. A model could become unstable as a result of structural changes. The following techniques were used in the study:

3.14.1 Roots of the companion matrix

Evaluating the model is crucial as misspecification in time series analysis can lead to biased results. It is also crucial to assess the validity of the model's generated coefficients. This is accomplished by examining the VECM model's eigen stability condition.model is stable if the roots of the companion matrix are all inside the unit circle (Adediran & Akpa 2022).

3.14.2 CUSUM Test

To maintain stability, it was crucial to check for structural flaws in the output model's residual. Turner (2010)'s proposed cumulative sum (CUSUM) formula was used to assess for stability throughout the course of the whole study period. The cumulative sum test uses the cumulative sum of recursive residuals based on the first n observations and is updated iteratively and shown against the break point. If the plot of the cumulative total and cumulative sum of squares remains below the 5% critical bound or at the 5% level of significance, the null hypothesis that all coefficients are stable is accepted. If any of the parallel lines is crossed, the null hypothesis of parameter stability is rejected.

3.15 Data Analysis and Estimation

Data analysis refers to the use of thinking to grasp the information that has been assembled to decide predictable examples and sum up the essential details uncovered

in the investigation (Zikmund, Babin, Carr& Griffin, 2010). In addition, an econometric model was used in the study to examine the relationship between macroeconomic variables and economic growth in Kenya. There are several ways for testing the existence of dynamic relationships in time series variables, such as the Johansen (1988) test.

In this study STATA Version 14.0 was used to analyze data. STATA has the advantage of holding large set, it also cross-platform software compatible to other statistical software and one can easily learn even if one does not know the syntaxes for running the data. Descriptive and inferential statistics were calculated. Descriptive statistics were used to summarize and describe the data. This usually entails calculating numbers from the data, called descriptive measures, such as percentages, averages, standard deviation, minimum and maximum values (Kaliyadan & Kulkarni, 2019). The technique was useful in analyzing all the quantitative data. In this case, cross tabulation, frequency tables and general statistics such as mean, standard deviation of study variables were calculated. Graphical presentations were also plotted to show the trend of the study variables. Inferential statistics were carried to analyses the vector error correction model.

3.16 Ethical Considerations

First, the researcher obtained an introductory letter from Department of Economics, Moi University and which facilitated research permit from the National Commission for Science Technology and Innovation (NACOSTI) to be obtained. Secondly, various sources of information that were used in the study were according to American Physiological Association (APA) citation style which was a requirement of Moi University. Similarly, the study used secondary information obtained from various institutions it was also pertinent to acknowledge all the institution from where

data was obtained. Furthermore, the study ensured the protection of the study by ensuring adherence on the quality and integrity of findings. Lastly, the researcher carried out plagiarism check to confirm the level of plagiarism index as one of the requirement by postgraduate school of Moi university.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Overview

The study utilized various statistical techniques with the assistance of STATA version 14 to establish the relationship between Selected Macroeconomic Variables and Economic Growth in Kenya. This chapter presents the diagnostic tests conducted, descriptive statistics, model selection, and the outcomes of the vector error correction model. Additionally, it includes the results of hypothesis testing.

4.2 Descriptive Statistics

Descriptive statistics are presented in the form of summary statistics, encompassing measures of central tendency like mean, minimum, and maximum, as well as measures of dispersion, which include the standard deviation. Descriptive statistics was evaluated to determine the dataset's overall pattern and trend. Table 4.1 presents the summary of descriptive statistics of the sample data that include standard deviation, mean, minimum and maximum.

Table 4. 1: Descriptive Statistics

Secondary data obtained was described by the following descriptive statistics;

Variable	Observations	Mean	Std. deviation	Minimum	Maximum
EGR	40	3.970454	2.284124	-0.799494	8.405699
DDT	40	5812027	8073803	12250.54	3.36e+07
EXD	40	9.37e+09	7.30e+09	3.23e+09	3.42e+10
INF	40	11.80326	8.526401	1.554328	45.97888
EXR	40	58.0077	31.43399	7.420187	103.4109

Source: Author (2021)

Measures of central tendency including as mean, and median were the main descriptive statistics that were carried out. Maximum and minimum values of study variables were also computed. The descriptive measures are important in time series analysis because it allows the presentation of raw data in a meaningful manner and easy interpretation of data (Cohen, 2014). Descriptive statistics were also computed to have a general view of the sample size and to simplify large data set in sensible manner. Economic growth over the study period had mean annual growth of 3.97 percent. Its minimum growth has been approximately -0.799 percent while the maximum growth has been 8.41 percent with a standard deviation of 2.28. This suggests that over the years, Kenya has shown a positive trend and has implemented significant economic, structural, and political reforms that have propelled and sustained its economic growth. However, the negative (-0.799) percentage indicates that Kenya still faces developmental challenges, including poverty, political issues, inequality, and vulnerability to climate change. These challenges have impacted private sector investment and weakened the economy. Nevertheless, Kenya possesses the potential to become one of Africa's success stories due to factors such as its growing youthful population, a dynamic private sector, a highly skilled workforce, improved infrastructure, a new constitution, and its crucial role in East Africa.

Domestic debt (DDT) showed a standard deviation of 8073803 US dollar, a minimum of 12250.54 US dollar and maximum of 3.36e+07 US dollar. External debt (EXD) on the other hand showed a mean of 9.37e+09percent, standard deviation of 7.2074, a minimum of 3.23e+09 percent and a maximum of 3.42e+10percent. Inflation (INF) recorded a minimum of 1.55 and a standard deviation of 8.53 and a maximum of 45.98percent. This was observed in the 1996 and it is associated with external shocks and internal disequilibria (Huerta, 2016). This surging inflation rate can also be

associated with declining GDP during this period with Kenyan economy's growth rate of -0.5 percent (Maka, 2018). Kenya's exchange rate against the US dollar had a mean of 58.01, a standard deviation of 31.43399 with a minimum of 7.42 and a maximum of 103.41. The deviations for the exchange rates are too far from the mean are too far from the mean. The variations from the mean for the exchange rates are very large. This may be attributed to the volatility of Kenya's macroeconomic instability factors, such as inflation, external debt, and trade inflows (Irungu, 2017).

Figure 4.1 exhibits some trends and drifts of economic growth that have experienced these factors. Kenya has been having a positive trend (trend line having a positive gradient) but there are some years it has experienced shocks for example in 1992 and 2007-2010. In 2010 for instance, Kenya had ushered in a new political and economic governance system with the promulgation of new constitution in 2010 that introduced a bicameral legislative house, devolved governance. The shock experienced in 1992 (negative economic growth) maybe associated with government injection of much cash into the county during the introduction of multipartyism.

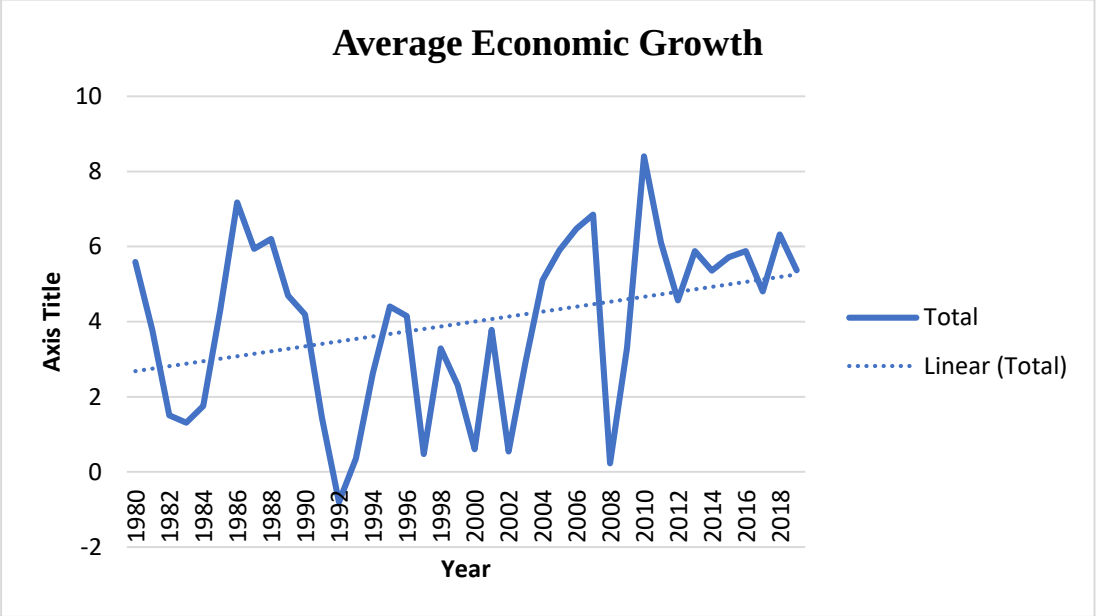


Figure 4. 1: Kenya's Economic Growth Trend

On the other hand, Kenya have had on average domestic debt of 5,812,027 million US Dollars Figure 4.2 presents domestic debt in Kenya for the period 1980-2018. The dotted implies a positive trend. From graphical presentation, it is shown that the level of domestic debt has an upward trend. For the period 1980 to 1982, it is shown that Kenya's domestic debt was relatively constant. However, between 1984 and 1990 it showed some upward trend and a sharp decline in 1992. For the period 1990 to 2000s, it showed a relatively constant growth. The period between 2000 and 2015 saw a rapid increases in Kenya domestic debt and this is linked to widening fiscal deficit for instance that led to increase in treasury bonds and bills from Kshs 402, 688.35 million in 2009 to Kshs 1072319.75 in 2015 (Meme & Muturi, 2016). In 2011/2012, Central government deficit budget was of Kshs 170.79 billion which was equivalent to 5 percent of the total GDP, was foreign finance (Kshs 51.4 billion) while the remaining amount of Kshs 119.5 was financed through domestic borrowing (Oyugi & Chiraerae, 2011). According to Meme and Muturi (2016) during this period, Kenya's domestic debt grew by 166.29 percent. In 2016, it is observed that there was a decline in domestic debt. During this period, the percentage share of domestic debt was less than that of external debt. This is a result of government shift to international financiers to finance government projects at a lower cost as compared to domestic markets. From the graph, it can deduced that domestic debt follows an upward trend and does not revert to it mean and therefore exhibits no mean reversion hence non-stationary at levels.

The figure 4.2shows that Kenya's domestic debt has exhibited and upward trend since 1980 since Kenya falls in the category of highly indebted countries and it suffers from not only from high liquidity problem but also from a high debt overhang since 1980s. In the early 1980s, it is observed that Kenya's external debt was relatively constant,

however, between 1983 and 1984 there was a sharp increase as a result of deficits in the public sector which has been a major concern since 1980.

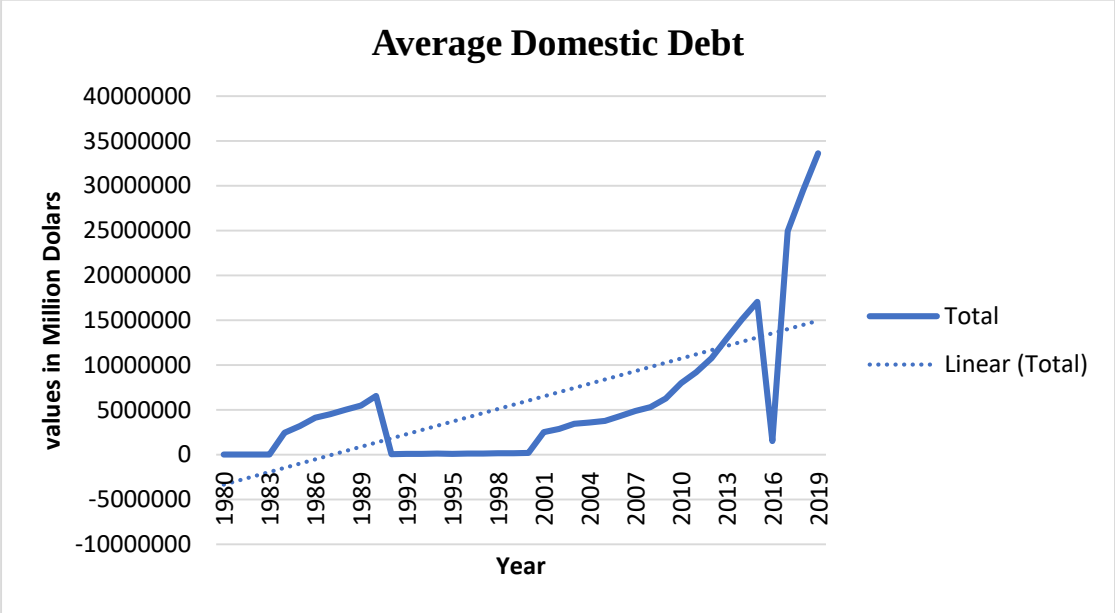


Figure 4. 2: Graph Showing Kenya's Domestic Debt
Source: Author (2021)

The results in figure 4.3 showed that in 1990s, it is shown that Kenya's external decrease due to the adoption of the proposals of Baker Plan of October in May 1989, Toronto Plan of June 1988 and Brady Initiative of March 1989 by World Bank and IMF to reduce commercial loans to low income countries including Kenya. The Baker Plan of May 1989 targeted 15 highly indebted countries while the Brady Agreement was for countries highly indebted to commercial creditors and the Toronto terms targeted low-income African countries whose official debt could be rescheduled under the Paris Club arrangements, subject to the introduction of structural reform programs by the IMF and the World Bank (Ajayi,. 2000). Between 2001 and 2019, it showed an increasing trend. There was rapid deterioration in the government's budgetary position as a result of increased government spending in the midst of weak domestic

revenue results. This was compounded by continued withholding of foreign assistance due to government policies.

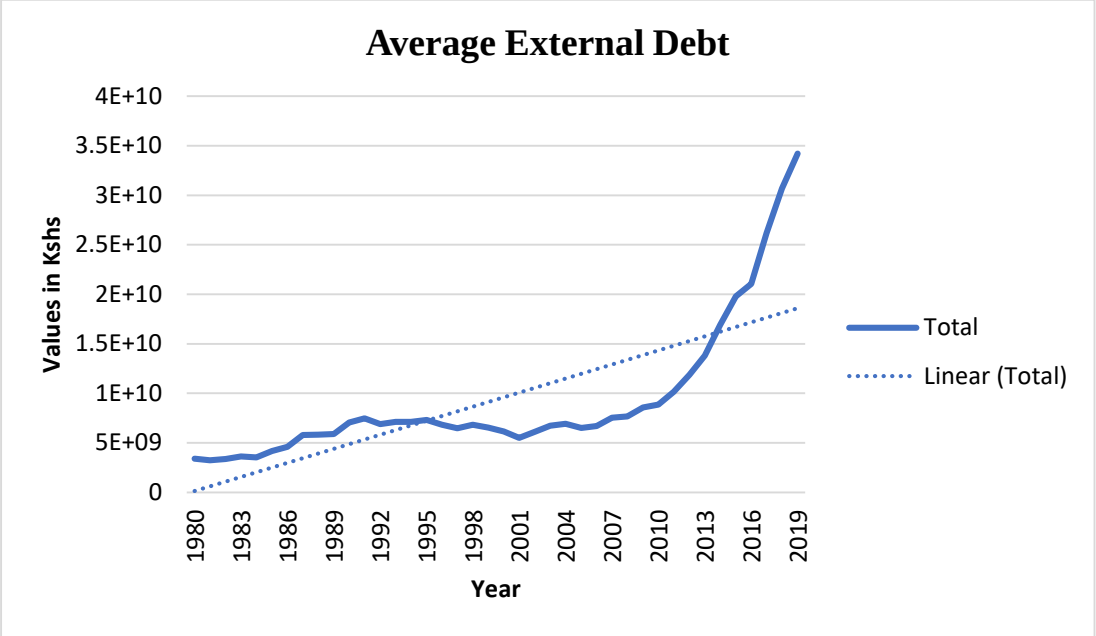


Figure 4. 3: Graph Showing Kenya's External Debt
Source: Author (2021)

The results in figure 4.4 showed that Kenya's inflation rate exhibited a cyclical trend since 1980. The graph showed that inflation possessed a decreasing trend in the early 1980s up to 1986. However, around 1985 its slopes changed again and stared to exhibit an increasing trend up to 1995, a period characterized by worst economic performance since independence. The highest inflation rate was between 1992 and 1993 at approximately 45.97 percent. This was instigated by insufficient policy reforms and inconsistency in policy implementation and financial mismanagement. In addition the country had political turmoil of 1992 due to tumult for the transition of multiparty politics. This led to low investor confidence, the depreciation of Kenya currency and low aggregate demand. Low foreign capital inflows, weak exchange rates and high balance of payments deficits, which combined raised inflation (Dupas, Green, Keats & Robinson, 2014). Between 1994 and 2006 inflation rate has been

fluctuation with small margins. For instance, in 1994, the economy experienced a GDP growth of about 3 percent with a decline in inflation to. This was because the government adopted a tight monetary policy, liberalization of exchange rate and trade regimes with de-regularized cereal markets. This led to reduction of inflation to approximately 10 percent.

In 2008 inflation rate was at 26.23 percent and this was related to the post poll chaos after 2007 general election that caused depreciation of Kenya's currency and consequently increased prices of consumer goods. In 2010 inflation dropped to 3.96 percent and this was a result of tightened monetary policies and falling of international oil prices. However, beyond 2010, inflation rate has been fluctuating between 5.72 percent and 5.2 percent.

