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Assessing the Interplay between Debt Sustainability and Macroeconomic Stability in Sub Saharan African Economies: Insights from Panel Data Analysis

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Abstract

This study explored the dynamics of debt sustainability and its impact on macroeconomic stability in Sub Saharan African countries. Spanning the years from 2010 to 2021, the study employs a comprehensive panel data methodology, covering ten (10) diverse countries in Sub Saharan Africa. The data set used in the study were sourced from the World Bank Database. The study employed descriptive statistics, trend analysis, and inferential statistics, specifically the fixed effects model to investigate the relationship between debt sustainability and macroeconomic stability in Sub Saharan African countries. The data analysis was executed using Econometrics View (E Views) version 10. The findings affirm both positive and negative impacts of debt sustainability on macroeconomic stability (inflation rates), emphasizing the need for effective policies and implementation strategies. Key findings included the significant influence of Debt to GDP ratio, a noteworthy impact of Debt to Export ratio, and the substantial effect of Debt Service to Exports Ratio on macroeconomic stability (inflation rates). However, the study could not establish significant impact of Debt to Gross National Income ratio and External reserve to Debt ratio on macroeconomic stability in Sub Saharan African countries, as they lack statistical significance. The study contributed significantly to the literature by incorporating a mix of control variables such as GDP per capital, political stability, government effectiveness, and regulatory quality. The study recommended among other things, strategic debt management and export diversification by government of various Sub Saharan African countries and policy makers in finance of same countries.

Keywords: Debt Sustainability, Macroeconomic Stability, Public Debt, Debt-to-GDP Ratio, Debt Service-to-Export Ratio

Introduction

Public debt has long been a pivotal instrument for financing investments and bridging short-term financial gaps in both private and public sectors (Akpansung, 2018). Its significance in sustaining business operations and fostering sustainable development cannot be overstated. Public debt includes domestic and external debts. Government borrowing is primarily driven by budget deficits which must be funded to maintain fiscal stability. The concept of public debt sustainability has both positive and negative effects on economic growth depending on policies and implementation strategies. When public debt is for investment on capital and productive projects, it stimulates economic growth. On the other hand, when public debt is used for recurrent and unproductive investment, repayments becomes a burden, hence economic growth is retarded.

Notably, public debt serves as a fiscal policy tool capable of mitigating economic fluctuations within Sub Saharan African economies and beyond (Jacob, 2021). Indeed, unsustainable levels of public debt pose significant challenges to economic growth and development as captured by the World Bank report of October 2022. The report indicated that the external debt of Sub Saharan African countries increased to a record $795 billion in 2021. This is the region's highest debt burden in a decade. Moreover, external shocks such as the COVID-19 pandemic exacerbated debt vulnerabilities in low-income and emerging economies, necessitating heightened scrutiny of debt management strategies (Della Posta, Marelli and Signorelli, 2022; Andreosso, Moon and Sohn, 2021; Islam, 2021; Baqaee and Farhi, 2020). The resultant surge in government debt intensified the trade-off between meeting sustainable development goals and averting debt crises.

The impact of public debt on economic activities and its sustainability, control, and limits has been a subject of extensive debate among policymakers and economists in advanced economies (Tomaselli, 2018). Recently, there has been a growing concern in most African countries regarding public debt and its sustainability, stemming from continuous government borrowing (Veiga, Ferreira-Lopes and Sequeira, 2014). Indeed, public debt sustainability in Africa has emerged as a prominent topic of discussion among economists, financial analysts, researchers, policymakers, and the public, including individuals on the streets. This heightened attention is partly attributed to the steadily increasing levels of public debt across Africa over the past decades, reaching unprecedented levels (Tomaselli, 2018). It is argued that unsustainable debt could exacerbate macroeconomic conditions and render economies more susceptible to external shocks (Câmpeanu and Stoian, 2010; Curtaşu, 2011). A major point of contention within the field of debt sustainability research revolved around identifying a common threshold value that could be applied to different economies (Owusu, 2019). Empirical studies by Izedonmi (2012), Utomi (2014), and Kadiu (2015) have reported a significant positive impact of external debt on economic growth, highlighting its role as a source of trade and aid and its importance in the growth process of nations. Conversely, studies by Ijeoma (2013) and Faraji & Makome (2013) argued that external debt carries significant risks that outweigh its benefits, citing examples of heavily indebted poor countries in Africa and proposing a contrary effect. However, studies by Ibi & Aganyi (2015) and Ogunmuyiwa (2011) have found an insignificant relationship between public debt and economic performance variables.

