Effect of External Debt on Economic Growth in Rwanda

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ABSTRACT

External debt plays a crucial role in financing economic development, particularly in developing countries like Rwanda. However, its effect on economic growth remains a subject of debate in Rwanda as excessive debt may lead to debt distress and hinder long-term growth. The research study examined the Effect of external debt on economic growth in Rwanda utilizing time series data from 1990-2023. This research was done in order to obtain relevant information towards the objective of this research study which is to examine the possible relationship between external debt and economic growth in Rwanda,to analyze the long-term and short-term dynamic relationships between external debt and economic growth, to explore how macroeconomic variables, such as inflation and exchange rates, mediate the effect of external debt on Rwanda's economic growth. The study used data collected from Central bank, National institute of statistics of Rwanda ,Ministry of Finance and Economics and world Data Bank for a period of 33 years starting from 1990-2023.The study employed an econometrice model especially SVAR model to invesutgate the relationship between external debt and economic growth in Rwanda . The unit root test indicated some variables are stationary at level while others are stataionery at first differencing .Variance decomposition results highlight that key macroeconomic variables are interdependent over time, emphasizing the interconnected nature of economic growth and debt dynamics. The Cointegration test indicated that there is a long term relation ship between the macro economic variables . The results of the study found a positive relationship between external debt and Economic growth in Rwanda. Policymakers should ensure that external borrowing remains within sustainable limits to avoid excessive debt burdens as this retards economic growth. Further studies should investigate the effect of external debt on sectoral growth to provide more targeted policy interventions in Rwanda

Keywords: External debt , Economic growth, debt sustainability , Debt management ,Rwanda

INTRODUCTION

Over the past few decades, external debt has become a prominent financial tool for many developing countries seeking to stimulate economic growth and development. The rise in external borrowing is often viewed as a double-edged sword; while it provides necessary financial resources for investments, it raises concerns about sustainability and long-term economic stability (World Bank, 2021). In 2020, the global debt crisis amplified due to the COVID-19 pandemic, which led to a surge in borrowing by developing nations unable to cope with economic shocks

The World Bank (2021) indicates that while borrowing can provide essential capital for growth, excessive external debt can lead to unsustainable economic strategies, ultimately resulting in repayment challenges and diminished fiscal space. Notably, the International Monetary Fund (IMF) has underscored the intricacies of external debt, emphasizing the delicate balance between leveraging these funds for developmental purposes and the associated risks, including currency fluctuations and interest rate variability (IMF, 2020).The global narrative surrounding external debt thus presents a double-edged sword, where the potential for growth must be weighed against the risk of economic instability..

Many African nations have relied heavily on external loans for economic development, infrastructure projects, and to address budget deficits (African Development Bank, 2022). The continent's debt levels have risen significantly, with a mix of concessional and non-concessional loans, yet the correlation between external debt and economic growth remains contentious. Studies suggest that while external debt can finance critical

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investment, excess borrowing may lead to economic instability and increased vulnerability to external shocks (UNCTAD, 2023).

Within the East African region, the dynamics of external debt remain complex and multifaceted. As countries such as Kenya, Uganda, and Tanzania pursue aggressive infrastructure and development projects, reliance on external borrowing has intensified. The East African Community (EAC) reports a general trend of rising debt levels among member states, spurred by the financing of major projects in transport, energy, and technology (EAC, 2021). However, the region faces significant challenges, including managing debt sustainability amidst fluctuating global economic conditions. Research indicates that while responsible borrowing can invigorate economic growth, mismanagement and overreliance on external debt can inhibit progress, stunting development initiatives and exacerbating socio-economic inequalities (IMF, 2020). As such, East African countries must navigate these challenges prudently to harness the benefits of external debt effectively.

Rwanda stands out due to its unique post-genocide recovery trajectory and aggressive developmental policies, which include seeking external financing to kickstart its economy. The country's external debt has increased as it invests in infrastructure and human capital development (National Bank of Rwanda, 2023). Despite this growth strategy, which has yielded impressive GDP rates in recent years, there are underlying concerns regarding debt sustainability. As Rwanda navigates the challenges of external borrowing, the debate on the effectiveness of these strategies in promoting long-term economic stability and growth continues (World Bank, 2022). Moreover, transparency, fiscal discipline, and economic performance are critical in understanding the relationship between external debt and growth in Rwanda.

Statement of the Problem

The relationship between external debt and economic growth is a crucial issue for developing countries, particularly Rwanda, which has experienced significant changes in its economic landscape over the past few decades. While external debt can potentially provide necessary funding for development projects, its escalating levels raise concerns about sustainability and the long-term impacts on economic growth. This tension between leveraging debt for immediate economic gains and the risks associated with high debt levels forms the basis of the prevailing dilemma.

First, it is vital to analyze the direct relationship between external debt and Rwanda’s GDP growth. According to a study by Ntabaganyuka et al. (2021), while borrowing can catalyze development, excessive debt levels can lead to economic instability, particularly if the funds are not utilized effectively. The direct correlation between external debt and GDP growth needs thorough investigation, as Rwanda's rapid borrowing may not always translate into proportional growth.

Furthermore, assessing the short-term and long-term dynamic relationships between external debt and economic growth offers insights into this complex interaction. A recent analysis by Muhire and Chala (2022) indicated that, in the short term, increased external debt often correlates with GDP growth spikes in Rwanda; however, the long-term implications may be more detrimental, leading to economic vulnerabilities that could hamper sustainable growth.

Additionally, the influence of macroeconomic variables like inflation and exchange rates cannot be overlooked in this equation. Recent findings by Habimana (2023) suggest that high inflation rates can erode the benefits of external debt, diminishing its positive impact on economic growth. Furthermore, exchange rate volatility can exacerbate the burden of external debt, particularly when debt is denominated in foreign currencies, thus undermining Rwanda's economic growth prospects (Twagiramungu, 2023).High levels of debt could also crowd out private investment and lead to rising debt-servicing costs, which may undermine the positive effects on GDP growth (Ngabonziza, 2022). Moreover, the short-term and long-term dynamics between debt accumulation and economic growth remain unclear, especially considering the role of external debt in Rwanda's developmental context (Mutabazi & Mugisha, 2023).Sharp depreciation of the national currency or high inflation can increase the cost of servicing foreign debt, particularly when debt is denominated in foreign currencies. This could limit the government's fiscal space for other development priorities and hinder overall economic performance (Karake, 2024)

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Objectives of the Study

This section contains general objective, specific objectives and hypotheses were undertaken in this this paper

General Objective

The general objective of the study is to examine the effect of External Debt on economic growth in developing countries: Evidence from Rwanda

Specific Objectives

i. To examine the possible relationship between public debt and economic growth in Rwanda

ii.To analyze the long-term and short-term dynamic relationships between external debt and economic growth

iii.To explore how macroeconomic variables, such as inflation and exchange rates, mediate the impact of external debt on Rwanda's economic growth.