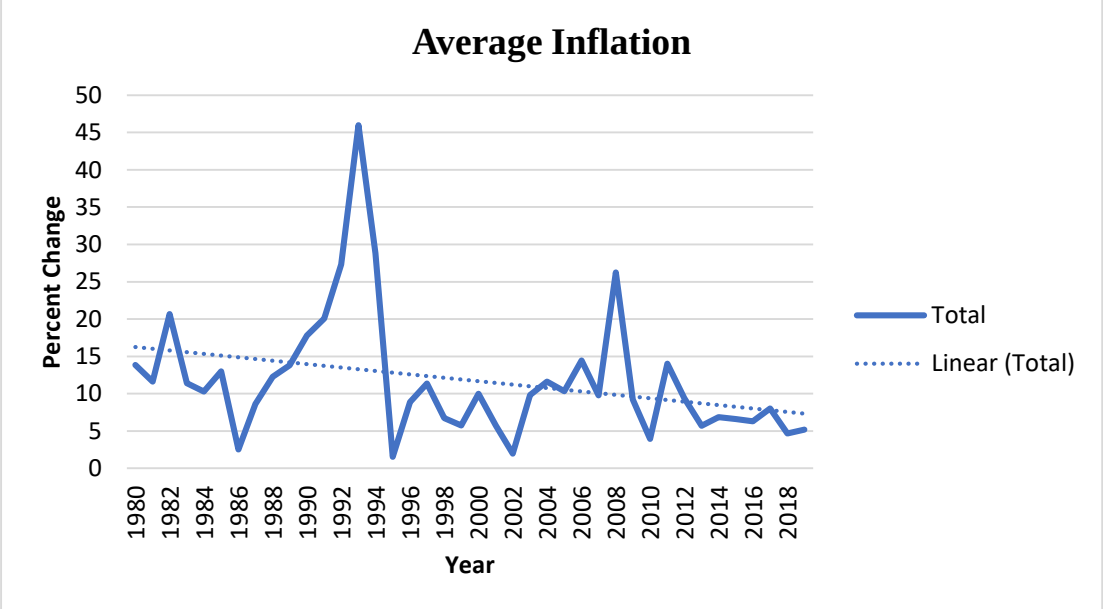


Figure 4. 4: Graph Showing Kenya's Inflation
Source: Author (2021)

It is shown in Figure 4.5 that exchange rate exhibited an increasing trend during the study period. Over the years, Kenya's exchange has from Fixed exchange rate regime

to the current Floating exchange regime. Kenya maintained fixed exchange for the period 1960s to 1970s. Kenya's exchange rate was pegged to the US dollar but after discrete devaluations the peg was changed to special drawing rate. It is observed that between 1980 and 1993, Kenya experienced an increasing trend in exchange rate, this coincides with the period when Kenya adopted dual exchange rate that lasted until 1993.

Kenya exchange rate however, in 1984, showed a sharp increase and this is attributable to short term capital flows taking advantage of high interest rate on treasury bonds and bills. The exporters using trade credit during this time, were uncertain of prices that they would pay for exchange rate when the letters of credit were called and hence wrote the expected foreign exchange redemption in their price structure (Onyango, 2014). A relative sharp decline was observed for the period 2004 to 2008. During this period Kenya Shilling remained relatively strong against the US Dollar, supported by an increase in foreign exchange supply in the domestic market from the merchandise of exports, tourism and interbank sales (Deschênes & Greenstone, 2007). Beyond 2008 it is observed, however, that Kenya's exchange has had an upward trend to 2018.

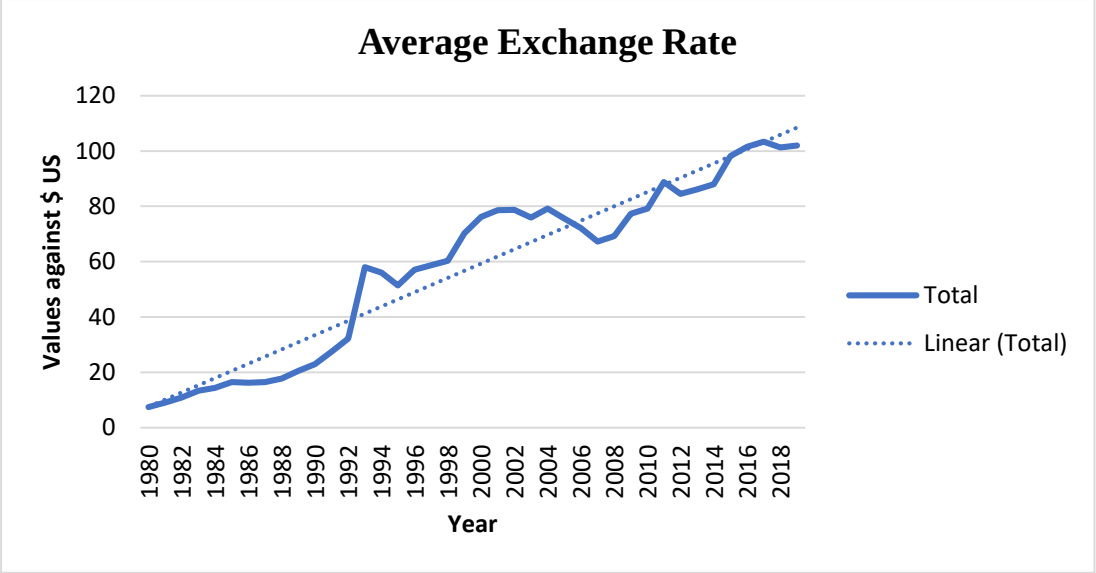


Figure 4. 5: Trend of Exchange Rate
Source: Author (2021)

4.3 Correlation Analysis

Correlation analysis establishes the nature and strength of the relationship between variables (Gogtay, N.J., & Thatte, U.M. 2017). Correlation involved the identification of existence of correlation between economic growth rates (EGR), domestic debt (DDT), external debt (EXD), inflation (INF) and exchange. Table 4.2 below presents pairwise correlation coefficients of Pearson's ρ for each variable, their significance value in form of diagonal matrix. It can be depicted that most of the independent variables had a significant association with the dependent variable.

The results in Table 4.2 indicated that the correlation coefficient between each of the variables (domestic debt, external debt, inflation, exchange rate and economic growth). EXD and DDT reported a significant high and positive *r* of 0.9027 with p-value = 0.00 < 0.05 which indicates presence of high multicollinearity between the two variables. INF and DDT reported a positive and significant correlation coefficient, *r*, of -0.3116; p-value = 0.0503 > 0.05. Correlation coefficient between DDT and EXR was positive and significant with a Pearson correlation coefficient, *r*, of 0.5614 suggesting presence of multicollinearity but does not pose a problem. EGR

and DDT reported a significant, weak and positive correlation coefficient, *r*, of 0.4268 with a p-value = 0.0060 < 0.05. Further, INF and EXD reported a weak, negative, and insignificant correlation coefficient of -0.2689; p-value = 0.0934 > 0.05. EXR and EXD indicated a strong and positive association. It registered a correlation coefficient, *r* = 0. 6824. This implies that an increase in exchange rate (EXR) causes an increase an increase in external debt (EXD). Table 4.2 presents output of pairwise correlation between variables.

Table 4. 2: Pairwise Correlation Analysis

The correlation among the study variables is as indicated hereby;

Variables	DDT	EXD	INF	EXR	EGR
DDT	1.0000				
EXD	0.9027	1.0000			
	(0.0000*)				
INF	-0.3116	-0.2689	1.0000		
	(0.0503)	(0.0934)			
EXR	0.5614	0.6824	-0.2835	1.0000	
	(0.0002*)	(0.0000*)	(0.0763)		
EGR	0.4268	0.3289	-0.5099	0.2200	1.0000
	(0.0060*)	(0.0383)	(0.0008*)	(0.1726)	

Note: * points to correlation coefficients that are statistically significant at 5% level
Source: Author (2021)

EGR and EXD reported a weak, positive and significant correlation coefficient of 0.3289; p-value = 0.0383 < 0.05. This shows that an increase in external debt (EXD) causes an increase in economic growth (EGR). A huge external debt stimulates the depreciation of exchange rate and this attracts resources toward tradable sector. EXR and INF registered a weak and insignificant correlation coefficient of -0.2835; p-value = 0.0763 > 0.05. Inflation (INF) and economic growth (EGR) indicated that they are

negatively related. It had correlation coefficient of -0.5099 and with p-value = 0.0008. A rapid growth in economic growth may cause an upward increase in prices, which causes a rise in inflation. EGR and EXR indicated a weak and insignificant correlation coefficient of 0.2200; p-value = 0.1726 > 0.05.

4.4 Unit Root Tests

A variable is considered non-stationary if it displays a unit root (Gujarati, 2022). It is crucial to check for unit roots in the macroeconomic variables. A time series variable's stationarity is a significant phenomenon since it can affect how the variable behaves (Ansari *et al*,. 2011).

Simple conventional least squares modelling of the Y_t and $X_t$connection will only produce an erroneous regression if and series were non-stationary random processes (integrated processes) (Lutkepohl, 2005). To establish stationarity, the study used the Augmented Dickey Fuller (ADF), Phillips-Perron (PP), and Kwatkowski-Phillips-Schmidt-Shin (KPSS) tests.

Unit root tests were conducted on the four variables used to assess economic growth in Kenya: external debt, domestic debt, inflation rate, and foreign exchange rate. The null hypothesis for each test was that the variable possessed a unit root (non-stationary), while the alternative hypothesis was that it did not have a unit root (stationary). If the test statistic exceeded the critical value at the 5% significance level, the null hypothesis would be rejected, indicating the absence of a unit root, and implying stationarity. Conversely, if the test statistic did not exceed the critical value, the null hypothesis would not be rejected, indicating the presence of a unit root, and suggesting non-stationarity. To eliminate the unit root, the first difference would be

taken when it was present. The study employed Philips Perron tests and Augmented Dickey-Fuller tests to assess stationarity, as discussed below.

4.4.1 Phillips-Perron Test

Philips Perron tests was developed was developed by Phillips and Perron (Cheung & Lai 1997). Philips Perron utilizes Dickey Fuller test that has been made robust by adjusting for serial correlation. It adjusts for serial correlation by utilizing Newey (1987) heteroscedasticity-autocorrelation consistent covariance matrix. The test examines the null hypothesis that the series contains a unit root, as opposed to the alternative hypothesis that the series was generated through a stationary process. Philips Peron test for unit roots is presented in table 4.3. The null hypothesis of unit root regression results in the univariate study variables is indicated here;

Table 4. 3: Philips Perron Unit Root Test

Unit Root Test at Level						
	ADF test statistic	Prob	Critical values			Conclusion
Variable			1%	5%	10%	
DDT	0.689	0.9896	-3.655	-2.961	-2.613	Nonstationary stationary
EXD	1.900	1.0000	-3.655	-2.961	-2.613	Nonstationary
INF	-3.430	0.0100	-3.655	-2.961	-2.613	*I(0)*
EXR	-0.837	0.8080	-3.655	-2.961	-2.613	Nonstationary
EGR	-3.563	0.0065	-3.655	-2.961	-2.613	*I(0)*
First Difference						
DDT	-8.600	0.0000	-3.662	-2.964	-2.614	*I(1)*
EXD	-9.795	0.0000	-3.662	-2.964	-2.614	*I(1)*
INF	-7.546	0.0000	-3.662	-2.964	-2.614	*I(1)*
EXR	-5.789	0.0000	-3.662	-2.964	-2.614	*I(1)*
EGR	-7.378	0.0000	-3.662	-2.964	-2.614	*I(1)*

Note: Probability implies Probability, I (0) indicates the variables that are stationary at level and I (1) indicates the variables that are stationary at first difference
Source: Author (2021)

The Table further shows that DDT; p-value = 0.9896, EXD; p-value = 1.000 and EXR; p-value = 0.8080. This failed to reject the null hypothesis of presence of unit root at all levels of significance; hence, the series were non-stationary at level. However, it is observed that for INF; p-value = 0.0100 and EGR; p-value = 0.0065 the time series are stationary as the probability value rejected the null hypothesis of presence of unit root and accepted the alternative hypothesis of stationarity.

The results by Phillips-Perron confirms the presence of unit root in the data and VECM model requires that all the variables should be co-integrated of order (*I*). VECM is a kind of VAR where restrictions of co-integration are applied. As a result first differencing was done as indicated in Table 4.3 above.

Upon first difference it is observed that all Mackinnon p values for all the variable, INF; p-value = 0.0000 < 0.05, EXR; p-value = 0.0000 < 0.05 and EGR; p- value = 0.0000 < 0.05 DDT; p- value = 0.0000 < 0.05 and EXD; p- value = 0.0000< 0.05 series are stationary or integrated of order one. This indicated that the series had no structural breaks and call for further unit root Perron. Therefore the null hypothesis of unit root was rejected in favor of alternative hypothesis that the variables are stationary and that the they are integrated of order one, *I (1)*(Perron, 2006).

4.4.2 Augmented Dickey Fuller Test for Unit Root

The second method unit test used in this study was Augmented Dickey Fuller test developed by Dickey and Fuller (1979), hereafter referred to as ADF. This test, (ADF) test has the null hypothesis that the series contains unit root against alternative hypothesis that the series is stationary or Augmented Dickey Fuller test assesses a null hypothesis that $\alpha = 1$ against alternative hypothesis that $\alpha \neq 1$ whereby and alpha is the coefficient of the variable. Basically, it has a similar null hypothesis as the unit

root test. That is, the coefficient of Y(t-1) is 1, implying the presence of a unit root. If not rejected, the series is taken to be non-stationary (Shrestha., & Bhatta., 2018).

DF test assumes that the error terms e_t for are distributed independently and identically. The ADF test advances the DF test by adding the regressand's lagged difference terms to in order to address any serial association (Damodar, 2004).

If variables are found to be non-stationary, it is corrected by differencing the variable. The results of Augmented Dickey Fuller test is presented in Table 4.4. The results in Table 4.4 showed that domestic debt (DDT), external debt (EXD), exchange rate (EXR) were all non-stationary at levels. The critical reference value for this was 5 percent all the absolute Mackinnon $Z\ (t)$ values less than absolute critical values at 5 percent level of significance. Inflation (INF) and EGR were stationary at levels hence I (0). However, it is observed that on first difference all the variables (DDT, INF, EXD, EXR and EGR) achieved stationarity. This is indicated by its critical values which were less than 5 percent, this rejected the null hypothesis of unit root and hence, *I (1)* and hence VECM model was applicable.

Table 4. 4: Augmented Dickey Fuller Unit Root Test

The table shows regression analysis of level and first difference results

	P-P Test Statistic	**Prob**	**Critical values**			**Conclusion**
Variable			**1%**	**5%**	**10%**	
DDT	-0.293	0.9265	-3.655	-2.961	-2.613	Non-stationary
INF	-3.436	0.0098	-3.655	-2.961	-2.613	*I (0)*
EXD	8.873	0.0000	-3.655	-2.961	-2.613	*I (0)*
EXR	-0.842	0.8064	-3.655	-2.961	-2.613	Non-stationary
EGR	-3.519	0.0075	-3.655	-2.961	-2.613	*I (0)*
			First difference			
DDT	-7.813	0.0000	-3.62	-2.94	-2.614	*I (1)*
INF	-7.546	0.0000	-3.62	-2.94	-2.614	*I (1)*
EXD	-6.438	0.0000	-3.62	-2.94	-2.614	*I (1)*
EXR	-5.789	0.0000	-3.62	-2.94	-2.614	*I (1)*
EGR	-7.378	0.0000	-3.62	-2.94	-2.614	*I (1)*

Note: Probability implies Probability, I (0) indicates the variables that are stationary at level and I (1) indicates the variables that are stationary at first difference

Source: Author (2021)

4.4.3 Zivot Andrews Test for Unit Root with Structural Breaks

First generation unit root tests, such as the Dickey–Fuller, Augmented Dickey–Fuller and Phillips–Perron tests have been shown to have relatively low power to reject their null hypothesis: that the series is non-stationary (I(1)) rather than stationary (I(0)). Any sort of structural break in the series is likely to cause a failure to reject, even if the series is stationary before and after the structural break. Structural Break is an abrupt change in economic time series because of sudden change which can be as result of unique economic phenomenon such as technological change, legislative or institutional changes or change in economic policies such as changes in prices in an economy. In time series analysis, testing for unit with structural breaks allows the removal of unbiasedness towards unit root and it can identify the possible date when the structural break occurred. However, the tradeoff is that Zivot Andrews allows for

a single structural break. This can be corrected by allowing the tests for allowing for multiple structural breaks. Zivot Andrews was therefore applied to test for endogenously determined for single structural break and has the null hypothesis of unit root. Table 4.5 presents the results of Zivot Andrews test.

Table 4. 5: Results of Zivot Andrews Test Allowing for Single Structural Break

The table below shows potential structural break over the study period;

	Variables				
	DDT	**EXD**	**INF**	**EXR**	**EGR**
Lags included	1	0	0	0	0
Minimum t-statistics	-1.528	1.905	-4.432	-4.394	-5.120
Year	1991	2013	1995	1993	1991
Critical value at 5%	-4.80	-4.80	-4.80	-4.80	-4.80
Critical value at 1%	-5.534	-5.534	-5.534	-5.534	-5.534

Source: Authors Own Compilation, 2021

The results in Table 4.5 above indicated that domestic debt registered a significant break in 1991 therefore the Null Hypothesis: DDT has a unit root with a structural break in the intercept was accepted following the rule of the thumb since the absolute critical t value was higher than the calculated t statistic at 5% level of significance (Hong, *et al* 2021). Similarly, for external debt it is observed that the structural break of 2013 was significant. For inflation it is shown from Table 4.5 that the structural of 1995 was significant. This is attributed to the spillover effects of pluralism politics of the early 1990s characterized by excessive money supply, low aggregate demand, the depreciation of Kenyan shilling coupled with low investor confidence for the period 1990- to late 1993. This can also be explained by the fact that in 1994, Kenya adopted a tightened monetary policy and liberalized foreign exchange that led to increase in economic growth by approximately 3 percent.

Exchange rate experienced a structural break in 1993. This can be explained by the depreciation of Kenya's exchange rate in relation those of their major trading partners because of instability of domestic prices. During this period an aid embargo was in place and the accelerated money supply growth and foreign exchange squeeze compounded the problems of inflation and exchange rate depreciation. These problems were related to growth of money supply by approximately 35 percent, low supply of commodities as a result of unfavorable weather conditions and price decontrols and excess consumer demand resulting from the expenses incurred during 1992 general elections. All these factors intertwined to push inflation upwards and depreciate Kenya's Shilling.

Zivot Andrews test indicates that economic growth experienced a weak structural break in 1991. This can be explained by the fact during this period; Kenya experienced its worst economic performance as a result of low economic growth since independence as result of shrinking in agricultural performance at an annual rate of 3.9 percent. This led to the shrinking of Kenya's economic growth by 2.2 percent (Aboulezz, 2015).