A World Bank report revealed that Sub Saharan Africa's external debt stocks to exports (%) increased from 76% in 2010 to 205% in 2020 (World Bank, 2021). In light of the substantial and ever-increasing borrowing in Sub Saharan Africa, the sustainability of public debt warrants empirical evaluation alongside macroeconomic stability in the region's economies.

Conceptual Overview

(a) **Debt to GDP Ratio and Macroeconomic Stability**: The effect of public debt on major macroeconomic stability variables such as GDP and inflation remains a major global concern among economic policymakers (Daba, Demissie & Sore,2023). Studies has shown that high levels of public debt as a proportion of GDP leads to a relatively less stable economy.

(b) **Impact of Debt to Exports Ratio on Macroeconomic Stability**: Over several years, the amount of export as the share of Sub Saharan African contribution to world trade decreased drastically due to high debt level which reduced export earnings. This poor performance created difficulties for Sub Saharan African countries to finance import, leading to more foreign assistance (Mohamed, 2018).

(c) **Influence of Debt on Gross National Income**: A moderate debt level improves welfare, real GDP and enhances growth. A highly indebted borrower stops spending, less indebted or lender could take the slack. It is asymmetry between those who are highly indebted and those who are not that leads to decline in aggregate demand (Eggerston & Krugman, 2011).

(d) **External Reserves to Debt Ratio on Macroeconomic Stability:** Foreign exchange reserve serves the purpose of conserving capital and supply liquidity to meet the foreign reserve needs of a nation (Onwuka & Igwezea, 2014). External reserves are a major pointer to a nation's ability to pay back her debt in foreign denominated currency. Due to high debt level, Sub Saharan African foreign reserves is low.

(e) **Debt Service to Export Ratio and Economic Growth**: Sovereign debt grew substantially following the Paris debt relief after 2006. There is a high unacceptable debt service payment which is a serious concern to Sub Saharan African external debt crisis. This led to the payment of a 30% of export earnings to debt services. This percentage is relatively high given other areas of development (Coulibaly, Gandi & Senbet, 2019).

Methodology

This study adopts an *ex-post facto* research design as delineated by Kumar (2011), to assess the relationship between debt sustainability and macroeconomic stability in Sub Saharan African countries. The ex-post facto design offers a structured framework for investigating historical economic data, facilitating a comprehensive examination of the relationship under scrutiny. All the countries marked as Sub Saharan Africa by the World Bank were included in the study.

A purposive sampling technique selected ten Sub Saharan African countries for analysis, focusing on those with average GDPs equal to or exceeding the regional average from 2010 to 2021. This approach ensures representation of varying economic performances, essential for nuanced insights into debt sustainability and macroeconomic stability.The study found that strategic borrowing for capital projects can stimulate growth, however excessive public borrowing leading to high debt

burdens may impede sustainable development.

Unsustainable debt undermines confidence in the government's commitment to policy actions. The deceleration of growth is primarily driven by "crowding-out" which occurs when interest rates rise as growth slows down (Kunieda and Nishida, 2012). This study is anchored on crowding out and debt overhang theories. Policy makers at all strata of government should effectively adopt prudent debt management practices, emphasize export diversification, and exercise caution with some of the variables to achieve proactive debt service planning that will ensure economic stability

The variable being measured or tested was known as the dependent variable. In a study, the searched for any potential impact that altering the independent variable might have on the dependent variable researcher. The result or modification that an independent variable (or variables) caused was referred to as a dependent variable. The dependent variable was sometimes referred to as an effect variable, an outcome variable, an explained variable, and a forecasted variable

Macroeconomic Stability Indicator = Inflation Rate

In this study, inflation rate was used as proxy for macroeconomic stability. Inflation as a proxy for macroeconomic stability was used due to its volatility in the determination of macroeconomic issues. The research encompasses all Sub Saharan African countries designated by the World Bank, totaling 48 nations. This extensive population ensures the inclusion of diverse economic contexts, essential for robust analysis.

A purposive sampling technique selected ten Sub Saharan African countries for analysis, focusing on those with average GDPs equal to or exceeding the regional average from 2010 to 2021. This approach ensures representation of varying economic performances, essential for nuanced insights into debt sustainability and macroeconomic stability.