The study intends to test the validity of the following hypothesis

H_{01}= There is no significant possible relationship between public debt and economic growth in Rwanda

H_{02}=There is no significant long-term and short-term dynamic relationships between external debt and economic growth

H_{03}=There is no significant macroeconomic variables mediate the impact of external debt on Rwanda's economic growth.

LITERATURE REVIEW

Debt Overhang Theory :

According to the Debt Overhang Theory, when a country or organization accrues more debt than a particular amount, the expected burden of future debt payments becomes so large that it deters fresh investment. This is because prospective investors reduce the incentives to invest since they anticipate that a sizable amount of the profits from any new projects will be used to pay off existing debt.

According to corporate Sector ,the macroeconomic impacts of corporate debt overhang were investigated in a (2022)study that was published in The Review of Financial Studies. According to the study, businesses with large debt loads were more financially fragile and recovered from recessions more slowly.

A study by a Resource Extraction Industry (2020) about the effects of debt overhang in the resource extraction industry were examined and the results showed that unsecured reclamation obligations caused a large overhang, which caused businesses to postpone or avoid investments with positive net present value. Conventional debt, on the other hand, imposed fewer investment distortions, indicating that the type and structure of debt are important considerations when making investments.

Debt and Economic Growth Model.

The existing literature on the analysis of public debt and economic growth tends to indicate a negative relationship. According to Modigliani (1961), Buchanan (1958), and Meade (1958), public debt is a burden to future generations because it reduces the stock of private capital, which in turn reduces the flow of income. Specifically, public debt can negatively impact economic growth by crowding out private investments. If the proportion of government operations funded through debt is significantly high, interest rates may substantially increase in the long-run. An increase in debt will not be costless to future generations despite benefiting the current generation.

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Modigliani (1961) argues that the gross burden of public debt can only be offset in part or in total if borrowed funds are used to finance productive public capital formation, which in turn improves the real income of future generations. The interest accruing from both domestic and external debt is often paid through taxes. This reduces the available lifetime consumption of taxpayers and their savings. As a result, capital stock and economic growth reduce.

Krugman (1988) coined the term „debt overhang' to describe the negative relationship between public debt and economic growth. Debt overhang refers to when the ability of a country to repay its external debt reduces below the contractual value of the debt. Cohen (1993), on the other hand, argues that the relationship between public debt and economic growth is non-linear. This means that an increase in external public debt promotes investment up to a certain level or threshold. Beyond the threshold, debt overhang will discourage investors from providing capital to the government. Eventually, economic growth begins to decline as interest rates increase.

The Growth-Cum-Debt Models :

The basic argument to the growth-cum-debt model is that a country will be able to service its debt provided the debt leads to more growth. This means that a country will only borrow if the borrowed funds help it to improve its economy. External borrowing will be determined on whether such borrowing affects economic growth. The amount of money does not quantify the value of debt but on the effects the debt will have on the economy of the country

The growth-cum-debt models consider debt capacity in terms of the benefits and costs of borrowing in the process of economic growth.

Empirical Review

This part of research deals with reviewing empirical review in line with past studies have relevancies to the researcher study in order to come up with the reviews to be undertaken in the research while searching gaps and criticisms.

The existing literature on the analysis of external debt and economic growth tends to indicate a negative relationship. External debt tends to reduce the stock of private capital, through crowding out private investments, which in turn reduces the flow of income (Van, *et al.*, 2019). It is worth noting that if the proportion of government operations funded through debt is significantly high, interest rates may substantially increase in the long-run. The interest accruing from external debt is often paid through taxes leading to a reduction in consumption of taxpayers and their savings, which in turn reduces capital stock and economic growth. The gross burden of external debt can be offset in part or in total if borrowed funds are used to finance productive public capital formation, which in turn, improves the real income (Ibrahim, 2015; Moh'd & Jaradat, 2019). Nevertheless, similar to the debt Laffer curve hypothesis, Dao., Oanh.,et al. 2017); Shkolnyk & Koilo (2018), and Ehikioya *et al.* (2020) argue that the relationship between external debt and economic growth is non-linear. This means that an increase in external debt promotes investment up to a certain level, beyond which debt overhang will discourage investors from providing capital to the government. Thus, high long-term interest rates can crowd out private investment, thereby reducing potential output growth.Extreme cases of the debt crisis can also trigger a banking or currency crisis; thus, causing a reduction in economic growth (Ibrahim, 2015).

Even time series studies for single countries reveal contradictory results. For example, Elwasila (2018) for Sudan, over the 1969-2015 period, finds a positive effect of external debt on economic growth while Akram (2011) for Pakistan, over the 1972-2009 period,reveals an inverse relationship between external debt and economic growth due to crowding-out effect.

Ndubuisi (2017) for Nigeria, over the period spanning from 1985-2015, while applying Johansen cointegration and error correction tests, shows that debt service payment has no effect on economic growth whereas external debt stock has a positive and significant effect on growth. Other factors such as external reserve and exchange rate also have a positive and significant effect on economic growth in Nigeria. The main implication of these results is that the government should apply external loans to infrastructural development and improve the

business environment. In Tanzania the study by Kasidi & Makame (2013), over the 1990-2010 period, finds that there is no long-run relationship between external debt and GDP in Tanzania.

Furthermore, Sami & Mbah (2018) for Oman, over the 1990-2015 period, show that external debt has a negative effect on economic growth. The study also includes a number of control variables namely, population growth, gross fixed capital formation ration of trade to GDP, Inflation, and human capital proxied by primary school enrollments

The This study by Rubagumya, F., & Nkurunziza, A. (2022) explored the long-term relationship between public debt and economic growth in Rwanda using panel data analysis. The findings suggest that while public debt has a short-term stimulative effect on growth, it leads to diminishing returns in the long term.

Accordinng to Munyaneza, E. (2023)investigated how different components of public debt contribute to various sectors of the economy. The study finds that external debt negatively affects growth while domestic debt offers more positive growth outcomes when managed properly.

Abbas & Dailami (2020). This study employed a dynamic panel data model covering 30 developing countries from 2000 to 2018. The results indicated a nonlinear relationship between external debt and economic growth, suggesting that while moderate levels of debt can stimulate growth, excessively high levels lead to negative outcomes.