Graphically the Zivot Andrews Test Allowing for Single Structural Break are presented in Figure 4.6 indicated below

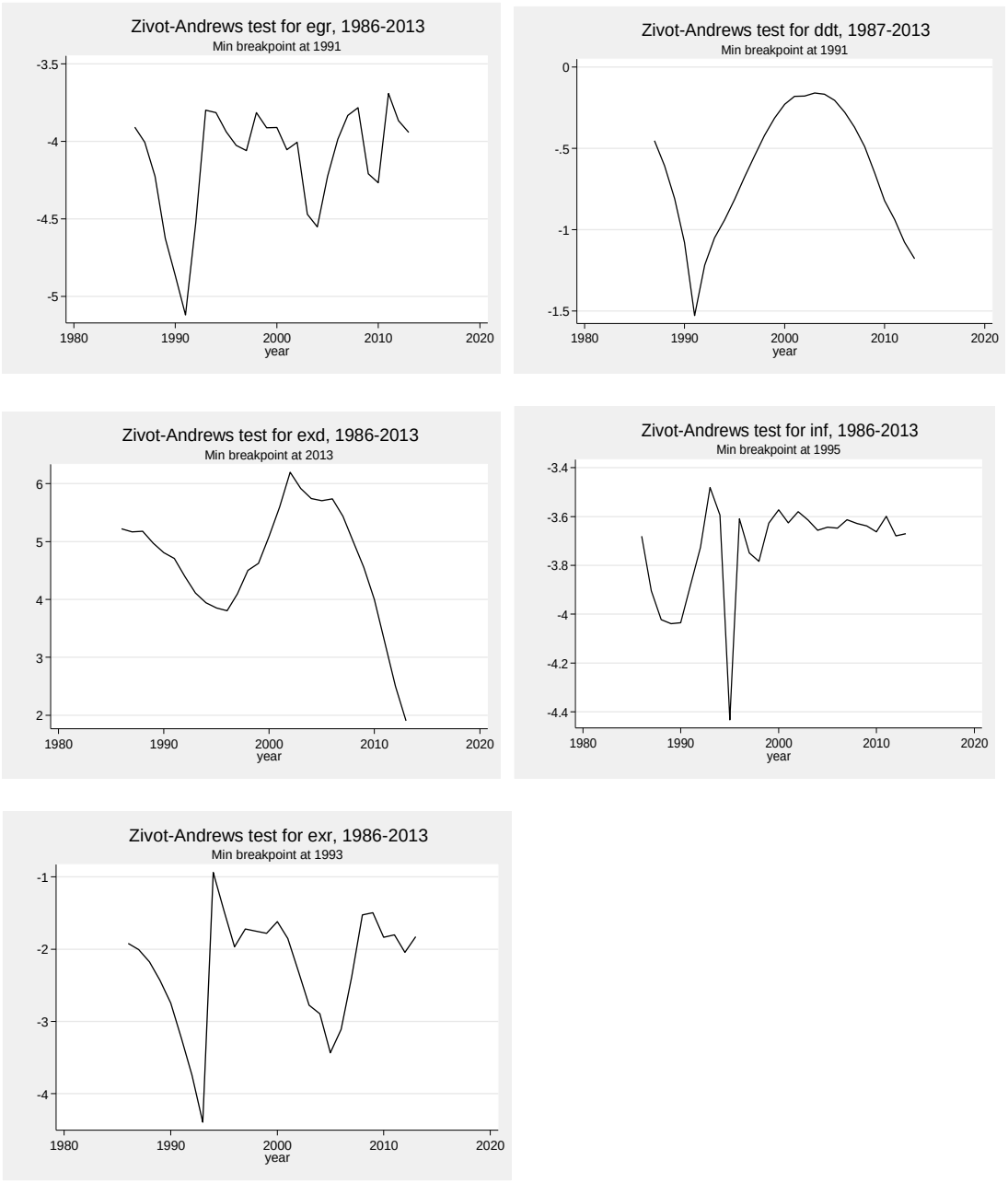


Figure 4. 6: Figures Showing Zivot-Andrews Structural Breaks
Source: Author (2021)

4.5 Hodrick-Prescot Filter

Figure 4.8 presents the output of Hodrick Prescott Filters for Time Series for separating the cyclical components from the trend components.

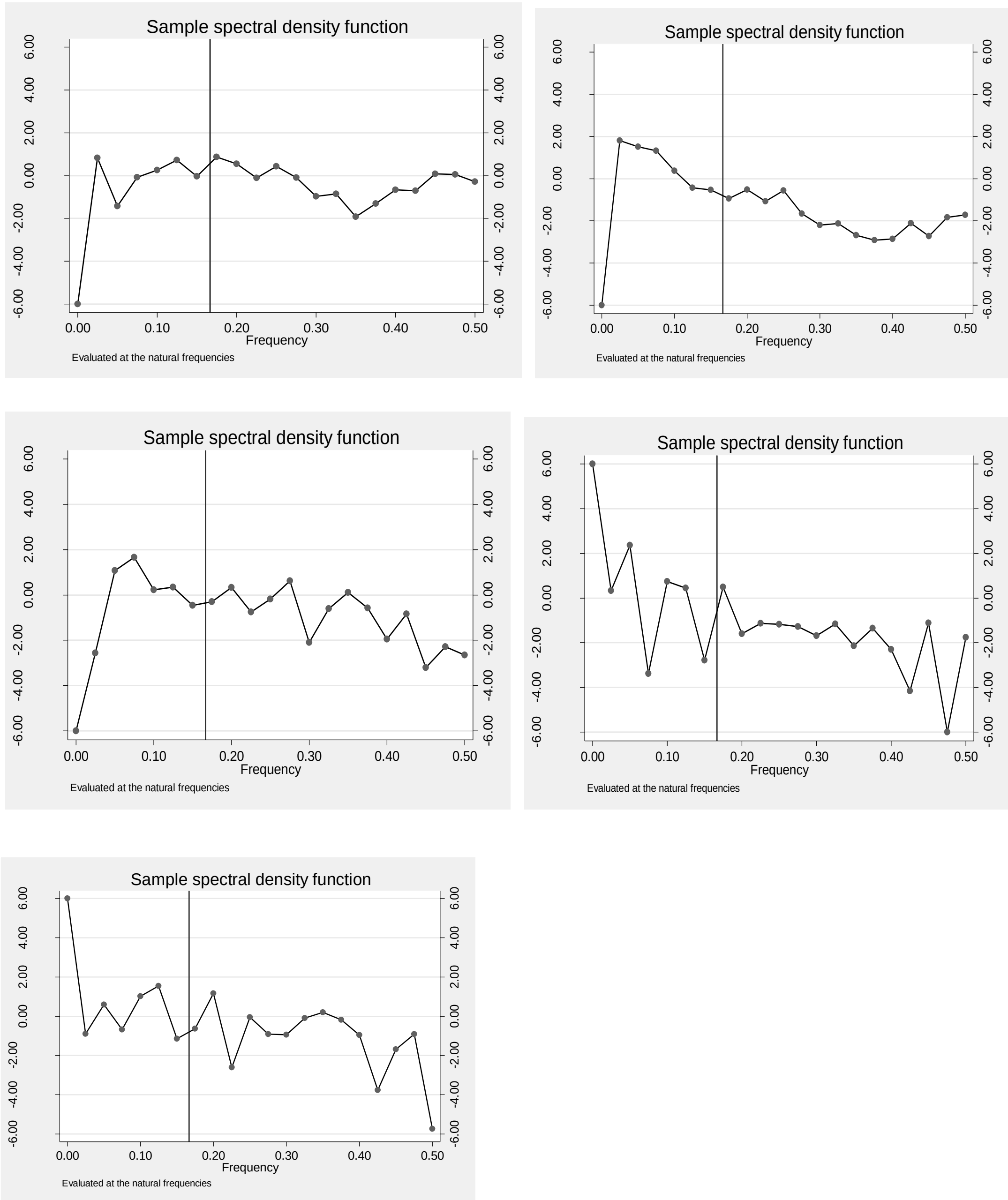


Figure 4.7: Sample Spectral Densities for Hodrick Prescott Filters for Time Series

Source: Author (2021)

The smoothening parameters are extremely dependent on the frequency of data. Higher rate of frequency, the higher smoothening parameter, Hodrick (1967) proposed that the value of λ (smoothening parameter) and that there is no agreement for the value of the smoothening parameter, however according to Ravn and Uhlig

(2002) suggests that λ should vary by the fourth power of the frequency of observation ratio and consequently for annual data, the smoothening parameter should be equal to 6.25. In some literature is has been suggested that the value of λ should range between 10 and100 for annual time series data as λ tends to infinity. In this study, Hodrick Prescott filter was used to separate the cyclical and trend components. The pergram syntax was utilized to calculate and visualize the periodogram of the cyclical component. Figure 4.3 shows that the vertical lines at the natural frequencies correspond to the standard values of business cycles, namely 32 and 6 periods. The pergram output displayed the results in natural frequencies, which are standard frequencies divided by 2π. The xtline syntax was then used to plot the observed vertical lines at the lower natural frequency (1/6 = 0.1667) and the upper natural frequency cutoff (1/6 = 0.1667). As expected, the Hodrick-Prescott (HP) filter effectively removed the stochastic cycles at unwanted frequencies, resulting in a flat periodogram at the minimum value of 6 outside the range identified by the vertical lines.

4.6 Optimal Lag Length Selection

It is important to determine the optimal lags because previous values have effect to the present values. The effects of the independent variables on the dependent may not be instantaneous, as it needs a lapse of time, which constitutes lags. This therefore implies that care needs be taken when choosing optimum lags during analysis.

Too many lags many inflate standard errors with respect to the estimated coefficients. Increasing the order of lag selection leads to overfitting, causing an increase in the mean square variance of residuals. (Lutkepohl, 2005). Conversely, few lags tend to be highly correlated hence; the problem of multicollinearity may arise. Ford *al.*,(2014)

stated that the number of lags to be used in annual data is 1, 2, or 3 and 4 in order not to lose the degrees of freedom, for quarterly data the number of lags should be between 1 and 8 while for monthly data, the number of lags should be 6, 12 or 24. There are various methods of determining optimal lag lengths. These include; FPE, AIC, HQIC and SBIC as shown in Table 4.6 below

Table 4. 6: Lag length Selection

The lag length specifies how far down the AR process you want to test for serial correlation.

Sample: 1980 -2019
Number of observations = 40
Selection order criteria

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-1159.46				8.6e+21	64.692	64.7687	64.9119
1	-977.111	364.69	25	0.000	1.4e+18e*	55.9506	56.4112*	57.2702*
2	-968.974	16.274	25	0.906	3.96e+18	56.8875	57.7319	59.3067
3	-938.123	61.704	25	0.000	3.5e+18	56.5624	57.7906	60.0813
4	-898.054	80.137	25	0.000	2.5e+18	55.7252*	57.3372	60.3438

Note: Star "" indicates the optimal lag lengths selected by various criteria*
Endogenous: egr e xr inf lexd lddt
Source: Author (2021)

Table 4.6 presents the various criteria used to select optimal lags. The regression output in Table 4.6 pointed out that 1 is the optimal lag as per FPE (1.4e+18e), HQIC (56.4112) and SBIC (57.2702). However, for AIC criterion it indicated an optimal lag of 4 with the lowest value of 55.7252. Therefore, for this study, optimal lag length of 4 was chosen as suggested by AIC criterion. Gujarati (2003) asserted that there was no precise number of number to use as successive number of lags implies less degrees of freedom, which makes statistical inferences less stable.

4.7 Cointegration Test

Before estimating the VECM model, which is based on Johansen's method (Enders, 2010, pg 401). The *vecrank* syntax in STATA generates the output using Johansens' cointegration test method using maximum eigenvalue statistic, trace statistic and the choice of *r (the number of cointegrating equations)* that minimizes the information criterion. All these are based on Johansens' maximum likelihood estimator maximum likelihood estimator of the cointegrating VECM model. Table 4.7 presents Johansens' tests for cointegration.

Table 4. 7: Johansens' Test for Cointegration

The table shows the co-integration relationship among the study eatables.

Trend: constant
Number of observation: 40
Lags : 4
Sample: 1980-2019

Maximum rank	parms	LL	Eigenvalue	Trace statistic	5% critical value
0	80	-136.5817	.	139.8905	68.52
1	89	-102.6319	0.8483	71.9910	47.21
2	96	-85.5983	0.6118	37.9238	29.68
3	101	-71.4473	0.5444	9.6218*	15.51
4	104	-66.6465	0.2341	0.0201	3.76
5	105	-66.6364	0.0005		

Note: Star "*" denote the number of cointegrating equation
Source: Author (2021)

The header of Table 4.7 provides general information about the sample size, number of lags use and the information of the model based on four lags and constant trend while the body presents information on critical values on the number of cointegrating equations. It was deduced from the Table 4.7 that there are three cointegrating

relationships among the variables. At maximum rank of zero it is clearly shown that the trace statistic is greater than it critical value at 5% level of significance ($139.8905 > 68.52$) and therefore the null hypothesis of no cointegration was rejected. At maximum rank one, the value of trace statistic is greater than its critical value at 5% level of significance ($71.9910 > 47.21$) implying that the null hypothesis of at least one cointegrating was also rejected. Similarly, at maximum rank two, the null hypothesis of at least two cointegrating equations was also rejected since the value of trace statistic was less at 5 % level of significance($37.9238 > 29.68$). At maximum rank of three, it shown that the value of trace statistic is less than its critical value at 5% level of significance($9.6218 * < 15.51$), (as shown by star *"*"*in Table 4.7, hence, null hypothesis that there is at three cointegrating relation was accepted. This implies that there exists a long run relationship among the variables.

The results for cointegration equation is depicted in Figure 4.8.

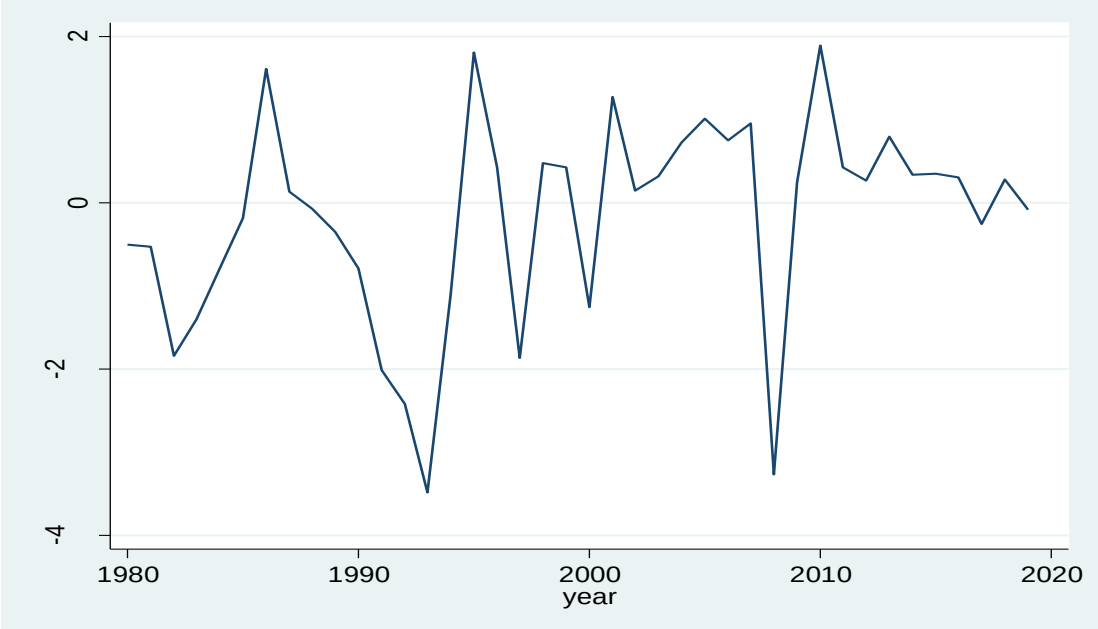


Figure 4. 8: Graphical Representation of Cointegrating Equation

Source: Author (2021)

The results in Figure 4.9 showed behavioural trend of the cointegration experience among the variables. Inference on the parameters typically relies heavily on the stationarity of the cointegrating equations, so the analysis tested the model specification and estimated and graphed the cointegrating equations over time.

Even though the large shocks visible in the graph of the levels have strong consequences on the cointegrating equation forecasts, the only point of interest is the negative pattern in the first cointegrating equation around the 1990s and recently around 2010. The level graph indicates that something brought about a substantial upward development of the economy around 2000 then a rapid downturn causing cointegration to a negative value but later in 2010, the positive sign of cointegration can associated to economic growth recovery.

4.8 Post Estimation Diagnostic Tests

Diagnostic tests play a crucial role in finding and validating a good predictive relationship among the dependent variables and determining whether the model is stable or not. The conducted diagnostic tests included assessments for normality, multicollinearity, heteroskedasticity, first-order autocorrelation, and the structural test of the reliability of coefficients.

4.8.1 Jarque-Bera Test for Normality

(Lomnicki, 1961) and (Jarque & Bera, 1987) introduced a test for non-normality based on the skewness and kurtosis of a distribution. The Jarque-Bera Test for Normality, which is a type of Lagrange multiplier test, assesses whether the sample data matches the characteristics of a normal distribution, making it a good measure of fit. Its null hypothesis is a joint hypothesis with skewness being zero and excess kurtosis being zero which implies a kurtosis value of 3. Jarque Bera statistics

presented in the Table 4.8 as indicated below for each of the equations and the joint hypothesis of all the equation.

Table 4. 8: Jarque-Bera Test for Normality

Normality test regression results is hereby shown by Table 4.8

Equation	$\boldsymbol{Chi^2}$	**Df**	$\boldsymbol{prob > Chi^2}$
D-EGR	1.37	2	0.51493
D_LEXR	2.151	2	0.34107
D_INF	1.783	2	0.41002
D_LEXD	9.887	2	0.71340
D_LLDT	16.107	2	0.26990
ALL	31.256	10	0.44537

Source: Author (2021)

For each of the equations above, the null hypothesis states that the disturbance term has a normal distribution, while the joint hypothesis states that the K disturbances are from a K-dimensional normal distribution. The results from the Jarque-Bera test in Table 4.8 do not reject the null hypothesis, leading to the conclusion that the sample was obtained from a normal distribution. Regarding skewness in the single equations, the null hypothesis states that the disturbances have zero skewness, which is characteristic of a normal distribution. The joint hypothesis test (ALL) yielded a p-value of 0.44537, which is greater than 0.05, leading to the failure to reject the null hypothesis as indicated in Table 4.9.

Table 4. 9: Skewness Test

The measure of asymmetry distribution of variables about their mean is indicated in the table below;

Equation	**Skewness**	Chi^2	**df**	$prob > Chi^2$
D-EGR	-0.45411	1.237	1	0.26599
D_LEXR	0.59229	2.105	1	0.14683
D_INF	-0.46712	1.309	1	0.25254
D_LEXD	0.89979	4.858	1	0.27520
D_LLDT	0.55735	1.864	1	0.17218
ALL		1.373	1	0.44470

Source: Author (2021)

The kurtosis of a normally data is usually three. Table 4.10 displays kurtosis statistics indicated the equations is above 0.05. The joint probability (*ALL*) value of the kurtosis shows a $p - value = 0.13100 > 0.05$,which implies that the null hypothesis of normality is accepted. Therefore, it was concluded the disturbances are from a normal distribution. The kurtosis of a normally distributed variable is three. The kurtosis statistics presented in the table test the null hypothesis that the disturbance terms have kurtosis consistent with normality. In this example, the results do not reject the null hypothesis.