Secondary data from the World Bank Database forms the basis of this study, ensuring access to reliable and comprehensive information pertinent to the research objectives. The study relied on secondary sources, defined by Kumar (2011) as existing published material. Data extraction primarily were from the World Bank Database, ensuring consistency and reliability.

The variable that affected the outcome variable was referred to as an independent variable. The following independent variables were considered in this study as they were selected based on established economic theory, their use in previous studies and the availability of data.

Debt to GDP Ratio: The debt-to-GDP ratio, presented as a percentage, was employed to evaluate a country's ability to meet her debt obligations. Put differently, it assessed a nation's government debt in relation to its annual economic output. Information for this metric was obtained from the World Bank database.

Debt to Export Ratio: The ratio of debt to exports provided a swift measure of a nation's capacity to settle her debt using the augmented revenue from exports. Information for this variable was obtained from the World Bank database.

Debt to Gross National Income: The metric of debt-to-Gross National Income (GNI) quantified and contrasted a nation's overall earnings with its debt responsibilities. The data for this variable was obtained from the World Bank database.

External Reserve to Debt Ratio: The ratio between external reserves and debt indicated the amount of money allocated for unforeseen costs compared to what was owed to creditors. This ratio functions as an indicator of a country's capacity to promptly address adverse or unforeseen events. Information for this variable was obtained from the World Bank database.

Debt Service to Export Ratio: The ratio of debt service to exports provided a quick gauge of a nation's capacity to manage its debt using the additional income generated from exports. Data for this variable was sourced from the World Bank database.

Control Variable

In a practical situation, as suggested by Kumar (2011), various additional factors might influence variations in the dependent variable. If these factors were not assessed in the study, it could potentially amplify or diminish the strength of the cause-and-effect relationship between the independent and dependent variables. This study incorporated certain variables from Okwoche's research in 2021, specifically political stability, corruption index, and regulatory quality, as control variables. The data for these variables were obtained from the World Bank database.

Three sets of variables dependent, independent, and control were employed to assess the influence of debt sustainability on macroeconomic stability. The study utilized the inflation rate as a proxy for macroeconomic stability.

Independent variables include:
1. Debt-to-GDP Ratio
2. Debt-to-Export Ratio
3. Debt-to-Gross National Income Ratio
4. External Reserve-to-Debt Ratio
5. Debt Service-to-Export Ratio

Political stability, government effectiveness, and regulatory quality, drawn from Okwoche's research (2021), served as control variables. These factors are crucial for mitigating confounding influences on the relationship between debt sustainability and macroeconomic stability.

Data Analytical Techniques

This study employed descriptive and inferential statistics to analyze the collected data. Descriptive statistics, including mean, standard deviation, maximum, minimum, and data visualization techniques such as graphs and charts, provided insights into trends and patterns in debt sustainability and macroeconomic stability. Inferential statistics using multiple regression analysis, facilitated the exploration of relationships between variables and enable predictions based on data patterns. Panel regression analysis, a

methodology used in prior investigations, served to quantify the impact of debt sustainability on macroeconomic stability, incorporating control variables for comprehensive analysis.

The study adopted the work of Owusu and Erickson (2016) and modified it to capture all the variables in the study.

The model by Owusu and Erickson (2016) is given thus:

$GDP_it = \propto + \beta_1 (GOVD)_{it} + \beta_2 (GOVE)_{it} + \beta_3(INFL)_{it} + \beta_4 (INV)_{it} + \beta_5 (OPEN)_{it} + \beta_6(POPG)_{it} + e_it$ ….. (i)

Where:

GDP_it	= Growth Rate in $Year_{it}$
$GOVD_it$	= A Measure of Public Debt
$GOVE_it$	= Government Consumption Expenditure
$INFL_it$	= Inflation
INV_it	= Investment Spending
$OPEN_it$	= Economic Openness (Imports and Exports in a Year)
$POPG_it$	= Population Growth
e_it	= Error Term

To evaluate the influence of changes in a dependent variable (macro-economic stability) caused by changes in independent variables (debt sustainability indicators) and test the hypotheses stated for this study, the regression model below was used.