Khan & Ali (2021).The Impact of External Debt on Economic Growth: Evidence from Asian Economies" the research examined data from 13 Asian developing countries from 1990 to 2019 using a fixed-effects model. The analysis showed that external debt has a negative impact on economic growth after a certain threshold, suggesting that structural reforms and economic policies are crucial in managing debt effectively.

Obamuyi et al. (2022).External Debt and Economic Growth Nexus: Evidence from West African Countries. A study use a time-series analysis on data from 1990 to 2020 for 15 West African nations, this study found that external debt positively influenced economic growth up to a certain limit. Beyond this threshold, the results indicate a detrimental impact due to the crowding-out effect of debt repayment on public investments.

Chidi & Zubairu (2023) Role of External Debt in Determining Economic Growth: A Case Study of Sub-Saharan Africa, the study used employing a combination of panel data techniques and country-level case studies, this paper analyzed the impact of external debt on economic growth in 40 Sub-Saharan countries from 2005 to 2021. The results showed that external debt generally hampers growth due to high debt service costs, which limit government spending on essential social and economic projects.

Sulaiman & Ogundipe (2024) External Debt and Economic Performance: A Study of BRICS and Next Eleven Nations , the study focused on the BRICS and Next Eleven countries from 2000 to 2022, utilizing a cointegration approach. It revealed that while external debt has a positive association with economic growth in the BRICS countries, it adversely affects the growth of the Next Eleven due to less conducive economic environments and governance structures.

Existing studies on Rwanda, such as Rubagumya & Nkurunziza (2022) and Munyaneza (2023), mainly discuss public debt rather than external debt separately. This therefore creates **a gap** for a more focused analysis of external debt's effect on Rwanda's economic growth.

METHODOLOGY

Research Design

This study employs a quantitative research design to investigate the effect of external debt on economic growth in developing countries, with a specific focus on Rwanda from 1996 to 2023. The objective is to analyze the correlation between external debt and economic growth in a systematic and logical manner. The study aims to examine the various factors influencing the economy, particularly external debt and its effects on economic

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growth. A quantitative approach will be used to analyze numerical data and statistical methods to draw meaningful conclusions about the relationship between these variables.

Quantitative research design typically encompasses three dimensions: descriptive research, correlation design, and experimental research. Descriptive research aims to elucidate current variables or phenomena using statistical analysis, while correlation design examines the relationships between variables. Experimental research applies the scientific method to establish cause-and-effect relationships. In descriptive studies, researchers often focus on a single variable, utilizing observational and survey methods to gather data about "what is." This approach may incorporate various other research styles to enhance interpretation and data analysis (Borg & Gall, 1989).

The analysis will incorporate various statistical tests, including Pearson's Product Moment Correlation, regression, and multiple regression analysis, to examine the relationships between multiple variables. When dealing with data from multiple time series, the study will employ methods to evaluate correlations between variables. To investigate the relationships between variables, an econometric model will be utilized. Specifically, a Vector Autoregression (VAR) model will be applied to analyze the impact of external debt on economic growth in developing countries. Evidence from Rwanda from 1996 to 2023. This approach has been successfully employed by researchers in various countries, such as Chile (Albala, 2001), Nigeria (Fasoranti, 2012), Kenya (Maingi, 2010), and Jordan (Sharabati et al., 2010), demonstrating its effectiveness in exploring economic relationships.

Data analysis

Data analysis is a critical tool for understanding complex phenomena, employed in various fields, including sciences, business, administration, and policy-making. In this study, econometric techniques will be utilized to analyze data and estimate model parameters. Specifically, the E-views software will be used to apply the econometrics approach, incorporating Vector Autoregression (VAR) and Ordinary Least Squares (OLS) methods. Hypotheses will be tested using the estimated parameters to determine the significance level of the chosen model. Given the time-series nature of the data, the study will assess the variables' characteristics, including stationarity, co-integration, and autocorrelation, to ensure robust modeling.

A Vector Autoregression (VAR) model is used in this study to investigate the dynamic relationships between control variables, economic growth, and external debt. Because the variables may be endogenous and affect one another over time, the VAR framework is suitable. In contrast to single-equation models, VAR captures feedback effects and short-run dynamics by allowing each variable to be described as a function of both its own and other variables' lags. This is done without applying constrictive theoretical assumptions.

Model specification

Numerous studies have shown that investment growth plays a crucial role in driving economic expansion, largely through the accelerator principle. Fogu (1996) contended that debt could also influence economic growth by impacting the efficiency of investments. While debt payments may not significantly curtail savings and investment levels, they can still have a direct effect on output growth by altering investment productivity and limiting variations in the investment mix. As such, the burden of external debt can impede investment levels, consequently affecting economic growth.

Furthermore, existing literature has identified a wide range of key variables and indicators that are significant in understanding external debt challenges faced by recipient countries. The primary macroeconomic indicators include: Gross Domestic Product (GDP), terms of trade, the ratio of external debt to GDP, the external debt service ratio relative to exports, real private investment as a percentage of GDP, inflation rates, and exchange rates. These variables collectively contribute to evaluating the impact of external debt on economic performance.

To effectively capture significant external debt burdens, the model is developed based on Elbadawi's (1996) research regarding the relationship between debt burden and production function. This approach is distinct in that it employs a singular model, contrasting with other studies that have utilized dual models namely, an

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economic growth equation alongside an investment equation to analyze the influence of external debt on economic growth. In this context, the inclusion of private investment as an explanatory variable within the growth model negates the necessity for a separate investment equation. Consistent with previous research, indicators of debt burden are incorporated directly into the production function. Thus, the functional form of this model can be expressed as follows:

RGDPt = f (EDGDP, DSR, PINV, TOT, ER, INFL)…… (4.18)

Where, RGDPt= Real GDP at time t

EDGDP=Stock of external debt to GDP ratio

DSR=the debt service as a ratio of export earnings (reflect crowding out effect)

PINV=Current real private investment as a ratio of GDP

TOT=Terms of trade (captures external shocks)

ER = Official exchange rate

INFL=Rate of inflation (reflects macro- economic stability)

In this analysis, we will utilize equation (4.18) to investigate the relative contributions, or elasticities, of various variables to the growth process. To facilitate this examination, we will express the relevant variables in their natural logarithmic forms. Drawing inspiration from the framework developed by Elbadawi et al. (1996), we will specify a growth equation that encompasses all pertinent indicators of debt burden. This specified model will be estimated using the Johansen maximum likelihood estimation technique, providing a robust foundation for our analysis.