Table 4. 10: Kurtosis Test

The flatness of the peak relative to the normal bell shaped regression results are indicated below;

Equation	Kurtosis	Chi^2	df	$prob > Chi^2$
D-EGR	3.2452	0.090	1	0.76398
D_LEXR	2.824	0.046	1	0.82934
D_INF	2.4379	0.474	1	0.49121
D_LEXD	4.8311	5.029	1	0.24921
D_LLDT	6.0815	0.014	1	0.16005
ALL		0.198	5	0.13100

Source: Author (2021)

4.8.2 Variance Inflation Factor Test for Multicollinearity

It is possible that there could exist a relationship between two or more independent variable and multicollinearity needs to be tested, hence VIF results is indicated in Table 4.11. A VIF of 1 implies absence of multicollinearity among the j^{th} predictor variable and the other predictor variable and hence the variances of the variables in the model are not inflated. The rule of the thumb is that a VIF greater shows presence of multicollinearity while VIF greater than 10 shows serious signs of multicollinearity that needs correction.

VIF estimates the extent to which a variance has raised the slope estimate. The High VIFs indicates a rise in the variances of the estimated regression coefficients beyond variances obtained when predictors are orthogonal due to collinearity across predictor variables. Multicollinear models offer lower forecasting precision and have other issues (Murray *et al.,* 2012).

The output in Table 4.11 showed the values of each of the variables ranges between 1.72 and 1.17 and the mean VIF is 1.55 which are below 4 and hence, it was concluded that the predictor variables in the model have no relationship and no multicollinearity existed. A model that exhibits multicollinearity such as estimate of the coefficients varies from one model to another (Glick & Figliozzi, 2019).

Table 4. 11: Variance Inflation Factor

The correlation among the independent variables is as indicated below;

Variable	VIF	$1/VIF$
DDT	1.72	0.581160
EXD	1.70	0.587362
EXR	1.62	0.615804
INF	1.17	0.856545
Mean VIF	**1.55**	

Source: Author (2021)

4.8.3 Breusch-Pagan –Godfrey Test for Heteroscedasticity

In order for the linear regression model to hold, the variance should remain constant. The error terms are referred to as heteroskedastic if their variance is not constant. Heteroskedasticity was investigated using the Breusch-Pagan method. Since each heteroskedasticity is somewhat unique, there is no overarching rule or technique for rectifying it. However, in general we can alter the regression if X_t is connected to the variance (Gujarati, D. N., & Porter, D. C. 2004).

Heteroscedasticity test results is presented in table 4.12. Breusch-Pagan –Godfrey Test for Heteroscedasticity has the null hypothesis of this test is that the residuals have a constant variance. The variable (fitted values of *egr*) reports the independent variable in the model. Since Breusch-Pagan-Godfrey Test for Heteroscedasticity is a

$Chi2$ test it has a value of 0.06 and probability of 0.8094 which is greater than 0.05 hence the null hypothesis of constant variance was accepted and it was concluded that the variance is constant.

Table 4. 12: Breusch-Pagan-Godfrey Test for Heteroscedasticity

The variance of the errors from the line of the best fit;

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of *egr*
chi2(1) = 0.06
chi2(1) = 0.06
Prob > chi2 = 0.8094

Source: Author (2021)

4.8.4 Lagrangian Multiplier (LM) Test for Autocorrelation

When the error terms from the previous period are correlated with the error terms from the present period, first order serial correlation arises in time series. Ordinary least squares estimates for positive serial correlation have a tendency to be smaller than expected standard errors, which lowers the t value and causes the hypothesis to be rejected when it should be accepted (Blaskowitz & Herwartz, 2014).

The study sought to confirm the presence or absence of serial correlation in the model. Endogeneity causes of serial correlation the data value and it lagged value. The study used LM test. Lagrangian Multiplier test is powerful over Durbin Watson because DW is limited to only one lags. The null hypothesis of LM test is that there is no serial correlation against the alternative hypothesis that there is serial correlation. Results in Table 4.13 showed that the probability of Chi-square is insignificant or the P value>0.05 at 5% level of significance implying the null hypothesis of no serial

correlation failed to be rejected but rather accepted. This implies that there was no serial correlation present.

Table 4. 13: Results for LM test for Serial Correlation

The relationship between study variables and a lagged version of itself over various time intervals is depicted as indicated below;

Lags(p)	**Chi2**	**Df**	**Prob> Chi2**
1	0.074	1	0.7863
H0: no serial correlation			

Source: Author (2021)

4.9 Structural Test of Reliability of Coefficients

Lawal, & Aweda (2015) emphasized that misspecification of the model series analysis could result in biased results. Therefore, it is crucial to conduct tests for model reliability to ensure the accuracy of the generated coefficients in the model. This involves checking the eigen stability condition of the VECM model, and the results are presented in figure 4.9.

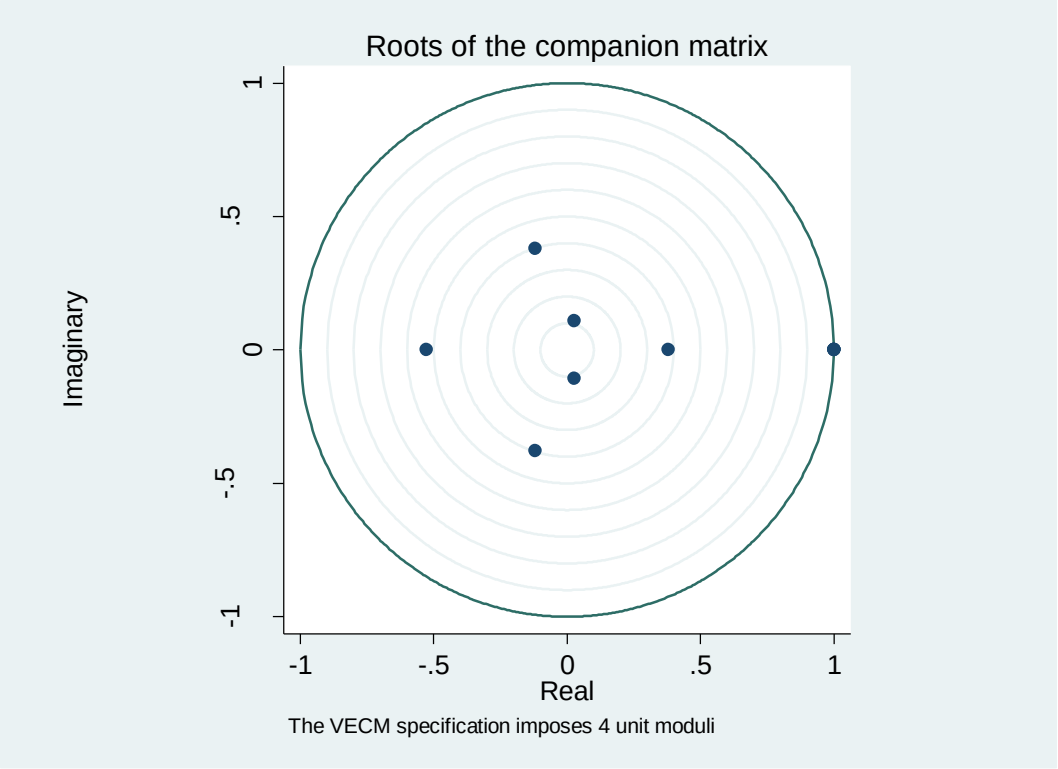


Figure 4. 9: Roots of Companion Matrix in a unit Moduli

Source: Author (2021)

The results in figure 4.8, showed that the all the values lies inside the unit circle hence this confirms the stability of the generated coefficient in the VECM model.

4.10 CUSUM Test

Forecast predictions from unstable models are very different from those from stable models .The CUSUMQ exam was used in the study to assess stability. The test plots the model's residuals against structural breaks to check for stationarity. The model is stable and can be applied to predicting if the residual plots around the central line without connecting the two lines. Reverting is the meaning of the residual experiences, which is an indicator of model stability. The model's stability can be shown in the residual experiences, which imply a reverting property (Lütkepohl, 2006). Figure 4.10 demonstrates that the model was stable.

The findings demonstrate that the modeled variables had not undergone any structural change, indicating that the model was stable as shown in figure 4.10. If the residual plots around the central line without closing the two lines then the model is stable and can be used for forecasting. This suggested that the modeled macroeconomic variables did not have structural instability.

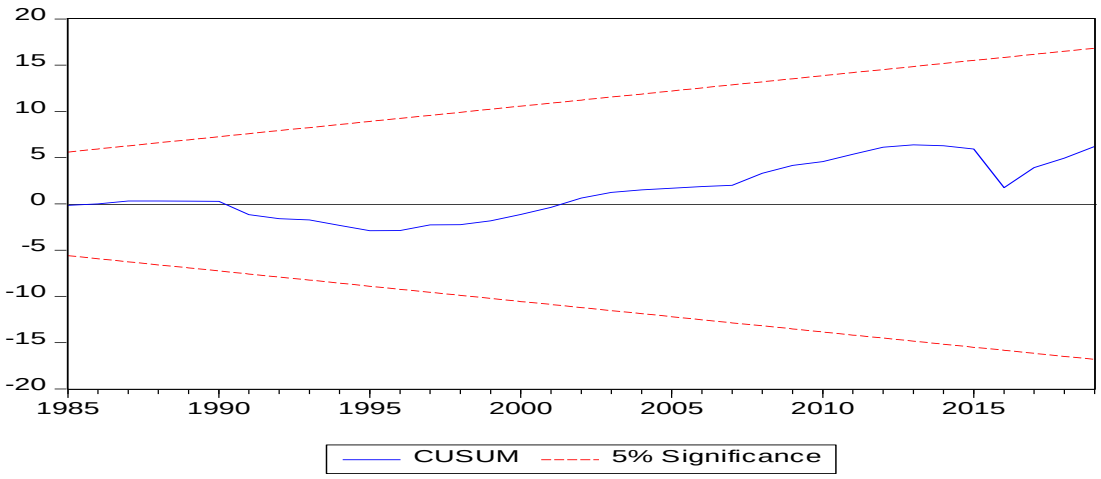


Figure 4. 10: CUSUM Test M1 Channel

Source: Author (2021)

4.11 Vector Error Correction Results

Vector error correction model (VECM) is a vector autoregression (VAR) in which variables are cointegrated Johansen's (1995) maximum likelihood method. The parameters in the cointegrating equations or the modification terms have the possibility of being constrained.

It is clearly evident now that co-integration exits. I.e. the long-term co-integration of the variables economic growth, external debt, domestic debt, inflation rate, and foreign exchange rate exists. The vector error correction model (VECM), which is the

more practical model for this type of data, is used to estimate the parameters as a result (Lütkepohl, (2007).

Three parts are produced by the model. The sample size summary, model fitness, and number of parameters found in the co-integration equation are all shown in the first row of Table 4.14. Table 4.15 presents the estimates of the short-run parameters, along with their corresponding standard errors and confidence intervals. The final section of Table 4.16 displays the estimates of the parameters in the co-integration equations, along with their respective standard errors and confidence ranges.

Table 4. 14: Summary of Statistical Results of the VECM

Summary statistics of main features of the VECM model were captured in the table below;

Sample:1984-2019		Obs	36	AIC	28.98043
LOG LIKELIHOOD	-432.648			HQIC	30.3468
DET (SIGMA_ML	18893.93			SBIC	32.89524
EQUATION	PARMS	RMSE	R-SQ	CHI2	P>CHI2
D_egr	17	2.0462	0.5862	26.9130	0.0494
D_exr	17	0.0904	0.7300	51.367	0.0000
D_inf	17	8.1656	0.5144	20.1291	0.2677
D_exd	17	601.528	0.9274	242.5319	0.0000
D_ddt	17	1.6368	0.2032	4.8466	0.9982

Source: Author (2021)

The results in Table 4.14 indicated that the root mean square error (RMSE) is small (2.045), R-square which measures the percentage at which the independent variables explain the dependent was 58.62 percent. This means that exchange rate, inflation, external and domestic debt explained approximate 58.62 percent of total variation of

economic growth in Kenya. Exchange rate explains 73 percent of the variations in the economic growth, inflations explains 51.44 of the variations, external debt determines highest variation in economic growth at 92.74 while domestic debt explains 20.32 of the variations in economic growth in Kenya during the period of the study. The chi square of 26.913 with a significant probability of 0.0494 showed that VECM model fitted well with low values of information criteria 28.98043.

4.12 Short-Run Vector Error Correction Model

The VECM model was utilized with the specific aim of examining the dynamics in both short-run and long-run relationships. It also illustrates the speed of adjustment, which indicates how quickly the dependent variable responds to changes in the independent variables and moves towards its long-term equilibrium or convergence point after experiencing temporary shocks. In the VECM model, the coefficients of the variables represent the short-run elasticities (Adıgüzel et al., 2013).

The results in Table 4.15 below indicates that ce1 shows the rate of adjustment to long run equilibrium is significant with confident of -1.2294 and p value of ($p = 0.007$) at 5% level meaning that when overall economic growth has risen by a certain percentage point, then all other indicators or variables in question are gradually dropping down and because this value is statistically significant, the estimates suggest swift adjustment to equilibrium. Contrary to this, if the cointegrating equation forecasts are positive, we would suggest that economic growth is above its equilibrium value. From the results in Table 4.15, indicated that it took 0.813 years (1/ce1 = 1/-1.2294) or approximate 10 months for these partial adjustments to fully come to equilibrium.

The constant term does not contain standard errors which affects the z-statistic as well as the p-value. The reason for not having standard errors for fixed parameters in the cointegrating equations is because their identification is accomplished by imposing constraints on them, as these parameters are fixed (Johansen, 1995).

Table 4. 15 : Results for Short-Run Vector Error Correction Model

The short run effects of the study variable on economic growth and the rate of return to long run equilibrium regression results are reported here;

D_egr		Coef.	Std. Err	z	p>|z|
	_Ce1				
	L1.	-1.2294	0.4521	-2.72	0.0e07
	Egr				
	LD	0.6056	0.3961	1.53	0.126
	L2D	0.2364	0.3132	0.75	0.450
	L3D	0.3508	0.2575	1.36	0.173
	Exr				
	LD	-5.7414	6.0724	-0.95	0.344
	L2D	2.8139	4.0966	0.69	0.492
	L3D	-5.2502	5.0259	-1.04	0.296
	Inf				
	LD	0.0142	0.0689	0.21	0.837
	L2D	0.0344	0.0612	0.56	0.574
	L3D	0.0420	0.0596	0.71	0.481
	Exd				
	LD	0.0010	0.0006	1.63	0.104
	L2D	-0.00001	0.0006	-0.02	0.986
	L3D	0.0020	0.0007	3.05	0.002
	Ddt				
	LD	-0.1253	0.3688	-0.34	0.734
	L2D	0.2216	0.3909	0.57	0.571
	L3D	-0.6602	0.4939	-1.34	0.181
	Const	-0.1871	0.6549	-0.29	0.775

Source: Author (2021)

The lagged differences of external debt (EXD) registered a significant coefficient of 0.0010 (p-value 0.104> 0.0500) which shows that for a unit increase in external increases foreign external debt by 0.0010 units although the results are insignificant. These findings are in line with economic theory which indicates that foreign debt is

good if the proceeds of such debt are invested in productive activities that can finance the debt.

In the short run, the lagged differences of external debt (EXD) had a significant coefficient of 0.0020 (p-value 0.002 < 0.0500) at the third lag of indicating that a unit increase in external debt increases economic growth by 0.002 units. These findings are in line with Keynesian theory which advocates for borrowing to induce aggregate demand that through multiplier effects will increase economic growth. The study corroborates with the findings of Senadza, Fiagbe, & Quartey, (2017) on the effect of external debt on economic growth in Sub-Saharan Africa. The study finding showed a negative relationship between external debt and growth among the selected Sub Saharan Countries.

The constant term does not contain standard errors which affects the z-statistic as well as the p-value. This is because the identification of parameters in the co-integrating equations is achieved by constraining some of them to be fixed and fixed parameters do not have standard errors (Johansen, 1995)

4.13 Co-integrating Equations

From the Johanssen' test for integration it was established that the variables were co-integrated of order *I(1)* after first order differencing and therefore it was appropriate to estimate VECM. Unrestricted vector auto regression (VAR) is not applicable in such cases since it was established that there is co-integration among variables and it was necessary to estimate the vector error correction model (VECM). The vector error correction model (VECM) is a special case of VAR which considers the co-integrating relations or the long run relationship among variables. VECM model is system of equations of two or more variables in which all the variables are treated as

endogenous and that there are no exogenous variables and is a restricted VAR model with co-integrating relationships. This meant that there was a long term association among economic growth, external debt, domestic debt, inflation and exchange rate in Kenya. Table 4.16 reports the results of the long run VECM model. The model was appropriate with p>chi2 value of 0.0000 and the Chi2 of 95.7686.

Table 4. 16: Long Term Co-integrating Equations and Hypothesis Testing

The table reports long run effects of the study variables on economic growth

Cointegrating Equations					
Equation	**Parms**	**Chi2**	**p>chi2**		
_ce1	4	95.7686	0.0000		
Identification: Beta is exactly identified					
Johansen Normalization Restriction Imposed					
	Beta	**Coef.**	**Std. Err**	**Z**	**p>|z|**
_ce1					
	Egr	1	.	.	.
	Exr	-0.8280	0.2569	-3.22	0.001
	Inf	0.0551	0.0237	2.33	0.020
	Exd	0.0003	0.0001	3.24	0.001
	Ddt	-0.2664	0.1140	-2.34	0.019
	Constant	-5.9603	.	.	.

Source: Author (2021)

4.13.1 Effect of External Debt on Economic Growth

The results indicated that the coefficient of external debt was positive (0.0003) and significant, P=0.001<0.05. Therefore, the null hypothesis that external debt does not have significant effect on economic growth in Kenya was rejected at 5 percent level of significance. This is in line with Keynesian theory, which promotes deficit spending to spur economic growth during downturns.

This implied that one unit increase in external debt would increase economic growth in Kenya by 0.0003 units in the long run. In support of this sentiment of positive effect, economists have concluded that the principal contributor to economic development in developed countries is foreign borrowing and this only happens when the debt is properly utilized.

This claim has been supported by multiple studies undertaken by Pattillo, et al, Ricci, (2002) and Karagollo et al. (2002). Kenya needs to be cautious concerning the external debt because even though debt is good, the government is advised to borrow and invest wisely (Wray, 2009). This is because accumulating more debts brings negative impacts to the economic growth in the long run and because there are weak debt policies and systems in most developed countries exacerbated by poorly designed international financial architecture. This has caused them to borrow heavily, leading to their economy being eroded (UN, 2009).There is yet to be a definitive finding on the effect of foreign debt on economic development.