$MES_it = \beta_0 + \beta_1 (DGDP)_{it} + \beta_2 (DXP)_{it} + \beta_3(DGNI)_{it} + \beta_4 (RD)_{it} + \beta_5 (DSXP)_{it} + \beta_6(GDPPCG)_{it} + \beta_7 (PS)_{it} + \beta_8 (GE)_{it} + \beta_9(RQ)_{it} + \mu_it$ …..... (ii)

Where:

MES_it	=	Macroeconomic Stability (Inflation rate)
$DGDP_it$	=	Debt to GDP Ratio
DXP_it	=	Debt to Export Ratio
$DGNI_it$	=	Debt to Gross National Income
RD_it	=	Reserve to Debt ratio
$DSXP_it$	=	Debt Service to Export Ratio
$GDPPCG_it$	=	GDP Per Capital Growth
PS_it	=	Political Stability
GE_it	=	Government Effectiveness
RQ_it	=	Regulatory Quality
$\beta_0 – \beta_8$	=	Are the parameters
μ_it	=	Stochastic factor/error term

Panel data regression approaches were adopted for the analysis of this study. Techniques such as Pooled OLS, Fixed and Random effect models were used to estimate the above multiple regression model.

The outlined methodology offers a systematic approach for investigating the relationship between debt sustainability and macroeconomic stability in Sub Saharan African countries. By employing rigorous research design, robust data collection, and advanced analytical techniques, this study aimed to provide valuable insights for policymakers and stakeholders navigating the complexities of economic management in the region.

Descriptive Statistics

A thorough examination of metrics such as mean values, maximum and minimum values, and standard deviation of this study aimed to uncover

patterns within the dependent, independent, and control variables.

Table 4.1 Descriptive Statistics

Variables	Mean	Minimum	Maximum	Std. Dev.	Observations
MES	15.10	-1.11	359.09	36.07	120
DGDP	53.72	9.45	275.04	41.17	120
DXP	171.68	20.30	459.00	115.99	120
DGNI	35.69	5.00	137.50	21.82	120
DSXP	11.36	0.50	49.70	9.70	120
RD	36.45	0.80	204.20	33.70	120
GDPPCG	1.75	-8.67	11.30	3.78	120
PS	19.99	0.95	52.83	16.35	120
GE	-0.80	-1.76	0.31	0.54	120
RQ	-0.70	-1.67	0.45	0.54	120

Source: Researcher's Computations using MS Excel 365 2023

Table 4.1 revealed the descriptive statistics for the variables under scrutiny, shedding light on their central tendencies, variability, and distribution across the sample of 120 observations. The Mean Economic Stability (MES) variable demonstrated an average value of 15.10, with a considerable standard deviation of 36.07, indicating notable variability in economic stability measures across the sampled countries. Debt to GDP (DGDP) exhibited a mean value of 53.72, suggesting a significant proportion of debt relative to GDP within the region, with notable fluctuations as indicated by the standard deviation of 41.17.

Similarly, Debt to Export Ratio (DXP) and Debt to Gross National Income (DGNI) displayed substantial mean values of 171.68 and 35.69, respectively, underscoring the considerable reliance on external debt and the need for sustainable debt management strategies. The standard deviations of 115.99 and 21.82 further highlighted the variability in these debt-related metrics, indicative of diverse economic conditions across Sub Saharan African economies.

Moreover, Debt Service to Export Ratio (DSXP) showcased a mean value of 11.36, emphasizing the importance of debt service obligations relative to export earnings, with a notable standard deviation of 9.70 reflecting variability in debt servicing capacities. Regulatory Quality (RQ) and Political Stability (PS) variables exhibited mean values of -0.70 and 19.99, respectively, with standard deviations indicating variability in regulatory frameworks and political stability across the region.

Overall, these descriptive statistics provided valuable insights into the economic dynamics and debt related metrics within Sub Saharan African economies, facilitating a comprehensive understanding of the challenges and opportunities for sustainable economic growth and development in the region.

Inferential Statistics/Test for Hypotheses

To fulfill the predefined objectives, this study utilized pooled

regression alongside fixed and random effect models to thoroughly examine and scrutinize the null hypotheses outlined within the research framework. Additionally, the study reported the outcomes of the Hausman test, a critical determinant used to identify the most suitable model choice between the fixed and random effects models.