LRGDPt=β0+β1LEDGDP+β2LDSR+β3LPINV+β4LTOT+β5ER +β6 LINFL +εt …… (4.19)

Where, LRGDPt=the natural logarithm of GDP at time t

LEDGP=the natural logarithm of stock of external debt to GDP (-)

LDSR=the natural logarithm of debt service as a ratio of export (-)

LPINV=the natural logarithm of current private investment as a ratio of GDP (- or +)

LTOT=the natural logarithm of term of trade (-or +)

ER= the official exchange rate (-)

LINFL=the natural logarithm of Rate of inflation (- or +)

Note: The expected sign of each variable is shown in the bracket.

In equation (4.19) above, β1, β2, β3, β4 and β5 are coefficients of elasticity‟s, and İt is the random disturbance term.

Stationarity and Non-Stationarity Series

In the formulation of econometric models involving economic variables, time series data is essential. However, recent advancements in econometrics have highlighted issues related to the analysis of macroeconomic time series data, particularly concerning non-stationarity. A time series is defined as stationary if its error component exhibits a mean of zero, a constant variance, and a covariance that relies solely on the lag between observations, rather than the specific time at which the observations are taken (Harris, 1995). Furthermore, the classical

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regression method, known as Ordinary Least Squares (OLS), is predicated on the assumption that the variables involved are stationary. This implies that, for a stationary series (denoted as yt), the series will possess a finite mean and variance, and its covariance between any two time points remains constant regardless of the actual time of measurement.

A stationary time series exhibits fluctuations around a constant mean and tends to revert to this mean value over time. In contrast, most macroeconomic variables are typically found to be non-stationary. When regression analyses are performed on non-stationary series, the results can be misleading, a phenomenon known as "spurious" or "nonsense" regression (Alemayehu G., Njuguna N. and Daniel Z., 2012). To prevent drawing incorrect conclusions from such non-stationary regressions, it is essential to ensure the stationarity of the time series data. Therefore, before estimating a long-run model, it is necessary to assess the time series characteristics of the variables by conducting unit root tests.

The Unit Root Test

Before conducting simultaneous tests, it is crucial to assess the individual stationarity of variables in a time series analysis. To determine whether these variables are stationary or non-stationary, several tests are commonly used, including the Dickey-Fuller (DF) test, the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron test, and the Auto-Correlation Function (ACF) test. In this particular study, the ADF test is employed to check for the presence of a unit root. This method enhances the standard DF test by incorporating an autoregressive process of order p, making it a more effective choice. The ADF test is favored for its consistency, accuracy, and robustness in analyzing time series data.

The Augmented Dickey-Fuller (ADF) test evaluates the null hypothesis that a time series has a unit root, which implies non-stationarity (Ho: $\theta = 0$, where $\theta = \rho - 1$ and ρ is the first autocorrelation). The alternative hypothesis suggests that the series is stationary ($\theta < 0$). If the null hypothesis is rejected, it indicates that the time series is stationary and does not contain a unit root, categorizing it as integrated of order zero, denoted as I(0). Conversely, failing to reject the null hypothesis suggests non-stationarity, necessitating differencing of the series to achieve stationarity. This differentiation is crucial because running regressions on non-stationary data can lead to misleading results, known as spurious regressions. Ensuring stationary series is vital for valid statistical inference and analysis.

Cointegration Test

Cointegration is a crucial economic concept that describes the equilibrium relationships between non-stationary variables. When multiple non-stationary variables are cointegrated, it implies they cannot move independently, as their stochastic trends are linked. The classical regression model, however, assumes stationary variables, which often contradicts real-world economic data where variables exhibit long-term trends. Differencing non-stationary variables makes them stationary, but using the levels of variables in a regression can lead to spurious correlation. Empirical studies have consistently shown that most macroeconomic variables are non-stationary at their levels but become stationary after differencing, making cointegration an essential tool for analyzing equilibrium relationships in economics.

The concept of cointegration is a crucial approach to handling non-stationarity in variables. It implies that if multiple non-stationary (I(1)) variables can be combined in a way that creates a stationary relationship, it validates the existence of a long-run equilibrium among these variables. This long-run relationship is influenced by any deviations, causing variables to move accordingly, thus returning to equilibrium(Alemayehu, 2012) . Cointegration analysis can be used in empirical work to identify relationships among variables tied by economic theory.

When dealing with difference stationary variables, estimating a model using first differences can capture only short-run dynamics, potentially overlooking valuable long-run equilibrium relationships. To address this limitation, one can utilize the concept of cointegration, which indicates the presence of long-term connections among the variables in question. Testing for cointegration is essential, as differencing the variables to achieve stationarity may obscure their long-run behavior. There are two primary methodologies for testing cointegration

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and estimating the corresponding co-integrating vector: the Engle-Granger method (1987) and the Johansen approach (1998). Both methods serve as tools to identify and analyze the underlying long-term relationships within the data.

Engle-granger / two step approach

The Engle-Granger methodology posits that for cointegration to be established, all involved variables must share the same order of integration. After confirming this condition, the subsequent step entails testing for cointegration. However, the Engle-Granger approach has its limitations. One significant concern is that the outcomes of the tests can vary based on the selection of the dependent variable in the regression, emphasizing the impact of the normalization chosen for the cointegrating vector. Second, if the cointegrating vector happens not to involve y1t but only y2t…ykt, the test is not appropriate and the cointegrating vector will not be consistently estimated by a regression of y1t up on y2t…ykt. Third, the residual-based test tends to lack power because it does not exploit all the variables information about the dynamic interactions of the variables. among the variables under investigation.

Johansen (1988) maximum likelihood

Johansen (1988) proposed an alternative approach to cointegration analysis that addresses limitations of earlier methods, such as the Engle-Granger two-step procedure. His method utilizes maximum likelihood estimation within a vector autoregressive (VAR) framework, allowing for the direct assessment of cointegration. This approach not only provides maximum likelihood estimators for the cointegration vectors but also facilitates testing for the number of cointegrating relations. By enabling the estimation and evaluation of multiple cointegration relationships in a single step, Johansen's technique significantly enhances the robustness of cointegration analysis.

The Johansen method offers a flexible way to analyze cointegration in multivariate time series by avoiding the need for prior classification of variables. It employs maximum likelihood estimation to detect multiple cointegration relationships in VAR systems, treating all variables as potentially endogenous. This approach allows for an in-depth examination of the long-term relationships among the variables.

The Johansen procedure is a method used to determine the number of cointegrating vectors in a system. It generates 'n' eigenvalues, referred to as characteristic roots, which indicate the degree of correlation among the cointegration relationships and the stationary elements within the model. To identify the number of cointegrating vectors, the Johansen procedure employs two test statistics: the maximal eigenvalue statistic (λmax) and the trace statistic (λtrace). These statistics assess the null hypothesis that there are at most 'r' cointegrating vectors, challenging it with the alternative that there are 'r + 1' cointegrating vectors (Enders, 1995).