In the report on the influence of public debt on both emerging and developed countries' Gross Domestic Product (Oke, (2022). concluded that the association between public debt and economic development differs across nations. Many governments have well-established frameworks that restrict the usage of borrowed funds, contributing to proper use and thus shooting up their economies. This is opposed to those who exploit these funds, which leads to a debt overhang that turns out to be a crisis rather than an advantage. In contrast to developing governments, Saungweme & Odhiambo, (2018) found that the negative effect of external debt on the development of an economy is deeply felt in emerging governments. Developed countries have used their savings to a larger degree to further pay their debt.

Researchers L. A. Sulaiman and Azeez (2012) studied how Nigeria's external debt affected the country's economic growth. The results of the error correction procedure demonstrated that Nigeria's economy had benefited from external debt. According to the report, the government should maintain political and economic stability and should acquire external debt primarily for business-related considerations rather than social or political ones.

The study differed with Ajuh & Oyeanu (2021)'s research on the effect of external debt on economic growth in Nigeria. The research findings showed that the amount of external debt outstanding as well as its service had a negative and significant influence on economic growth. These results implied that economic growth decreased by 0.495 units if the foreign debt stock changed by one unit. The analysis came to the conclusion that Nigeria's external debt stock has hampered economic growth throughout the time period under consideration. The research consequently advocated that policy makers should stick carefully to the appropriate use of debt through efficient investment to boost growth and avoid excessive debt accumulation.

The study's conclusions agreed with those of Thiora, (2021), who examined the impact of Kenya's external debt on economic growth. The results showed that Kenyan economic growth was positively impacted by the stock of external debt while negatively impacted by the services of external debt. Additionally, both elements have a big impact on economic expansion. The analysis comes to the conclusion that Kenya's economic growth is positively impacted by external debt. The research also suggests that the government ensure that loans are directed towards productive sectors, diversify the economy to enable higher revenue creation, encourage capital development, and, where necessary, take on debt in critical capital areas.

4.13.2 Effect of Domestic Debt on Economic Growth

The results showed that the coefficient of domestic debt was negative,-0.2664 and significant, $p = 0.019 < 0.05$. The null hypothesis that domestic debt does not have significant influence on economic growth in Kenya was rejected at the 5 percent level of significance. This implied that one unit increase in external debt would reduce economic growth in Kenya by 0.2664 units in the long run. Further, according to this study, domestic borrowing would cause crowding out effects which in the long run reduce investment from the private sector hence reducing economic growth in the country.

In support of this sentiment of negative impact, economists have concluded that the principal contributor to economic development in developed countries is domestic borrowing and this only happens when the debt is properly utilized. In developing economies, domestic debt is not properly utilized and hence the negative impact. In developing economies, this implied that domestic debt was not utilized properly leading to a reduction of economic growth.

This claim has been supported by multiple studies undertaken by Pattillo *et al*. (2002) and Karagollo *et al*. (2002). It has been demonstrated by Panizza (2007) and Christensen (2005) that domestic public debt is more costly than external debt. This is when policymakers turn to raising interest rates to continue enticing buyers as public domestic debt begins to rise, which increases the expense of managing public debt. Kenya has been carrying out net loan repayments for over a decade, while domestic debt has accumulated steadily over the years (Maana and Mutai, 2008).

There has been a substantial rise in domestic debt between 2001 and 2012, with an alarming amount of 1 trillion. Recently, Kenya's is at treasury bills were Kshs 928.91

billion on 30 September 2019, while treasury bonds were Kshs1.82 trillion. In the other hand, treasury bills fell slightly to Kshs 918.77 billion on 28 August 2020, while treasury bonds rose to Kshs 2.417 trillion. Moreover, the ratio of treasury bills to treasury bonds has changed from 33:64 on 30 September 2019 to 27:71 as of 28 August 2020 because of domestic debt. In September 2019, domestic debt grew from Ksh2,852 trillion to Ksh3,178 trillion in June 2020 (Update, 2020).

According to the most recent CBK weekly bulletin, banks and pension funds have dominated domestic government debt stocks. The share of local debt by financial institutions rose from 53.63 per cent in September 2019 to 54.94 per cent in August 2020. On the other hand, the share of pension funds rose from 28.77 percent in September to 29.37 percent in August 2020. Looking into Kenya's real GDP from early years between 1981 and 1984, declined with the rise in domestic debt, during which economic growth has been seen to rise with the rise in domestic debt and consequently decrease with the rise in domestic debt to its lowest rate, currently less than one in 2000 (Update, 2020).

The study concurs with the research of Njoroge, (2015) in his analysis on the effect of domestic public debt on economic growth in Kenya. The study inferred a negative association between debt and growth, however the data disprove that debt is a direct cause of economic growth. The study recommends, among other things, that the government ensure sure the nation's overall debt is kept as low as possible. If the government must borrow, it should take into account domestic borrowing for the sake of the country's economy.

The study was in line with Babu et al., (2015)'s paper. Their analysis suggested a negative association between debt and growth, however the data disprove that debt is

a direct cause of economic growth. The study recommends that the government should ensure that the nation's overall debt is kept as low as possible. If the government must borrow, it should take into account domestic borrowing for the sake of the country's economy.

According to the study by Matiti, (2013) whose objective of this study was to investigating the relationship between public debt and economic growth in Kenya, the analysis found that domestic borrowing consumed a large percentage of government revenue, endangering the fiscal viability of the government. Domestic debt is more expensive to sustain since its interest rates are greater than those on external debt, which is typically taken out on favorable conditions. Therefore, the government must develop and implement immediate debt reduction plans for domestic debt. Such plans must take into account the possibility that straightforward debt reductions may raise system liquidity and threaten macroeconomic stability.

The study further indicated that market and rollover risks associated with the debt have greatly decreased, despite the greater domestic debt servicing costs brought on by higher yields on longer-dated bonds. Therefore, the government should keep implementing broader reforms that stimulate the purchase of Treasury bonds and motivate institutional investors like pension funds and insurance companies to do the same. For these institutional investors to continue investing in government assets, good corporate governance is also essential.

4.13.3 Effect of Inflation on Economic Growth

Regression analysis in Table 4.16 above as regards coefficient of inflation rate was positive, 0.0551 and significant, $p = 0.020 < 0.05$. Therefore, the null hypothesis relating to inflation rate was rejected at the 5 percent level of significance. This

implied that one unit increase in inflation rate would increase economic growth in Kenya by 0.0551units in the long run. A sound macroeconomic policy that relies on both private and government investment to generate wealth raise production, national income, and wages, minimize inflation and fund the provision of public services is the most powerful instrument for economic development (Saungweme & Mufandaedza, 2013).

The study is consistent with structural economists who believe inflation is beneficial to economic growth, whereas monetarists believe inflation is destructive to economic progress. Both points of view explain why inflation has a good or negative impact on economic growth. Inflation, for example, enhances economic growth by altering the income distribution in favor of greater saving capitalists, according to neoclassical ideas. This boosts savings and, as a result, economic growth. Furthermore, Keynesians claimed that inflation may boost GDP by increasing the rate of profit, hence stimulating private investment (Mamo, 2012).

Nowadays, price stability is necessary in the majority of nations in order to ensure sustained economic growth. One of the primary goals of these countries' macroeconomic policy continues to be maintaining price stability. The relationship between inflation and economic growth is still one of the issues deemed troublesome in the macroeconomic sector since both the growth rate and the global economic rate of inflation are constantly in flux (Kryeziu 2019).

When inflation is kept within reasonable bounds, this does not harm economic expansion. Whereas Sergii (2009) came to the conclusion that the relationship between growth and inflation was firmly coupled with a concept known as the inflation rate, where high inflation tends to impede economic growth and low

inflation promotes it. According to Kryeziu's research, assuming all other factors remain constant, a 1% increase in the inflation rate ratio results in a growth of 22.4% points in the growth rate.

Sargsyan (2005) determined the threshold level of inflation for the Armenian economy for the period 2000-2008 and concluded that it may be helpful for Armenia's growth to target an inflation level higher than the current 3% but not higher than the 4.5% threshold level for the Armenian economy. Kremer, (2009) presented a panel of 63 developed and non-industrial countries with new data on the impact of inflation on long-term economic development. The empirical findings suggest that inflation hinders productivity if it crosses the 2% threshold for developed countries and 12% for non-industrial countries, respectively. It should be noted that, as reported by Kemer, (2009), inflation thresholds in the production of Countries and, thus, the required inflation target amount may be country specific. Inflation-growth nexus thresholds may provide valuable knowledge about the right position and magnitude of inflation.

The findings of this study supported those of Osuala, (2013) who examined the effect of inflation on economic growth in Nigeria. The findings showed that inflation and economic growth in Nigeria had a statistically significant positive association. The relationship between Nigerian inflation and economic growth, however, lacked a leading variable. Since there was no leading variable, the causality investigation of the relationship between inflation and economic growth was contemporaneous. The "terrible era of double digit inflation rate" might also be efficiently used by the Nigerian government to reduce the nation's debt load because there is a strong correlation between inflation and economic growth in that country. In other words, the

government should "inflate away her debt" rather than spend billions of naira negotiating for "debt forgiveness".

According to De Gregorio, (1992), it is simple to identify examples of what policy issues should be avoided when seeking for lessons from Latin American economies that apply to Eastern European countries. Of course, Latin America's persistently high inflation is one of the region's biggest economic issues. Empirical proof shows that Latin America's growth has been significantly hampered by inflation. According to the study, inflationary phenomena are not new but have gotten worse since the mid-'70s. Argentina, Bolivia, Brazil, and Chile all saw average inflation rates above 50% during the time period. The inflation issue has become more severe as a result of the debt crisis and several years of macroeconomic imbalances, and numerous nations are still dealing with it.

Compared to Barro, (2013)'s study on inflation and economic growth, this research indicated different findings. The impact of inflation on economic performance was examined using information for about 100 nations from 1960 to 1990. According to the regression results, a 10 percentage point annual increase in average inflation would have the following effects: a 0.2–0.3 annual drop in the growth rate of real per capita GDP and a 0.4–0.6 annual fall in the ratio of investment to GDP. There is some evidence that these associations represent the causal influences of inflation on growth and investment since the statistical approaches employ reasonable instruments for inflation. However, outcomes that are statistically significant only appear when the sample include instances of extreme inflation. Despite appearing to have a minimal impact, inflation has a significant long-term repercussion on living standards. For instance, it is projected that changing monetary policy to increase the long-term

average inflation rate by 10 percentage points per year will result in a 30-year real GDP level decline of 4-7%, which is more than enough to support a strong interest in price stability.

Ogu et al. (2021) conducted study on the influence of inflation on economic growth in Nigeria. It was discovered that inflation had a minor but favorable impact on economic growth in Nigeria. The research recommended, among other things, the implementation of effective tax policy as well as policy to put invisible hands on the side of consumers.

4.13.3 Exchange Rate on Economic Growth

The results showed that the coefficient of foreign exchange rate was negative,-0.8280 and significant, $p = 0.001 < 0.05$. As a result, the null hypothesis concerning the foreign exchange rate was rejected at the 5% level of significance. This meant that a one-unit rise in external debt would limit Kenyan economic growth by 0.8280 units in the long run.

This study contradicts common knowledge, which holds that there is a link between economic growth and the exchange rate. An increase in exchange rates increases net export volume and, as a result of growing general demand, stimulates economic growth. However, this study supports the claim made by structural economists that the exchange rate and economic growth are inversely related. An increase in exchange rates raises the cost of import production inputs, reducing economic growth, particularly in emerging economies Kenya inclusive where the input structure of production is based on imported capital and intermediate goods (Karahan, 2020).

Bhorat *et al*., (2014) and Huang & Tang, (2015) indicated that it is possible that an exchange rate appreciation will be harmful to job development in tradable industries such as the manufacturing industry. Domestic exports become more costly compared to foreign exports in the wake of an appreciation of the domestic currency. As such, demand for products from the tradable sectors declines, while this effect is greater for exports. Conversely, currency appreciation is beneficial to non-tradable industries, as net importers of inputs are projected to improve production and employment. A depreciation is, in effect, favorable to tradable industries, while an appreciation is negative. The influence of domestic currency appreciation results in a positive job effect for non-tradable sectors, while depreciation has a negative impact on non-tradable sectors. Consequently, this analysis contrasts the changes in the growth of gross jobs with changes in the actual exchange rate and the growth of GDP.

Economic theory suggests that exchange rate fluctuations, result in foreign products and changes in domestic prices, may influence the reallocation of capital within the economic sector (Alexandre et al., 2011). As trade liberalization is characterized by intense demand instability, workflows tend to be extremely vulnerable to shifts in relative prices, exchange rate fluctuations and shocks to firms (Haltiwanger et al., 2004). A depreciation of the exchange rate raises stimulates local productivity growth in the manufacturing and non-manufacturing industries (Yokoyama et al., 2015). Maintaining exchange rate stability helps inreducing high depreciation therefore regulating the level of unemployment in a region (Chimnani et al., 2012).

Stable long-term economic development requires stable trade and foreign exchange markets, in addition to sufficient basic physical capital stocks, to ensure a stable exchange rate regime and favorable terms of trade. Sometimes, however, the

misalignment of actual exchange rates impacts economic development. In foreign exchange rate misalignment in developed countries has also taken the form of overvaluation, which negatively affects tradable commodities by reducing the actual prices of suppliers. For example, real exchange rate misalignment exists in markets where actual exchange rates are not permitted to respond to changes in economic fundamentals (Thapa, 2002), thereby diminishing incentives and income, leading to a reduction in the amount of investment and exports.

The study differs from Sibanda, (2012)'s study on the impact of real exchange rates on economic development in South Africa over the long run. Based on the regression results, it was found that currency undervaluation has a significant negative impact on long-term economic growth, but it can lead to short-term economic growth. However, weakening the currency to achieve short-term growth is not sustainable in the long run. Therefore, the study's findings suggest that currency misalignment, whether it is overvaluation or undervaluation, should be avoided to ensure stable and sustainable economic growth.

This study aligns with the findings of Iheanachor & Ozegbe (2021), who also conducted research on the effects of exchange rate on Nigeria's economic performance. The motivation behind their study was to understand why the efforts of Nigeria's monetary authorities to achieve internal and external balances did not yield significant positive results in recent times. Both studies' empirical findings demonstrated that the exchange rate has a significant negative impact on Nigeria's economic growth in the long run. The report offers specific measures for the Nigerian economy based on these empirical findings. To begin, there should be a greater emphasis on agricultural export diversification and increased investment in the agro-

industry. Secondly, the government should implement credible reforms to influence the foreign exchange system and reduce the adverse effects of an unstable exchange rate on the Nigerian economy. Adopting these recommendations may better position Nigeria to overcome the problems provided by exchange rate volatility and generate more sustainable economic growth.

The study adds to Ewubare and Ushie's (2022) research on Exchange Rate and Economic Growth in Nigeria. The data show that the exchange rate and inflation have a negative impact on economic growth. This result shows that rising exchange rates and prices are harmful to economic growth. Based on the findings, this study recommends, among other things, that the federal government provide consistent exchange rate policy in order to provide the opportunity for a realistic and stable exchange rate capable of stimulating economic growth in Nigeria.

The study also backs up Kogid and Loganathan's (2012) findings on the effect of exchange rates on economic growth. Both nominal and real exchange rates are thought to benefit economic growth. Given the importance of exchange rate components, particularly the real term, our findings imply that a systematic exchange rate via monetary policy should be effectively created to improve the stability and sustainability of Kenya’s economic growth.

4.14 Granger Causality

Granger-causality occurs when previous values of variable x can be utilized to predict future values of variable y, given past values of y. The ability to predict future values is particularly significant in this study as it involves economic variables that are nonstationary at the initial level but stationary after differencing.

During the Wald test, the lags of the variables in the excluded column are set to zero in the equation column. This implies that the coefficients of variable x will be zero in the equation, allowing for Granger causality tests. The null hypothesis of these tests is that the coefficients of past values in the regression equation are zero, indicating the absence of Granger causality.

Table 4.17 shows the model regression findings among the variables exchange rate, inflation, external debt, and domestic debt with p values 0.300, 0.876. 0.386, 0.594, 0.467 and including all at 0.467 respectively are less than 0.005 therefore, the null hypothesis that selected macroeconomic variables does not granger cause economic growth was accepted at 5% level of significance.

Similarly, the table indicates that no any other variable granger cause the other at 5% level of significance therefore the null hypothesis of no granger causality was also accepted apart from external debt which granger causes domestic debt and all the variably jointly granger cause external debt at 5% level of significance as indicated in Table 4.17 below.

Table 4. 17: Wald Test Granger Causality

The regression results on the causation among the study variables are indicated in the table below;

Equation	Excluded	Chi2	Df	Prob > chi2
egr	exr	2.41	2	0.300
egr	inf	.26533	2	0.876
egr	exd	.75298	1	0.386
egr	ddt	1.0432	2	0.594
egr	ALL	6.6456	7	0.476
exr	egr	4.6708	2	0.097
exr	inf	.86733	2	0.648
exr	exd	3.3362	2	0.189
exr	ddt	.99251	2	0.609
exr	ALL	8.3953	7	0.299
inf	egr	.47231	2	0.790
inf	exr	4.4801	2	0.106
inf	exd	2.0445	2	0.360
inf	ddt	.0694	2	0.966
inf	ALL	6.3785	2	0.496
exd	egr	3.0612	2	0.216
exd	exr	.3831	2	0.826
exd	inf	.5123	2	0.774
exd	ddt	1.145	2	0.564
exd	ALL	5.742	8	0.676
ddt	egr	.85887	2	0.651
ddt	exr	3.0402	2	0.219
ddt	inf	1.1756	2	0.556
ddt	exd	15.37	2	0.000
ddt	ALL	20.007	8	0.010

Source: Research Data, 2022

Given the study used economic variables which are nonstationary at level but stationary at first difference, future prediction of values of the variables in the system is very important. Therefore, study utilized impulse responses for model prediction when a variable is presented with an external shock in the system.

4.15 Impulse Response Functions

The aforementioned Granger causality may not fully account for all system interactions. The comprehension of the causal relationship between variables will be

enhanced by knowing how one variable responds to an impulse produced by another variable in a system that may contain many other variables. Tracing the path of an external shock to one system variable and its impact on any or all other system endogenous variables allows for the identification of the reaction. If the variable with the impulse does not Granger Cause the set of all the other variables in that system, the impulse effect is absent (Lutkepohl, 2013).

According to Lutkepohl (2013), in the case of stationary variables I(0), impulses have non-permanent consequences. However, with temporal horizon, non-stationary integrated variables I(1), they produce effects to variables that are permanent in nature that is there is always a non-zero end indicated by the responses.