Table 4.2 Estimates for Hypotheses Testing

Variables	Fixed Effect++	Random Effect	Pooled Model
DGDP	0.5389 (3.8978)***	0.6742 (7.0657)***	0.6742 (6.0034)***
DXP	-0.2650 (-5.1597)***	0.0010 (0.0341)	0.0010 (0.0290)
DGNI	0.0557 (0.2357)	-0.3297 (-1.8777)*	-0.3297 (-1.5954)
RD	0.2605 (1.7853)*	0.2768 (3.1548)***	0.2768 (2.6805)***
DSXP	2.5980 (6.6499)***	1.3719 (4.1103)***	1.3719 (3.4923)***
GDPPCG	-0.1000 (-0.0972)	1.2572 (1.5716)	1.2572 (1.3353)
PS	1.0269 (1.8532)*	0.1780 (0.7855)	0.1780 (0.6674)
GE	-22.1855 (-0.9023)	7.7608 (0.5717)	7.7608 (0.4857)
RQ	-2.8348 (-0.1344)	-16.7751 (-1.2481)	-16.7751 (-1.0605)
C	-49.4615 (-1.8476)*	-46.5271 (-3.5605)***	-46.5271 (-3.0251)***
R-Squared	0.628401	0.439393	0.439393
Adjusted R-squared	0.562176	0.393525	0.393525
F-Statistic	9.488808	9.579538	9.579538***

Source: Researcher's Computations (2023) using EViews 10
****, ** and * represent 1%, 5%, and 10% significance levels respectively.*
Figures in brackets are t- statistics values.
++ = lead equation.
Dependent variable: Macroeconomic Stability (MES)

Upon analyzing the econometric estimates delineated in Table 4.2, which encompasses fixed effect, random effect, and pooled models, it becomes evident that the pooled model is not typically applied in cross-sectional studies such as the present one. This exclusion stems from its failure to recognize the panel structure inherent in the data, as it merely estimated parameters without acknowledging the individuality or heterogeneity among the entities in the study (Kurt, 2015). Therefore, the study chooses to exclude the pooled regression model from further consideration, aligning with the overarching objective of investigating the individual performance of the entities (countries) included in the study.

The Fixed Effects and Random Effects Models formed the cornerstone of the study's evaluation. The Fixed Effects, or Least Squares Dummy Variable (LSDV) model, accounts for heterogeneity and individuality, while the Random Effects model assumes a common mean value for the intercept (Greene, 2008). The selection of the most appropriate model was determined through the Hausman Test, a crucial step in ensuring methodological robustness and aligning with the subtle intricacies of the dataset.

Hausman Test

To ascertain the optimal model for hypotheses testing, the study conducted the Hausman test, the results of which are presented below:

Table 4.3 Hausman Test Result

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		51.372203	9	0.0000
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
DGDP	0.538938	0.674183	0.010014	0.1765
DXP	-0.264951	0.00104	0.001705	0.0000
DGNI	0.055648	-0.329727	0.024928	0.0147
RD	0.260506	0.276802	0.013594	0.8888
DSXP	2.597979	1.371853	0.041234	0.0000
GDPPCG	-0.09995	1.257208	0.417687	0.0357
PS	1.026939	0.178036	0.255705	0.0932
GE	-22.185483	7.760814	420.185528	0.1440
RQ	-2.83477	-16.775192	263.944585	0.3909

Source: Researcher's Computations (2023) using EViews 10

Based on the probability of the Hausman test, where the probability (0.0000) was less than 0.05, the fixed effects model was preferred. This indicated the rejection of the null hypothesis of the Hausman test, which states that the random effects model is preferred, and the acceptance of the alternative that the fixed effects model was preferred. Consequently, based on the Hausman test outcomes, the study acknowledged the fixed effects model as the most suitable estimator for evaluating the relationship between debt sustainability and macroeconomic stability in Sub Saharan African economies.

In scrutinizing the fixed effects econometric estimates presented in Table 4.2, the R-squared (R^2) value stood at 0.628401. This indicated that approximately 62.8401% of the total variations observed in the dependent variable, Macroeconomic Stability, were accounted for by the independent variables encompassing debt sustainability variables and control variables. However, it is pertinent to acknowledge the potential bias in R-squared, given the inflationary impact of employing multiple independent variables in the model. To mitigate this, attention was directed toward the adjusted R-squared.