In summary, the Johansen method helps ascertain the number of cointegrating vectors by analyzing eigenvalues and using specific statistics to test hypotheses regarding their presence.

Vector Error-Correction Model (Vecm)

This section explored how the long-term relationships among economic variables are established. However, these variables also exhibit short-term behaviors that can be examined using dynamic modeling techniques. One particularly relevant approach is the Error Correction Model (ECM), which captures the adjustments that occur in response to short-term deviations from long-term equilibrium. The Vector Error Correction Model (VEC) is a specific type of restricted Vector Autoregression (VAR) tailored for non-stationary time series that exhibit cointegration. This model incorporates cointegration relationships into its framework, ensuring that the long-term behavior of the variables aligns with these relationships while still accommodating short-term dynamics.

In summary , this section discusses the Error Correction Model (ECM) and, more specifically, the Vector Error Correction Model (VEC), which is a restricted VAR model designed for cointegrated non-stationary time series. The VEC captures both the long-term relationships and the short-term dynamics of economic variables, allowing for corrections back to equilibrium over time.

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In the context of non-stationary time series data, a long-run relationship among variables can be captured using an error correction model (ECM). If two non-stationary variables exhibit a stationary linear combination, they are considered cointegrated, indicating that deviations from their long-run equilibrium will eventually correct themselves. To develop an efficient and parsimonious model, it's essential to iteratively remove insignificant explanatory variables, ultimately retaining only those that are meaningful in terms of significance, economic relevance, and overall model validity. This approach ensures the resulting model is both streamlined and robust.

Impulse Response and Variance Decomposition

Impulse response analysis is a key method for understanding how various policies or shocks influence a specific variable within a Vector Autoregression (VAR) framework. This analytical approach helps to explore the dynamic interactions among variables in the VAR model. It can be applied to evaluate both the overall dynamic behavior of the system and the impact of different variables on each other. Notably, when a shock occurs to the i-th variable, it not only influences that specific variable but also reverberates through the other endogenous variables due to the lag structure inherent in the VAR mode (Alemayehu G., Njuguna N. and Daniel Z., 2012).

Simply , Impulse response analysis helps in understanding the influence of shocks on variables in a VAR model, assessing both dynamic interactions and policy impacts. When a shock affects one variable, it also impacts other interconnected variables through the VAR's lag structure.

The impulse response function illustrates how one variable, such as economic growth, reacts over time to a shock in another variable, like indicators of external debt. It effectively maps the direct and indirect impacts of shocks from various variables included in a Vector Autoregression (VAR) model on the specific variable of interest. In contrast, variance decomposition analyzes the contributions of different shocks to the overall variation in an endogenous variable within the VAR model. This means that while impulse response functions focus on the effects of a single shock across the model, variance decomposition helps to assess the significance of each individual shock in influencing the variables involved.

The variance decomposition is a useful tool for understanding how much one variable impacts another in a system. Each variable has a forecast error, which can be attributed to its own past and present values, as well as those of other variables in the system. By analyzing these forecast errors, we can assess the extent to which a particular variable is affected by its own earlier shocks and by shocks from other variables in a Vector Autoregression (VAR) model. This analysis allows us to draw conclusions about the relative contributions of past values and inter-variable influences on the behavior of a time series.

DATA ANALYSIS, FINDINGS AND RESULTS

Descriptive Statistics

The table below provides the summary statistics for the main variables. It highlights the central tendency (mean), variability (standard deviation), and the range (minimum and maximum values) of the dataset.

Table 6.1: Descriptive Statistics

	Mean	Maximum	Minimum	St. deviation	Observations.
GDP	28.95	30.029	27.65	0.657	28
STOCK OF EXTERNAL DEBT	21.168	23.038	18.658	1.025	28
DEBT SERVICE RATIO	3.464	5.568	2.186	0.963	28
PRIVATE INVESTMENT	26.329	28.589	24.554	1.281	28
TERMS OF TRADE	-0.991	0.684	-2.212	1.017	28

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EXCHANGE RATE	6.172	7.056	4.427	0.631	28
INFLATION RATE	1.907	2.985	0.689	0.612	28

Source : Authors computation,2024

The table above of descriptive statistics provides perceptions of the central tendency, variability, shape, and distribution of the data for each variable.

The descriptive statistics indicate overall economic stability, with Real GDP averaging 28.95 billion Rwf and a low SD of 0.657. External debt has a mean of 21.168 billion Rwf with a stable SD of 1.025, while the debt service ratio averages 3.464% with a SD of 0.963, indicating manageable debt payments. Private investment remains stable at a mean of 26.329 billion Rwf and SD of 1.281. The terms of trade show a negative mean of -0.991 billion Rwf with a SD of 1.017, pointing to deteriorating trade conditions. The exchange rate averages 6.172 FRW/USD with SD of 0.631, and inflation remains low at 1.905% with a SD of 0.612, reflecting price stability.

Unit Root Test

Table 6.2: Unit root test using Augmented dickey Fuller (ADF) test

With Constant and Deterministic Trend Assumption			
Variable	Level	First Difference	Order of Integration
GDP	0.2691	-6.1556***	I (1)
Stock of External debt	3.0935	-5.4242***	I (1)
Debt service Ratio	1.9499	-6.654***	I (1)
Private investment	5.7646**		I (0)
Exchange rate	-4.267**		I (0)
Inflation rate	3.1892	-6.388***	I(1)
Terms of trade	2.2387	-7.6105 ***	I(1)
Note: ***, **, and * denotes significance at the 1%, 5%, and 10% level respectively			

Source: Author's Computation.

Data pre-testing and appropriate handling of trends and stationarity are highly stressed by the literature in order to arrive at more reliable estimation techniques, including correct estimation equations. The unit root tests using ADF is conducted on each variable to tell whether it is stationary or not station ery at level or first difference. The tests are conducted on the equations describing the data generating process (DGP) of the series. Results show that all the endogenous variables of the log of GDP, log of stock of external debt , log of debt service Ratio are stationary at first difference then log of private investment and log of exchange rate are all stationary at level while log of infalation arate and log of terms of tarde are also stationary at fisrt difference.

HO: There is a unit root . (The series is non stationary) if $P<0.05$, reject null Hypothesis that the series is non stationary .

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H1 : There is no unit root (The series is stationary) . if P>0.05 , accept Null hypothesis that the series is non stationary.