The figure below 4.11 shows the response of the study's variable of interest i.e. economic growth to the shock or innovation into the dynamic system by domestic debt, inflation, external debt and exchange rate. For instance if there is a standard deviation shock to domestic debt economic growth during the short run period will increase sharply then decrease. This is consistent with economic theory because credit obtained locally in the near run is being invested, but the advantages will be outweighed by the high interest rate paid back between periods one and four. After that, assuming no governmental interventions to restore the levels between periods 4 and 10, there will be constant then negative consequences in the long run before leveling off. This implies that that with innovations into the economy like liquidity crisis in the banking system, unpredictable changes in monetary policies, however much the government may obtain the credit internally it will not trigger any economic growth. Eventually as confirmed by the VECM model it will have negative implications to economic growth.

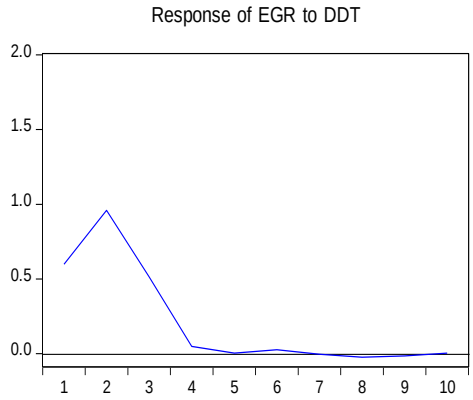
The impulse from one standard deviation shock on inflation in the system causes economic growth to rise lightly for one period to third period and sharply decline to the fifth period before leveling off. From period five on, the long-term impact of the inflation shock on economic growth will be negative. The study model showed that, at low levels, inflation had beneficial benefits on economic growth, which is consistent with economic theory. According to the Phillips curve, a rise in inflation at low levels reduces unemployment, which has a cascading effect on economic growth (Alisa 2015).

External debt standard deviation shock generates a dramatic boost in economic growth up to period two, then a steady drop to period four before another increase and finally leveling out up to period eight. In the long run, the impacts of an external debt shock promote economic growth. As a result, it is possible to deduce that a one standard deviation shock has an asymmetric effect.

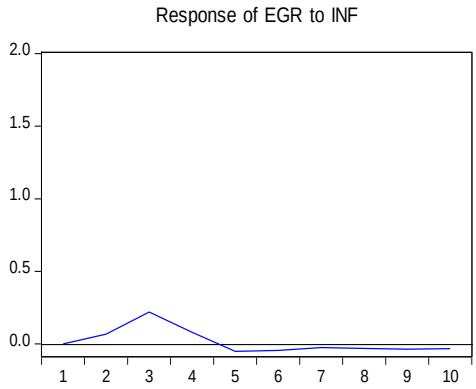
The figure 4.11 depicts that in the short run there is an increase in economic growth due to a standard deviation shock in exchange rate. Similar effects are also revealed in the long run. Therefore innovations to exchange rate will have positive effects both in short run and long run at 5% level of significance.

The impulse from economic growth to itself causes it to fall in the short run before slightly rising then falling and leveling off in the negative zone in the long run levels off. Generally a standard deviation shock of economic growth to economic growth will have negative effects in the short run and in the long run. This implies that our economic growth is not stable.

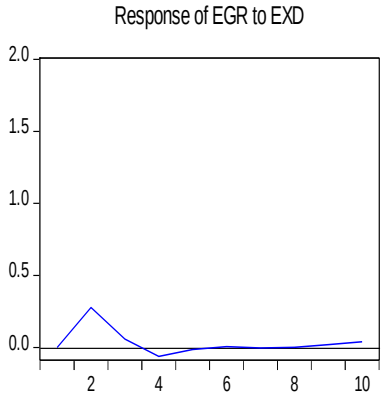
Response to Cholesky One S.D. (d.f. adjusted) Innovations



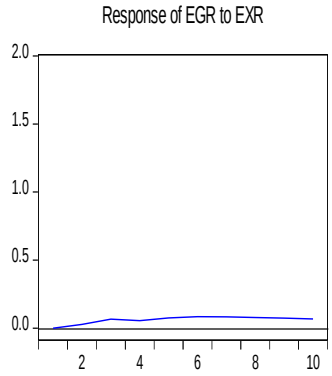
Response to Cholesky One S.D. (d.f. adjusted) Innovations



Response to Cholesky One S.D. (d.f. adjusted) Innovations



Response to Cholesky One S.D. (d.f. adjusted) Innovations



Response to Cholesky One S.D. (d.f. adjusted) Innovations

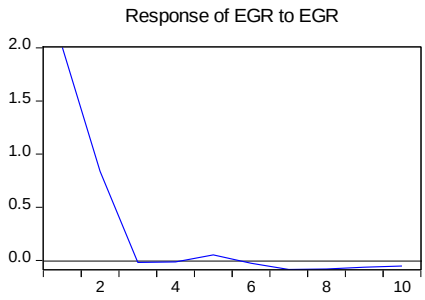


Figure 4. 11: Impulse Response Functions

Source: Author (2021)

4.16 Summary of Hypotheses Tested

Applying VECM which is the restricted VAR was used in testing the stated hypotheses in various sections in this study and the summary of the results were as follows:

Table 4. 18: Summary of the Hypothesis Tested

Hypothesis testing using long run regression VECM model is summarized in the table below;

Hypothesis	β-Value	P-Value	Decision
HO_1: External debt does not have significant influence on economic growth in Kenya	0.0003	0.001<0.05	Rejected
HO_2: Domestic debt does not have significant influence on economic growth in Kenya.	-02664	0.019<0.05	Rejected
HO_3: Inflation has no significant effect on economic growth in Kenya	0.0551	0.020<0.05	Rejected
HO_4: foreign exchange does not significantly affect economic growth in Kenya	-0.8280	0.001<0.05	Rejected

Source: Research Data, 2022

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Overview

The fundamental focus of this section is to highlight some of the findings, conclusion about the results, recommendations based on objectives and finally some of the suggestions regarding further researchers.

5.2 Summary of Findings

The first part of the analysis was to describe the behavioral characteristics of the data concerning the measures of central tendencies. Descriptive statistics was computed to have a general view of the sample size and to simplify large data set in sensible manner. The descriptive statistics summary of the sample data includes standard deviation, minimum, and maximum values. The study revealed that over the observation period, economic growth exhibited an average annual growth rate of 3.97 percent. The lowest recorded growth rate was approximately -0.799 percent, while the highest growth rate reached 8.41 percent. These figures indicate a positive trend in Kenya's economic development, attributed to significant economic, structural, and political reforms that have driven and sustained its growth.

However, the presence of a negative growth percentage indicates that Kenya still faces some development challenges, including issues such as poverty, political instability, inequality, and the impact of climate change. These challenges have affected private sector investment and left the economy vulnerable in certain aspects.

Despite these challenges, Kenya possesses promising potential to become one of Africa's success stories. This potential is attributed to factors such as a growing youthful population, a dynamic private sector, a highly skilled workforce, improved

infrastructure, a new constitution, and its pivotal role in the East African region. By harnessing these strengths and addressing the identified challenges, Kenya can continue its journey towards sustained and inclusive economic growth.

Kenya has had on average domestic debt of 5,812,027 million US Dollars. For the period 1980 to 1982, the Kenya's domestic debt was relatively constant. However, between 1984 and 1990 it showed some upward trend and a sharp decline in 1992. For the period 1990 to 2000s, it showed a relatively constant growth. The period between 2000 and 2015 saw a rapid increase in Kenya domestic debt and this is linked to expansionary fiscal policies for instance that led to increase in treasury bonds and bills from Kshs 402, 688.35 million in 2009 to Kshs 1072319.75 in 2015.

The highest inflation rate was between 1992 and 1993 at approximately 45.97 percent. This was instigated by insufficient policy reforms and inconsistency in policy implementation and financial mismanagement. Further, political turmoil of 1992 due to tumult for the transition of multiparty politics in Kenya. This led to low investor confidence, the depreciation of Kenya currency and low aggregate demand.

Test for stationarity was key in this study, conventional unit tests in times series such as Phillips-Perron and Augmented Dickey Fuller unit root tests were applied. Zivot Andrews test was used to check for unit in presence of structural breaks. Results showed that using Phillip Perron test, all the variables except inflation and economic growth had unit root at levels. But after first order differencing all variables were stationarity. Further, the results were supported by ADF test. The optimum number of lags chosen as suggested by minimal AIC was 4. Long run relationship existed after determining the number of cointegrating relationship. This is after confirmation of 3 cointegrating equations suggested by Johannsen's test.

Several multivariate linear regression assumptions such as normality, multicollinearity, and heteroskedasticity were tested. Normality assumption was tested using Jarque- Bera and results showed that the data followed a normal distribution. VIF was used to test multicollinearity. Results showed the average VIF value was 4 which is below 10 and, in this case, no collinear relationship between the predictor variables. Breusch-Pagan-Godfrey test for Heteroscedasticity, is a Chi2 test had a value of 0.06 and probability of 0.8094 which is greater than 0.05 hence the null hypothesis of constant variance was accepted, and the study concluded that the variance is constant (homoscedastic).

Because cointegrating relationship was present, a confirmation of long run relationship between independent variables on dependent variable, VEC model was estimated. From the output, the root mean square error (RMSE) is small (2.045), R-square which measures the percentage at which the independent variables explain the dependent was 58.62 percent. This means that exchange rate, inflation, external and domestic debt explained approximate 58.62 percent of total variation of economic growth in Kenya. The chi square of 26.913 and its significant probability of 0.0494 shows that VECM model fits well. The ce1 value of -1.2294 ($p = 0.007$) is the coefficient of cointegration.

The coefficient of ce1 is estimated at -1.2294 and this means that when overall economic growth has risen by a certain percentage point, then all other indicators or variables in the study are gradually dropping down and because this value is statistically significant, the estimates suggest swift adjustment to equilibrium. Contrary to this, if the cointegrating equation forecasts are positive, we would suggest that economic growth is above its equilibrium value. From the results, it took 0.813

years (1/ce1 = 1/1.2294) or approximate 10 months for these partial adjustments to fully come to equilibrium. Results from VEC model indicated that external debt positively ($\beta = .00029$) and significantly ($p = 0.001$) influenced economic growth in Kenya. This implies that any increment of external debt in Kenya over the last years under this study have had an impact of economic growth by 0.00029. Domestic debt negatively and significant to affect economic growth with coefficient $\beta = -0.2664$ and $p = 0.019$ meaning any increase in domestic borrowing rate by a unit would reduce economic growth by -0.2664 units. This implies that Kenya's domestic borrowing has not contributed to its economic growth.

Further, inflation a positive and significant effects to economic growth ($\beta = 0.0551, p = 0.020$). This could be attributed to the fact that the value of debt is decreased by a modest inflation rate. The actual value of debt rises when there is unemployment, leading to a squeeze on disposable incomes. Moderate inflation rates allow prices to change and commodities to meet their true price. Foreign exchange rate does not have significant influence on economic growth in Kenya. The results vector correction model showed that exchange rate significantly affected the economic growth in Kenya with coefficient $\beta = -0.8280$ ($p = 0.00$). This implied economically that any increase in exchange rate by a unit causes a reduction of economic growth by -0.8280 units. It is an indication that strengthening of the exchange rate allows real GDP to grow slower because of a decline in net exports and an increase in import demand. A higher exchange rate will also have a negative multiplier effect on the economy.

5.3 Conclusions

The study investigated the liaison of Kenya's external and domestic debt, exchange rate, and inflation on economic growth. From the results it can be concluded that external debt would have a favorable effect on the borrowing country's economy if the marginal output of an available external debt is greater than or equal to the principal and interest payment. In support of these sentiments of positive impact, economists have concluded that the principal contributor to economic development in developed countries is foreign borrowing and this only happens when the debt is properly utilized. Though external debt was found to be positively affecting economic growth over the study period, there is a threshold on how the government should regulate borrowing because external debt affects economic growth. Increasing in debt borrowing will raise government spending and if this is not properly utilized will affect the external investors. Typically, investors assess risk by comparing debt to a country's overall economic production. The debt-to-GDP ratio indicates the likelihood of a government repaying its debt and if this ration is higher it is not a good indicator for investors in any economy.

This, in essence, would necessitate the use of external borrowing in profitable industries and basic infrastructure to improve the competitiveness of other sectors. External debt servicing has little effect on economic development in this scenario. However, if Kenya failed to service its debt, it will lose its' credit worthiness; and this in turn might affect the economic performance by reducing the availability of foreign debt. As interest rates rise, it becomes more expensive for a country to refinance its existing debt. In time, taxes increase to go toward debt repayment, and less toward government services.

Domestic debt had a negative and significant effect on economic growth in Kenya. This implied that domestic borrowing would result in crowding out effects such that private investors would be negatively affecting hence not able to in invest in the country. As a result of this economic growth in Kenya would reduce considering that private sector is not investing hence production of goods and services would be curtailed.

Inflation had a statistically significant positive impact on GDP growth, but when inflation is high, this positive relationship can start declining. When inflation rises above a certain level, economic growth is expected to slow. The result may be useful for monetary decision makers in this sense that to keep inflation rate below the threshold level of 11.80 percent (mean inflation rate) for preventing its negative effect on economic growth. Though moderate inflation is good to the economy, high inflation is dangerous for the economy as well. There are many ways for policymakers to direct the economy along a direction of steady growth without high inflation: monetary policy and fiscal policy.

5.4 Theoretical Implications of the Study

The research aligns with established theories and prior empirical work in the current body of literature. It validates the conclusions reached by several scholars regarding the dynamics of selected macroeconomic variables and their impact on economic growth in Kenya. The Keynesian approach of boosting economic growth through government spending proves effective for the Kenyan economy, as the outcomes correlates this perspective. Therefore, the study expands on the Keynesian theory, which advocates for government intervention in the economy through fiscal and monetary policies to attain the desired level of employment and output in an economy

5.5 Policy Implications

The study's findings reveal that the increase in domestic debt in Kenya over the study period has a negative and significant influence on economic growth. As a result, the study suggests that the Kenyan government should consider reducing domestic borrowing to mitigate the negative effects on long-term economic growth. This step is crucial to prevent crowding out in the economy, wherein the private sector may reduce its investment due to the increased presence of government borrowing. By managing domestic debt more prudently, the government can foster an environment conducive to sustained and robust economic growth.

The results showed that external debt had a positive and significant effect, which could mean that if external borrowing was employed as intended in the borrowing plans, it could contribute to improved economic growth in Kenya.

Results showed that inflation had a positive and significant effect to economic growth. However as revealed by impulse function any shock will have negative implication to economic growth. A key goal of Kenyan economic policy should be to control the volatility of inflation. The government needs to think of ways to increase supply. By leveraging investment into import-substituting goods to regulate prices, structural adjustments should be put into place to increase domestic output. The study therefore recommends that the government should encourage an equilibrium inflation rate.

The study found out that foreign exchange rate had a negative effect on economic growth in Kenya, therefore, macroeconomic policies that strengthens the stability of Kenya’s exchange rate against the major world trading currencies should be encouraged. In order to promote economic growth, policymakers in CBK may adopt

measures that preserve and sustain stability in the exchange rate to prevent volatility, including the introduction of high tariffs to deter product imports. Diversifying exports should be a priority, and programs like EPZ that offer free exportation of taxes are welcomed.

5.6 Contribution to Knowledge

In Kenya, while external debt would increase economic growth, domestic borrowing would reduce economic growth. This contribution would lead to utilizing prudently the external debt especially the ones with stringent measures with detailed and expressed usage of the borrowed funds. The external borrowing could be utilized with assurance that the funds borrowed are used for the intended purpose.

Macroeconomic variables and their contribution to economic growth has generated a lot of debate in the last two decades. Most studies have concentrated on how each macroeconomic component affects economic growth in general, rather than how they affect economic growth specifically. Furthermore, this type of literature is scarce in Kenya. Furthermore, there are conflicting conclusions regarding how macroeconomic variables influence economic growth. The research findings contribute to the current literature on economic growth, making them useful elements of information for academia. As a result, the study adds to the expanding body of knowledge about the relationship between selected macroeconomic variables and economic growth.

The study backs up accepted hypotheses and adds empirical data to the body of knowledge. The study supports previous research on the correlation between some selected macroeconomic factors' dynamics and Kenya's economic growth, albeit it still has significant discrepancies with other studies as indicated. The study advances Keynesian theory that justifies government intervention through public policies such

as borrowing that aim to attain full employment and price stability. The study too extends Solow growth theory that has tried to respond to one of the major growth economic mysteries. The theory advocates for favorable economic policies, to address the issue of economic growth.

5.7 Limitations of the Study

In conducting this research study, several challenges were encountered. One of the most notable challenges was the incomplete information from some sources. For instance, some of the sources had information for up to the year 2018 while the study period was up to 2019. However, this limitation was solved by finding using data from various sources.

The rebasing of the economic growth estimates by National Treasury. This was done by changing the base year from 2009 to 2016 during the study period. The structure of the economy is now more diversified than before. Previously, the agriculture sector and tourism sector dominated the economy. With the rebasing, new sectors like manufacturing, service industry and technology largely contribute to Kenya's economic growth among other sectors. This has got the effect of adjusting estimates of economic growth.

5.8 Areas for Further Research

This study is limited to external debt, inflation, exchange rate and domestic debt in Kenya. Similar study could be extended to East Africa or sub Saharan Africa region subject to data availability for all variables. This study spanned the years 1980 to 2019. There is a need to include more recent years data for the years 2020 and 2021 in the analysis.

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APPENDICES

Appendix 1: Do Files

```
use "C:\Users\ADMIN\Desktop\KITUM\KITUM DATA.dta", clear

. sum

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        year |        40      1999.5    11.69045       1980       2019
         ddt |        40     5812027     8073803   12250.54   3.36e+07
         exd |        40    9.37e+09    7.30e+09   3.23e+09   3.42e+10
         inf |        40    11.80326    8.526401   1.554328   45.97888
         exr |        40    58.00777    31.43399   7.420187   103.4109
-------------+--------------------------------------------------------
         egr |        40    3.970454    2.284124   -.799494   8.405699

pwcorr  ddt exd inf exr egr, obs sig


             |      ddt      exd      inf      exr      egr
-------------+-------------------------------------------
         ddt |   1.0000
             |
         exd |   0.9027   1.0000
             |   0.0000
         inf |  -0.3116  -0.2689   1.0000
             |   0.0503   0.0934
         exr |   0.5614   0.6824  -0.2835   1.0000
             |   0.0002   0.0000   0.0763
         egr |   0.4268   0.3289  -0.5099   0.2200   1.0000
             |   0.0060   0.0383   0.0008   0.1726
```

pperron ddt

Phillips-Perron test for unit root Number of obs = 39

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ---------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) 2.367	-18.152	-12.948	-10.480
Z(t) 0.689	-3.655	-2.961	-2.613

MacKinnon approximate p-value for Z(t) = 0.9896

pperron exd

Phillips-Perron test for unit root Number of obs = 39

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ---------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) 7.027	-18.152	-12.948	-10.480
Z(t) 1.900	-3.655	-2.961	-2.613

MacKinnon approximate p-value for Z(t) = 1.0000

pperron inf

Phillips-Perron test for unit root Number of obs = 39

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ---------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) -19.053	-18.152	-12.948	-10.480
Z(t) -3.430	-3.655	-2.961	-2.613

```
------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0100
```

pperron exr

```
Phillips-Perron test for unit root                Number of obs   =        39
                                                  Newey-West lags =         3
                                 ---------- Interpolated Dickey-Fuller ---------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
 Z(rho)           -0.898           -18.152           -12.948          -10.480
 Z(t)             -0.837            -3.655            -2.961           -2.613
------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.8080
```

pperron egr

```
Phillips-Perron test for unit root                Number of obs   =        39
                                                  Newey-West lags =         3
                                 ---------- Interpolated Dickey-Fuller ---------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
 Z(rho)          -20.173           -18.152           -12.948          -10.480
 Z(t)             -3.563            -3.655            -2.961           -2.613
------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0065
```

dfuller ddt

```
Dickey-Fuller test for unit root                  Number of obs   =        39
                                 ---------- Interpolated Dickey-Fuller ---------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
 Z(t)             -0.293            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
```

```
MacKinnon approximate p-value for Z(t) = 0.9265
```

dfuller exd

```
Dickey-Fuller test for unit root                  Number of obs   =        39

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------

 Z(t)              8.873            -3.655            -2.961           -2.613

------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 1.0000
```

dfuller inf

```
Dickey-Fuller test for unit root                  Number of obs   =        39

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value

------------------------------------------------------------------------------

 Z(t)             -3.436            -3.655            -2.961           -2.613

------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0098
```

dfuller exr

```
Dickey-Fuller test for unit root                  Number of obs   =        39

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------

 Z(t)             -0.842            -3.655            -2.961           -2.613

------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.8064
```

dfuller egr

```
Dickey-Fuller test for unit root                   Number of obs   =        39

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------

 Z(t)             -3.519            -3.655            -2.961           -2.613

------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0075
```

UNIT ROOT TEST AT FIRST DIFFRENCE

pperron dddt

```
Phillips-Perron test for unit root                 Number of obs   =        38

                                                   Newey-West lags =         3

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------

 Z(rho)          -5.468           -18.084           -12.916           -10.460

 Z(t)             -1.438            -3.662           -2.964            -2.614----------
------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.5641
```

pperron dinf

```
Phillips-Perron test for unit root                 Number of obs   =        38

                                                   Newey-West lags =         3

                              ---------- Interpolated Dickey-Fuller ---------

                 Test         1% Critical       5% Critical      10% Critical

               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------

Z(rho)          -36.781           -18.084           -12.916           -10.460

Z(t)             -7.546            -3.662            -2.964            -2.614

------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0000
```

pperron dexd

```
Phillips-Perron test for unit root                Number of obs   =        38
                                                  Newey-West lags =         3
                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
 Z(rho)          -5.468          -18.084           -12.916           -10.460
 Z(t)            -6.438           -3.662            -2.964            -2.614----------
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

pperron dexr

```
Phillips-Perron test for unit root                Number of obs   =        38
                                                 Newey-West lags =         3
                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(rho)         -34.738          -18.084           -12.916           -10.460
Z(t)            -5.789           -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

pperron degr

```
Phillips-Perron test for unit root                Number of obs   =        38
                                                  Newey-West lags =         3
                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(rho)         -35.760          -18.084           -12.916           -10.460
Z(t)            -7.378           -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

dfuller dddt

```
Dickey-Fuller test for unit root                   Number of obs   =        38

                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(t)             -7.813           -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

dfuller dinf

```
Dickey-Fuller test for unit root                   Number of obs   =        38

                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(t)             -7.065           -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

dfuller dexd

```
Dickey-Fuller test for unit root                   Number of obs   =        38

                                ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
Z(t)             -1.813           -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.3740
```

dfuller dexr

```
Dickey-Fuller test for unit root                   Number of obs   =        38

                                 ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(t)             -5.800            -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

dfuller degr

```
Dickey-Fuller test for unit root                   Number of obs   =        38

                                 ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value----------
------------------------------------------------------------------------------
Z(t)             -6.924            -3.662            -2.964            -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

TEST FOR UNIT ROOT WITH STRUCTURAL BREAKSUSING ZIVOT ANDREWS TEST

zandrews ddt

```
Zivot-Andrews unit root test for  ddt
Allowing for break in intercept
Lag selection via TTest: lags of D.ddt included = 1
Minimum t-statistic -1.528 at 1991  (obs 12)
Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```

zandrews exd

```
Zivot-Andrews unit root test for  exd
Allowing for break in intercept
```

```
Lag selection via TTest: lags of D.exd included = 0

Minimum t-statistic  1.905 at 2013  (obs 34)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```

zandrews inf

```
Zivot-Andrews unit root test for  inf

Allowing for break in intercept

Lag selection via TTest: lags of D.inf included = 0

Minimum t-statistic -4.432 at 1995  (obs 16)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```

zandrews exr

```
Zivot-Andrews unit root test for  exr

Allowing for break in intercept

Lag selection via TTest: lags of D.exr included = 0

Minimum t-statistic -4.394 at 1993  (obs 14)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```

zandrews egr

```
Zivot-Andrews unit root test for  egr

Allowing for break in intercept

Lag selection via TTest: lags of D.egr included = 0

Minimum t-statistic -5.120 at 1991  (obs 12)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```

ZIVOT ANDREWS GRAPHS

zandrews ddt, graph

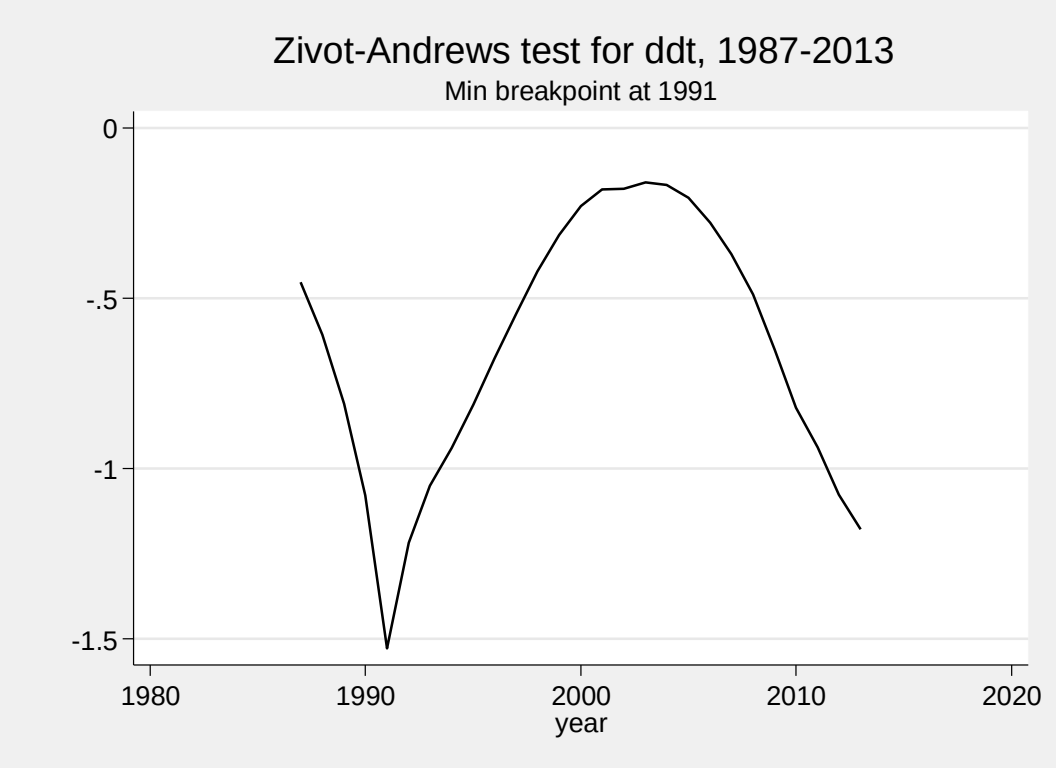
```
Zivot-Andrews unit root test for  ddt

Allowing for break in intercept

Lag selection via TTest: lags of D.ddt included = 1

Minimum t-statistic -1.528 at 1991  (obs 12)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```



zandrews exd, graph

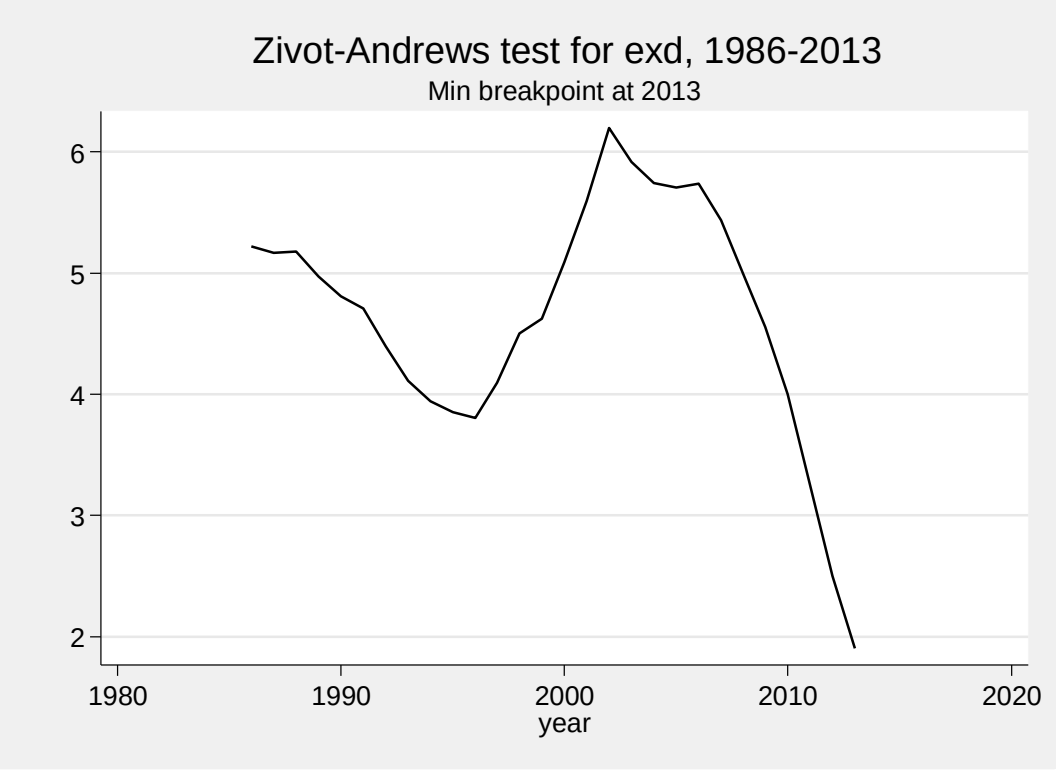
```
Zivot-Andrews unit root test for  exd

Allowing for break in intercept

Lag selection via TTest: lags of D.exd included = 0

Minimum t-statistic  1.905 at 2013  (obs 34)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```



zandrews inf, graph

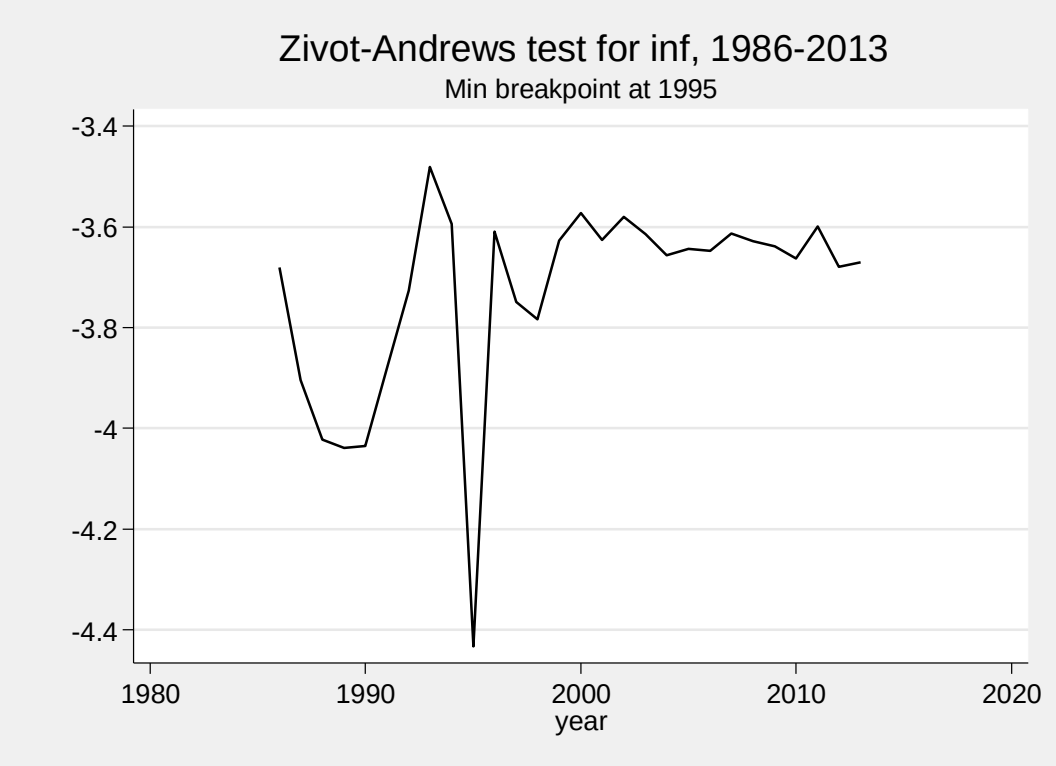
```
Zivot-Andrews unit root test for  inf

Allowing for break in intercept

Lag selection via TTest: lags of D.inf included = 0

Minimum t-statistic -4.432 at 1995  (obs 16)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```



zandrews exr, graph

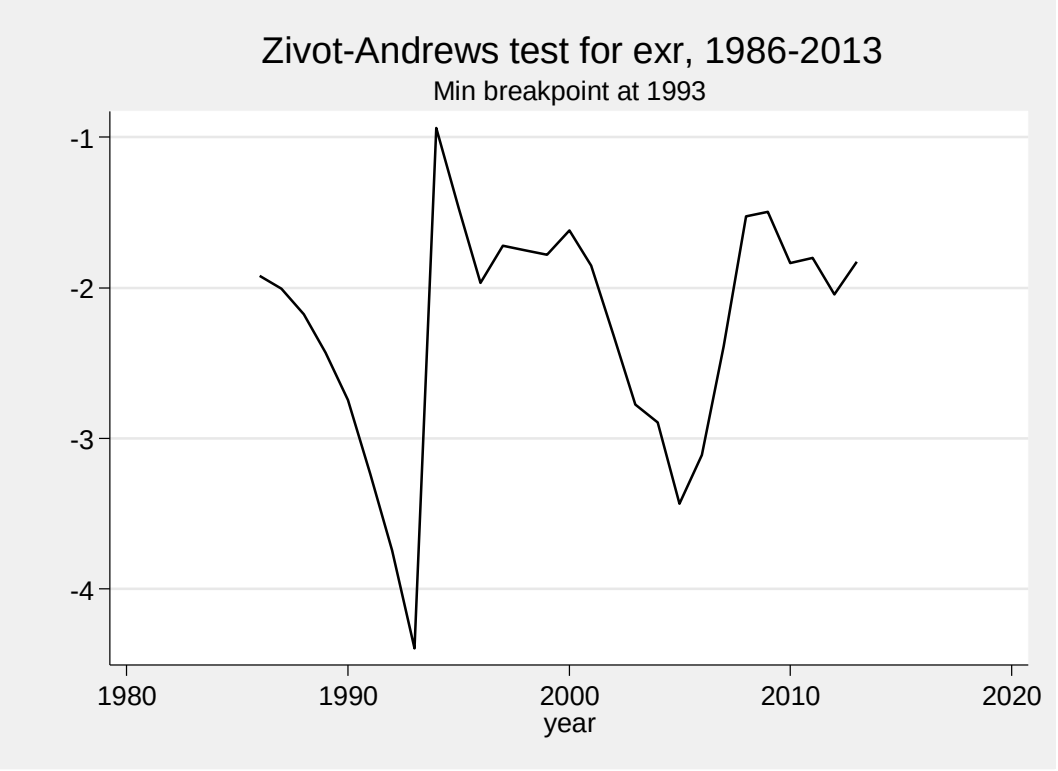
```
Zivot-Andrews unit root test for  exr

Allowing for break in intercept

Lag selection via TTest: lags of D.exr included = 0

Minimum t-statistic -4.394 at 1993  (obs 14)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```



zandrews egr, graph

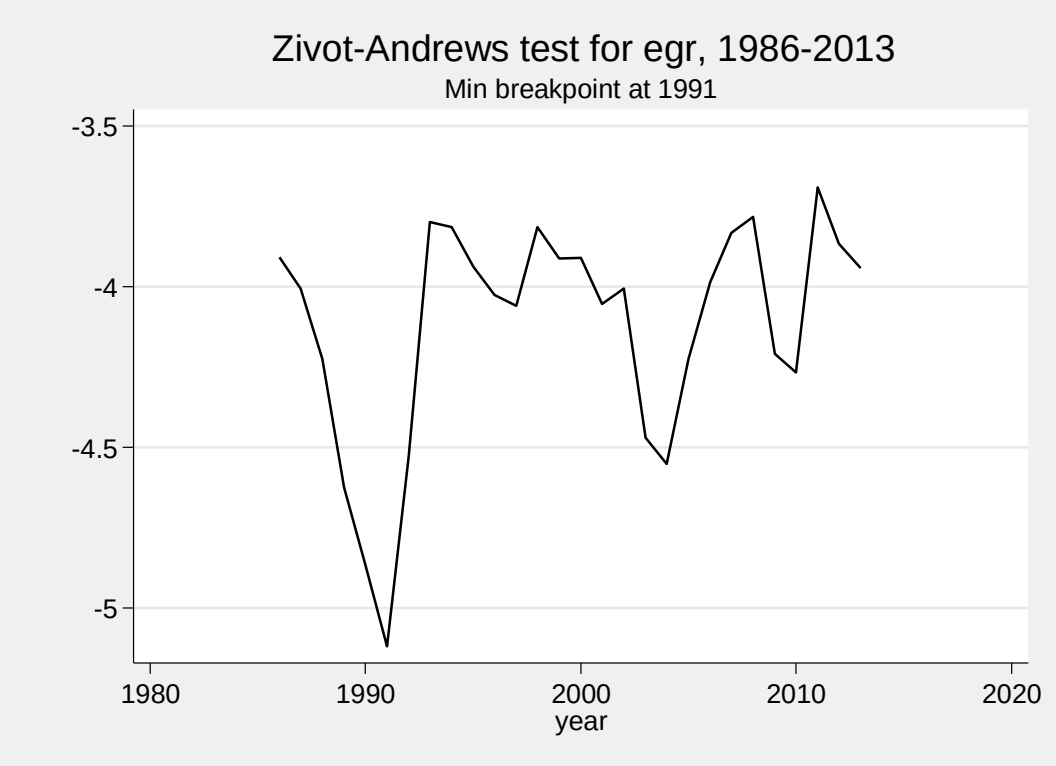
```
Zivot-Andrews unit root test for  egr

Allowing for break in intercept

Lag selection via TTest: lags of D.egr included = 0

Minimum t-statistic -5.120 at 1991  (obs 12)

Critical values: 1%: -5.34 5%: -4.80 10%: -4.58
```