Cointegration Test

The results on unit root test of stationarity indicated that the series are all integrated at least on order one [I (1)] as indicated in Table 4.2 above, the cointegration test was run to establish if a long-run relationship exists among the non-stationary variables. The Trace as well as the Max-eigenvalue test indicates that 5 equations are cointegrated at the 5 percent level, as shown in Table below.

Table 6.3: Johnsen Cointegration Test

Sample (adjusted): 1993 2023
Included observations: 31 after adjustments
Trend assumption: Quadratic deterministic trend
Series: LDSR LED_GDP LEXCH LGDP LINFL LPINV LTOT
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.969174	288.7169	139.2753	0.0000
At most 1 *	0.874222	180.8557	107.3466	0.0000
At most 2 *	0.735411	116.5853	79.34145	0.0000
At most 3 *	0.664484	75.36848	55.24578	0.0003
At most 4 *	0.571326	41.51387	35.01090	0.0089
At most 5	0.364712	15.25502	18.39771	0.1305
At most 6	0.037692	1.191033	3.841465	0.2751

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.969174	107.8613	49.58633	0.0000
At most 1 *	0.874222	64.27032	43.41977	0.0001
At most 2 *	0.735411	41.21686	37.16359	0.0162
At most 3 *	0.664484	33.85461	30.81507	0.0206
At most 4 *	0.571326	26.25884	24.25202	0.0268
At most 5	0.364712	14.06399	17.14769	0.1331
At most 6	0.037692	1.191033	3.841465	0.2751

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source : Author's computation ,2024

The trace statistic (288.7169) exceeds the critical value (139.2753) with a p-value of 0.0000 at None, indicating rejection of no cointegration. This continues until At most 4, where the trace (41.5387) exceeds the critical value (35.3977), suggesting at least 5 cointegrating relationships. At most 5, the trace (1.1910) is below the critical value (3.8415), so we fail to reject the null. The max-eigen statistic confirms 5 cointegrating equations, with similar patterns at None (107.8613), exceeding the critical value (49.5863), and at most 4 (14.2452) just below the critical value (14.2646). Overall, both tests indicate 5 cointegrating relationships among LDSR, LED_GDP, LEXCH, LGDP, LINFL, LPNV, and LTOT, highlighting strong long-term relationships relevant for VECM analysis. Thus, the max-eigen test also confirms the presence of 5 cointegrating equations at the 5% level.

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Lag selection

Table 6.4 lag selection.

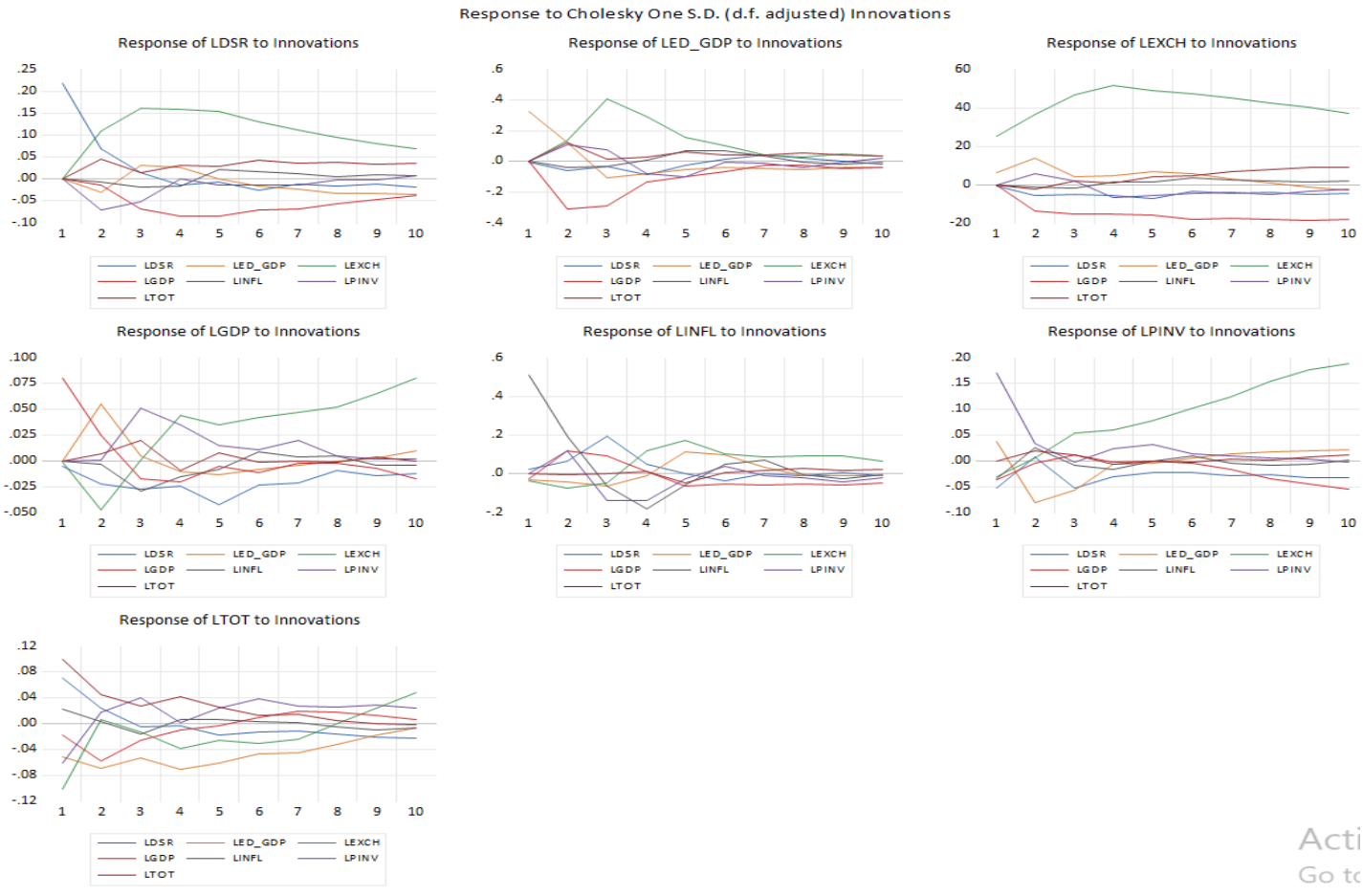
VAR Lag Order Selection Criteria
Endogenous variables: LDSR LED_GDP LEXCH LGDP LINFL LPINV LTOT
Exogenous variables: C
Date: 02/17/25 Time: 06:36
Sample: 1990 2023
Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-277.5443	NA	0.124808	17.78402	18.10465	17.89030
1	-102.3460	262.7976	5.05e-05	9.896622	12.46166*	10.74686
2	-33.24513	73.41962*	2.33e-05*	8.640321*	13.44977	10.23452*

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

Source: Aurthor's Computation,2024

According to the table, the optimal lag length is indicated by the asterisks (*) next to the values. The results suggest that the optimal lag length is 2 as indicated by AIC, HQ, as well as FPE. as it corresponds to the lowest values or the highest likelihood ratios for most of the criteria.