Vector error-correction model

Sample: 1984 - 2019	No. of obs	=	36
	AIC	=	28.98043
Log likelihood = -432.6477	HQIC	=	30.3468
Det(Sigma_ml) = 18893.93	SBIC	=	32.89524

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_egr	17	2.04615	0.5862	26.91303	0.0594
D_lexr	17	.090408	0.7300	51.367	0.0000
D_inf	17	8.16558	0.5144	20.12914	0.2677
D_lexd	17	601.528	0.9274	242.5319	0.0000
D_lddt	17	1.63675	0.2032	4.846592	0.9982

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_egr						
_ce1						
L1.	-1.229375	.4521429	-2.72	0.007	-2.115559	-.3431916
egr						
LD.	.6055703	.3960781	1.53	0.126	-.1707286	1.381869
L2D.	.2364074	.313157	0.75	0.450	-.3773691	.8501838
L3D.	.3507745	.257503	1.36	0.173	-.1539222	.8554711
lexr						
LD.	-5.7414	6.072407	-0.95	0.344	-17.6431	6.1603
L2D.	2.813918	4.099604	0.69	0.492	-5.221158	10.84899
L3D.	-5.250203	5.025956	-1.04	0.296	-15.1009	4.60049
inf						
LD.	.0142219	.0689701	0.21	0.837	-.120957	.1494009
L2D.	.0343979	.0611727	0.56	0.574	-.0854983	.1542941
L3D.	.0420404	.059605	0.71	0.481	-.0747832	.1588639
lexd						
LD.	.0010262	.0006305	1.63	0.104	-.0002095	.002262
L2D.	-.0000102	.0005826	-0.02	0.986	-.001152	.0011317
L3D.	.0020467	.0006718	3.05	0.002	.00073	.0033635
lddt						
LD.	-.1252977	.3688292	-0.34	0.734	-.8481895	.5975942
L2D.	.2215775	.3909503	0.57	0.571	-.544671	.987826

```
        L3D. |  -.6601698   .4939244    -1.34   0.181    -1.628244    .3079042
             |
       _cons |  -.1871271   .6548968    -0.29   0.775    -1.470701    1.096447
-------------+----------------------------------------------------------------
D_lexr       |
        _ce1 |
         L1. |  -.0322866   .0199776    -1.62   0.106    -.0714419    .0068687
             |
         egr |
         LD. |   .0094705   .0175004     0.54   0.588    -.0248296    .0437707
        L2D. |  -.0072242   .0138366    -0.52   0.602    -.0343435     .019895
        L3D. |  -.0045062   .0113776    -0.40   0.692    -.0268058    .0177935
             |
        lexr |
         LD. |  -.1597112   .2683045    -0.60   0.552    -.6855784    .3661561
        L2D. |  -.0158851   .1811378    -0.09   0.930    -.3709086    .3391384
        L3D. |   .0573537   .2220679     0.26   0.796    -.3778914    .4925988
             |
         inf |
         LD. |    .001565   .0030474     0.51   0.608    -.0044078    .0075377
        L2D. |  -.0033002   .0027029    -1.22   0.222    -.0085977    .0019974
        L3D. |   .0004385   .0026336     0.17   0.868    -.0047232    .0056003
             |
        lexd |
         LD. |   6.18e-06   .0000279     0.22   0.824    -.0000484    .0000608
        L2D. |   .0000528   .0000257     2.05   0.040     2.33e-06    .0001032
        L3D. |   6.86e-06   .0000297     0.23   0.817    -.0000513     .000065
             |
        lddt |
         LD. |  -.0189626   .0162964    -1.16   0.245     -.050903    .0129778
```

```
        L2D. |  -.0526244   .0172738    -3.05   0.002    -.0864804   -.0187683
        L3D. |   -.006596   .0218237    -0.30   0.762    -.0493696    .0361776
             |
       _cons |   .0611207   .0289361     2.11   0.035      .004407    .1178344
-------------+------------------------------------------------------------------
D_inf        |
        _ce1 |
         L1. |  -2.597992   1.804364    -1.44   0.150     -6.13448    .9384961
             |
         egr |
         LD. |   1.833571   1.580627     1.16   0.246    -1.264401    4.931542
        L2D. |   1.454723   1.249714     1.16   0.244    -.9946707    3.904117
        L3D. |    .396337   1.027616     0.39   0.700    -1.617753    2.410427
             |
        lexr |
         LD. |   .0389485   24.23312     0.00   0.999    -47.45709    47.53499
        L2D. |  -33.45134   16.36027    -2.04   0.041    -65.51687   -1.385808
        L3D. |  -20.13796   20.05705    -1.00   0.315    -59.44906    19.17315
             |
         inf |
         LD. |  -.3043166   .2752387    -1.11   0.269    -.8437745    .2351413
        L2D. |  -.2122692   .2441213    -0.87   0.385    -.6907382    .2661999
        L3D. |   .1157664   .2378652     0.49   0.626    -.3504407    .5819736
             |
        lexd |
         LD. |    .001964   .0025161     0.78   0.435    -.0029675    .0068956
        L2D. |   .0030499   .0023249     1.31   0.190    -.0015068    .0076067
        L3D. |   .0001691    .002681     0.06   0.950    -.0050856    .0054239
             |
        lddt |
```

```
         LD. |  -1.773779   1.471884    -1.21   0.228    -4.658619    1.111062
        L2D. |  -3.517844   1.560163    -2.25   0.024    -6.575708   -.4599811
        L3D. |  -.4418258   1.971101    -0.22   0.823    -4.305113    3.421461
             |
       _cons |   2.728073   2.613493     1.04   0.297    -2.394279    7.850424
-------------+----------------------------------------------------------------
D_lexd       |
        _ce1 |
         L1. |   565.7147   132.9209     4.26   0.000     305.1945    826.2349
             |
         egr |
         LD. |  -436.7748    116.439    -3.75   0.000    -664.9911   -208.5585
        L2D. |  -347.3272   92.06187    -3.77   0.000    -527.7652   -166.8893
        L3D. |  -256.6662   75.70072    -3.39   0.001    -405.0369   -108.2956
             |
        lexr |
         LD. |  -1468.909   1785.166    -0.82   0.411     -4967.77    2029.952
        L2D. |   2922.946   1205.201     2.43   0.015     560.7954    5285.098
        L3D. |   2520.254    1477.53     1.71   0.088    -375.6519     5416.16
             |
         inf |
         LD. |     29.909   20.27583     1.48   0.140    -9.830904     69.6489
        L2D. |   -15.0864   17.98353    -0.84   0.402    -50.33347    20.16068
        L3D. |  -5.631148   17.52266    -0.32   0.748    -39.97493    28.71264
             |
        lexd |
         LD. |  -.2206316   .1853536    -1.19   0.234    -.5839181    .1426548
        L2D. |   -.274043   .1712678    -1.60   0.110    -.6097218    .0616358
        L3D. |   .6937408   .1975028     3.51   0.000     .3066424    1.080839
             |
```

```
        lddt |
         LD. |   301.2783   108.4284     2.78   0.005     88.76265     513.794
        L2D. |     418.08   114.9315     3.64   0.000     192.8184    643.3417
        L3D. |   485.4567   145.2039     3.34   0.001     200.8623     770.051
             |
       _cons |   .0120542   192.5265     0.00   1.000     -377.333    377.3571
-------------+----------------------------------------------------------------
D_lddt       |
        _ce1 |
         L1. |  -.0352719   .3616754    -0.10   0.922    -.7441426    .6735988
             |
         egr |
         LD. |  -.0651989   .3168284    -0.21   0.837    -.6861712    .5557734
        L2D. |  -.0666836   .2504987    -0.27   0.790    -.5576519    .4242847
        L3D. |  -.1133668   .2059802    -0.55   0.582    -.5170807    .2903471
             |
        lexr |
         LD. |  -1.405382   4.857403    -0.29   0.772    -10.92572    8.114954
        L2D. |   .1641471    3.27933     0.05   0.960    -6.263222    6.591516
        L3D. |   2.052637   4.020332     0.51   0.610     -5.82707    9.932344
             |
         inf |
         LD. |  -.0268353   .0551702    -0.49   0.627    -.1349669    .0812962
        L2D. |  -.0002007   .0489329    -0.00   0.997    -.0961074    .0957059
        L3D. |  -.0389458   .0476788    -0.82   0.414    -.1323946     .054503
             |
        lexd |
         LD. |  -.0004449   .0005043    -0.88   0.378    -.0014334    .0005436
        L2D. |    .000111    .000466     0.24   0.812    -.0008024    .0010243
        L3D. |   .0005918   .0005374     1.10   0.271    -.0004615    .0016451
```

```
             |
        lddt |
         LD. |   -.047692   .2950316    -0.16   0.872    -.6259433    .5305592
        L2D. |   .0850141   .3127266     0.27   0.786    -.5279187     .697947
        L3D. |  -.0229138    .395097    -0.06   0.954    -.7972896    .7514621
             |
       _cons |   .1228599    .523861     0.23   0.815    -.9038889    1.149609
------------------------------------------------------------------------------

Cointegrating equations

Equation           Parms    chi2     P>chi2
-------------------------------------------
_ce1                   4    95.7686   0.0000
-------------------------------------------

Identification:  beta is exactly identified

                Johansen normalization restriction imposed
------------------------------------------------------------------------------
        beta |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
_ce1         |
         egr |          1          .        .       .            .           .
        lexr |   .8280236   .2569257     3.22   0.001     .3244584    1.331589
         inf |   .0551048   .0236745     2.33   0.020     .0087036     .101506
        lexd |   .0002919   .0000901     3.24   0.001     .0001153    .0004685
        lddt |  -.2663581    .114027    -2.34   0.019    -.4898469   -.0428693
       _cons |  -5.960279          .        .       .            .           .
```

Tests for Autocorrelation

```
. estat dwatson

Durbin-Watson d-statistic(  5,    40) =  2.040205

. estat bgodfrey

Breusch-Godfrey LM test for autocorrelation
```

lags(p)	chi2	df	Prob > chi2
1	0.074	1	0.7863

H0: no serial correlation

Appendix 2: Study Data

Year	DDT	EXD	INF	EXR	EGR
1980	12250.5	3.40E+09	13.8582	7.42019	5.59198
1981	16045.1	3.20E+09	11.6031	9.0475	3.77354
1982	17570.4	3.40E+09	20.6667	10.9223	1.50648
1983	20143	3.60E+09	11.3978	13.3115	1.30905
1984	2.40E+06	3.50E+09	10.2841	14.4139	1.75522
1985	3.20E+06	4.20E+09	13.0066	16.4321	4.30056
1986	4.10E+06	4.60E+09	2.53428	16.2257	7.17756
1987	4.50E+06	5.80E+09	8.63767	16.4545	5.93711
1988	5.00E+06	5.80E+09	12.265	17.7471	6.20318
1989	5.50E+06	5.90E+09	13.7893	20.5725	4.69035
1990	6.60E+06	7.10E+09	17.7818	22.9148	4.19205
1991	72527.4	7.50E+09	20.0845	27.5079	1.43835
1992	90521	6.90E+09	27.3324	32.2168	-0.7995
1993	110340	7.10E+09	45.9789	58.0013	0.3532
1994	118271	7.10E+09	28.8144	56.0506	2.63278
1995	116180	7.30E+09	1.55433	51.4298	4.40622
1996	137557	6.80E+09	8.86409	57.1149	4.14684
1997	151170	6.50E+09	11.3618	58.7318	0.4749
1998	156132	6.80E+09	6.72244	60.3667	3.29021
1999	169039	6.50E+09	5.742	70.3262	2.30539
2000	211813	6.10E+09	9.98003	76.1755	0.5997
2001	2.50E+06	5.50E+09	5.7386	78.5632	3.77991
2002	2.90E+06	6.10E+09	1.96131	78.7491	0.54686
2003	3.40E+06	6.70E+09	9.81569	75.9356	2.93248
2004	3.60E+06	6.90E+09	11.624	79.1739	5.1043
2005	3.80E+06	6.50E+09	10.3128	75.5541	5.90667
2006	4.30E+06	6.70E+09	14.4537	72.1008	6.47249
2007	4.90E+06	7.50E+09	9.75888	67.3176	6.85073
2008	5.30E+06	7.70E+09	26.2398	69.1753	0.23228
2009	6.30E+06	8.60E+09	9.23413	77.352	3.30694
2010	8.00E+06	8.90E+09	3.96139	79.2332	8.4057
2011	9.20E+06	1.00E+10	14.0225	88.8108	6.10826
2012	1.10E+07	1.20E+10	9.37777	84.5296	4.56321
2013	1.30E+07	1.40E+10	5.71749	86.1229	5.87868
2014	1.50E+07	1.70E+10	6.87815	87.9222	5.35713
2015	1.70E+07	2.00E+10	6.58217	98.1785	5.71851
2016	1.50E+06	2.10E+10	6.29716	101.504	5.87895
2017	2.50E+07	2.60E+10	8.00572	103.411	4.8057
2018	2.90E+07	3.10E+10	4.68982	101.302	6.31845
2019	3.40E+07	3.40E+10	5.2	101.991	5.36575

Appendix 3: Introductory Letter

MOI UNIVERSITY
POSTGRADUATE OFFICE
SCHOOL OF BUSINESS AND ECONOMICS

Tel: 0790940508
0771336914
0736138770
Fax No: (053) 43047
Telex No. MOIVARSITY 35047

P.O. Box 3900
Eldoret.
Kenya

RE: SBE/DPHIL/ECO/001/18 **DATE:** 6th November, 2020

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: KITUM TOROITICH EDWARD – SBE/DPHIL/ECO/001/18

The above named is a bonafide student of Moi University School of Business and Economics, undertaking a Doctor of Philosophy Degree in Economics. He has completed coursework, defended his PhD proposal, and is currently proceeding to the field to collect data for his research topic titled: **"Nexus between Selected Macroeconomic Variables and Economic Growth in Kenya"**

Any assistance accorded to him will be highly appreciated.

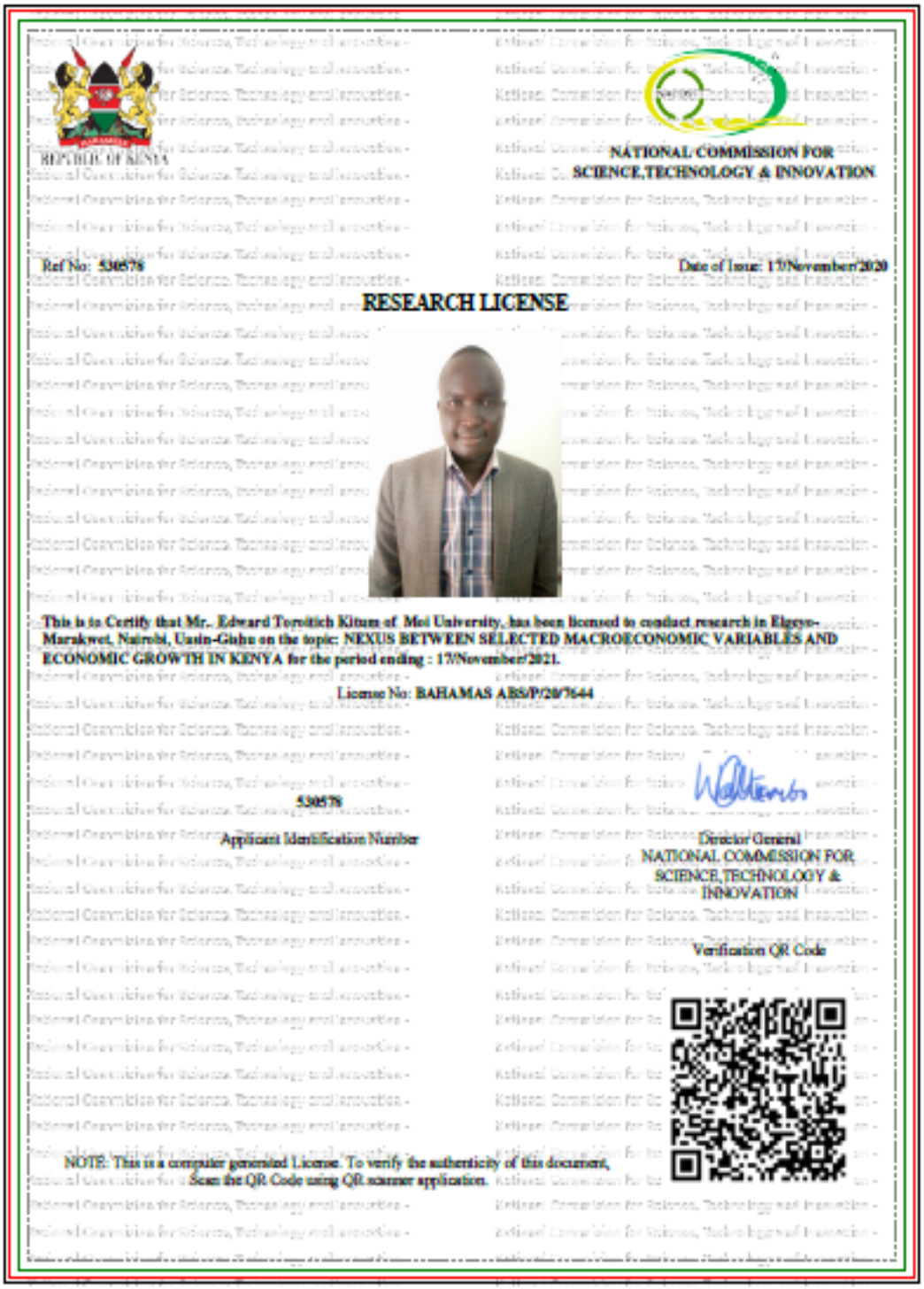
Yours faithfully,

DEAN
School Of Business and Economics
MOI UNIVERSITY

DR. JOSEPHAT CHEBOI
Ag.DEAN, SCHOOL OF BUSINESS AND ECONOMICS

/fk

Appendix 4: Research Permission Letter from NACOSTI



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Date of Issue: 17/November/2020

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