Source : Authors computation,2024

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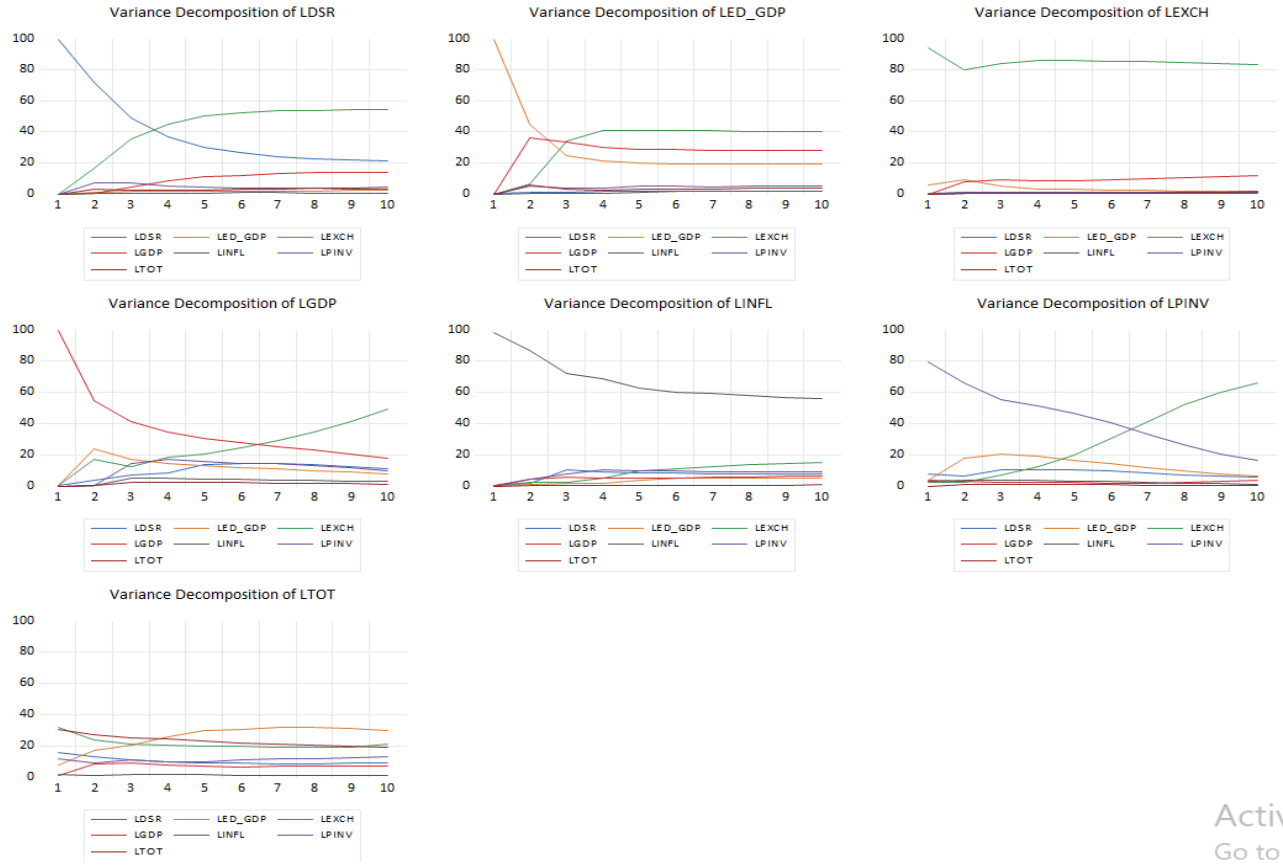
The IRFs from the VAR model show that exchange rate shocks lead to an increasing LDSR (Debt Service Ratio), indicating higher debt burdens over time, with smaller fluctuations in GDP, inflation, and terms of trade. A positive response of LED_GDP to exchange rate shocks suggests depreciation raises external debt relative to GDP, stabilizing after a few periods. LEXCH exhibits a strong, persistent positive self-response, with other variables showing weaker effects, indicating exchange rate shocks are mainly driven by their own dynamics. Depreciation appears to boost GDP (LGDP) and private investment (LPINV), but initially worsens terms of trade (LTOT), which later stabilizes, while inflation (LINFL) responds strongly initially and then stabilizes. Worsening terms of trade negatively impact GDP and investment initially, but effects stabilize over time.

Variance decomposition.

Variance Decomposition using Cholesy (d.f) Factors



Source : Authors computation,2024

The VAR model analysis shows that the debt service ratio initially is dominated by its own shocks but declines over time, with exchange rate and GDP contributing more to its variance. The stock of external debt is initially driven by its own shocks, but over time, debt service ratio and external debt to GDP play a larger role, indicating spillover effects. Exchange rate remains primarily influenced by its own shocks, with a slight increase in influence from GDP over time. GDP initially driven by its own shocks, later influenced more by debt service ratio and external debt, reflecting economic interactions. Inflation exhibits strong persistence of its own shocks with minor external influence, maintaining mostly self-driven variance. Private investment shifts from being dominated by its own shocks to increased external influence, indicating dynamic interactions. Terms of trade show stable contributions from variables with no major shifts, highlighting more stability in variance composition.

Summary

The descriptive statistics reveal Rwanda's stable macroeconomic environment, with real GDP averaging 28.95 billion Rwf, external debt at 21.168 billion Rwf, and a debt service ratio of 3.464%. Private investment remains

steady, while terms of trade decline and the exchange rate shows low volatility; inflation stays low and stable. Unit root tests indicate some variables, like debt service ratio and private investment, are stationary at level, while others, such as GDP, inflation, terms of trade, exchange rate, and external debt, require differencing. The Johansen cointegration test confirms five long-term relationships among variables—LDSR, LED_GDP, LEXCH, LGDP, LINFL, LPNV, and LTOT—highlighting strong interdependencies suitable for VECM modeling. Impulse response analysis shows exchange rate depreciation increases LDSR and LED_GDP, initially boosts LGDP, but is offset by deteriorating terms of trade; inflation reacts strongly to exchange rate shifts, and private investment is positively influenced by depreciation but negatively by trade deterioration. Variance decomposition underscores macroeconomic interdependence, with changes propagating through growth, investment, and inflation, indicating a positive but mediated relationship between external debt and economic growth.

CONCLUSION

This study contributes to the understanding of the relationship between external debt and economic growth in Rwanda. The findings provide crucial insights for policymakers in designing strategies for sustainable debt management and economic development. Further studies should investigate the effect of external debt on sectoral growth to provide more targeted policy interventions

RECCOMMENDATION

Based on the findings , policymakers should keep external borrowing within sustainable limits to prevent excessive debt burdens .The government is encouraged to promote private investment to foster economic growth and lessen reliance on external debt, while monetary authorities should stabilize the exchange rate to ease debt repayments.Trade policies should focus on improving terms of trade through export diversification and reducing import dependence. The central bank needs effective monetary policies to control inflation and support growth. Applying VECM-based forecasting can enhance policy planning by capturing long-term relationships among economic variables.Future research should expore the impact of external debt on sectoral growth fore more targeted interventions

REFERENCES

1. Abbas, S. A., & Dailami, N. (2020). External Debt and Economic Growth in Developing Countries: A Dynamic Panel Analysis. Journal of Economic Perspectives, 34(3), 157-174.
2. African countries. University of Nairobi.
3. African Development Bank. (2020). African Economic Outlook 2020: Developing the Digital Transformation.
4. African Development Bank. (2022). African Economic Outlook 2022.
5. Chidi, J., & Zubairu, I. (2023). The Role of External Debt in Determining Economic Growth: A Case Study of Sub-Saharan Africa. Journal of African Economies, 32(2), 156-178
6. Dao, H.T.T. and Oanh, D.H., 2017. External Debt and Economic Growth in Vietnam: A Nonlinear
7. doi.org/10.4314/afrrev.v11i4.13.
8. East African Community (EAC). (2021). EAC Regional Developments.
9. East African Community. (2021). Report on EAC Regional Debt Levels.
10. Economic Theory, 21(1), and 116-134, doi.org/10.1111/jpet.12324.
11. economy: Evidence from Nigeria. African Research Review, 11(4), pp. 156-173.
12. Ehikioya, B.I., Omankhanlen, A.E., Osuma, G.O. and Inua, O.I., 2020. Dynamic Relations Between
13. Elwasila, S.E.M., 2018. Effect of external debt on economic growth of Sudan: Empirical analysis
14. empirical evidence from Ukraine and other emerging economies, Investment Management and
15. expenditure, external and domestic public debt, and economic growth, Journal of Public
16. Financial Innovations, 15(1), pp. 387-400.doi:10.21511/imfi.
17. Habimana, M. (2023). Inflation and Economic Growth: The Case of Rwanda. Journal of Economic Research, 14(2), 45-67.
18. Ibrahim, H., 2015. Effect of external public debt on economic growth: An empirical analysis of East

19. IMF. (2022). World Economic Outlook: Growth Slowdown, Precarious Recovery. International Monetary Fund.
20. International Monetary Fund (IMF). (2020). Global Financial Stability Report: Markets in the Time of COVID-19
21. International Monetary Fund (IMF). (2021). Rwanda: Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Rwanda.
22. International Monetary Fund. (2021). Global Financial Stability Report.
23. Journal of Open Innovation: Technology, Market, and Complexity,6(88), pp. 1-16,
24. Kalu, I., Samuel, A., & Okoro, A. (2022). "External Debt and Economic Growth: Evidence from Low-Income Countries." Journal of Economic Perspectives, 36(3), 45-64.
25. Karake, J. (2024). Macroeconomic Consequences of External Debt in Sub-Saharan Africa: The Case of Rwanda. African Development Review, 36(4), 537-556.
26. Khan, M. A., & Ali, S. (2021). The Impact of External Debt on Economic Growth: Evidence from Asian Economies. Asian Economic Policy Review, 16(1), 42-60.
27. Marini, M., Thomas, J., & Gupta, R. (2023). "Governance, Institutions, and External Debt Management: A Comparative Study."International Journal of Development Studies, 30(2), 119-139.
28. Moh'd, AL-T.K.A. and Jaradat, M.S., 2019. Impact of External Debt on Economic Growth in Jordan
29. Muhire, A., & Chala, B. (2022). The Dynamic Relationship Between External Debt and GDP Growth in Rwanda: Short- and Long-term Effects. African Journal of Finance, 8(1), 87-102.
30. Mutabazi, P., & Mugisha, R. (2023). The Role of External Debt in Economic Development: Evidence from Rwanda. International Journal of Economics and Finance, 15(2), 103-118.
31. National Bank of Rwanda. (2023). The Economic Report 2022/2023.
32. Ndubuisi, P., 2017. Analysis of the impact of external debt on economic growth in an emerging
33. Ngabonziza, G. (2022). Debt, Inflation, and Growth: An Empirical Analysis of Rwanda's External Debt Impact. Rwanda Economic Journal, 12(1), 45-62.
34. Ntabaganyuka, D., Niyonsenga, D., & Nyamurinda, S. (2021). External Debt and Economic Development: The Rwandan Experience. International Journal of Development Studies, 20(3), 204-220.
35. Obamuyi, T. M., Ojong, E. E., & Ojo, J. A. (2022). External Debt and Economic Growth Nexus: Evidence from West African Countries. African Journal of Economic and Management Studies, 12(3), 321-339.
36. OECD. (2023). Economic Outlook: Interim Report. OECD Publishing.
37. Osei, K., Dumor, K., & Johnson, L. (2021). "Debt and Development: Understanding the Role of External Debt in Low-Income Countries." *Global Economic Review*, 50(1), 79-92.
38. Public External Debt and Economic Growth in African Countries: A Curse or Blessing?,
39. Relationship, China-USA Business Review, 16 (1), pp. 1-13 doi:10.17265/1537-
40. Santos, L., & Ferreira, R. (2024). "Lessons from the Pandemic: External Debt Dynamics in Developing Nations." Economic Analysis and Policy, 66(1), 23-41.
41. Shkolnyk, I. and Koilo, V., 2018. The relationship between external debt and economic growth:
42. Sulaiman, A. M., & Ogundipe, A. A. (2024). External Debt and Economic Performance: A Study of BRICS and Next Eleven Nations. Global Economic Review, 53(1), 85-102.
43. Twagiramungu, R. (2023).Exchange Rate Volatility and Its Impact on External Debt in Rwanda. Journal of Economic Policy Analysis, 19(4), 113-129
44. UN. (2024). World Economic and Social Survey: Sustainable Development Goals and Economic Growth. United Nations.