The adjusted R-squared, a refined version of R-squared adjusted for the number of predictors in the model, was considered to enhance the robustness of the estimate. Unlike R-squared, the adjusted R-squared only increases if additional variables genuinely improve the model beyond chance expectations. The fixed effects model's adjusted R-squared was 0.562176, implying that approximately 56.22% of the unbiased explained proportion of total variations in the dependent variable was attributed to the independent variables particularly, debt sustainability variables and control variables. In simpler terms, these factors

elucidated about 56.22% of the total variations observed in Macroeconomic Stability within Sub Saharan African economies.

To evaluate the statistical significance of the relationship between debt sustainability and macroeconomic stability in Sub Saharan African economies, attention turned to the F-statistic. The F-statistics value within the fixed effect model was 9.488808, accompanied by a probability value of 0.0000, establishing the statistical significance of the relationship between debt sustainability and macroeconomic stability in Sub Saharan African economies. This outcome led to the conclusive finding that debt sustainability bears a significant relationship with macroeconomic stability within the context of Sub Saharan African economies. Consequently, the fixed effect model emerged as statistically apt for scrutinizing the connection between debt sustainability and macroeconomic stability in the Sub Saharan African economic landscape.

Hypotheses Testing

$H0_1$: Debt to GDP ratio has no significant effect on macroeconomic stability in Sub Saharan African countries

The fixed effect estimate reveals a positive association between the Debt to GDP Ratio (DGDP) and macroeconomic stability in Sub Saharan African countries, with a coefficient of 0.538938. This implied that an increase in the Debt to GDP ratio corresponds to approximately a 0.538938-fold increase in macroeconomic stability in these nations. Specifically, the result indicated that a unit increase in Debt to GDP ratio will lead to about 0.538938 increase in inflation rate in the Sub Saharan African economies. The statistical significance of this relationship was affirmed by the t-test value of 3.897748, coupled with a probability value of 0.0002. Consequently, the study established that the Debt to GDP ratio significantly influenced macroeconomic stability in Sub Saharan African countries.

$H0_2$: Debt to exports ratio has no significant impact on macroeconomic stability in Sub Saharan African countries

The fixed effect estimate highlighted a negative correlation between the Debt to Export ratio (DXP) and macroeconomic stability in Sub Saharan African countries, as indicated by the coefficient of -0.264951. This signified that an increase in the Debt to Export ratio corresponded to approximately a -0.264951-fold decrease in macroeconomic stability in these nations. The statistical significance of this inverse relationship was underscored by the t-test value of -5.159699, accompanied by a probability value of 0.0000. Consequently, the study established that the Debt to Export ratio significantly influences macroeconomic stability in Sub Saharan African countries.

$H0_3$: Debt to Gross National Income ratio has no significant influence on macroeconomic stability in Sub Saharan African countries

The coefficient of the Debt to Gross National Income (DGNI) ratio suggested a positive correlation between this debt metric and macroeconomic stability in Sub Saharan African countries. However, the statistical analysis revealed that the positive relationship between the Debt to Gross National Income ratio and

macroeconomic stability lacked statistical support. Consequently, the study accepted the null hypothesis that Debt to Gross National Income ratio has no significant influence on macroeconomic stability in Sub Saharan Africa countries.

$H0_4$: External Reserve to debt ratio has no significant effect on macroeconomic stability in Sub Saharan African countries

The positive coefficient associated with the External reserve to Debt Ratio (RD) implied a potential positive correlation between the ratio and inflation, but this relationship lacks robust statistical support. Consequently, the study concluded that reserve to debt ratio is not a significant influencer of macroeconomic stability in Sub Saharan Africa countries.

$H0_5$: Debt service to exports ratio has no significant impact on macroeconomic stability in Sub Saharan African countries

The positive coefficient associated with the Debt Service to Exports ratio (DSXP) suggested a potential positive correlation between this ratio and inflation rates, indicating that an increase in the debt service to exports ratio may lead to a proportional increase in macroeconomic stability in Sub Saharan African countries. The statistical analysis reinforced this relationship, implying that the debt service to exports ratio indeed has a substantial and statistically significant impact on macroeconomic stability in Sub Saharan African countries.

Results and Discussions

Numerous empirical inquiries have delved into the intricate relationship between debt sustainability and economic indicators. The outcomes of this study underscore the profound relationship between debt sustainability and macroeconomic stability in Sub Saharan African economies. The utilization of the fixed effects model, yielding an R-squared of 0.6284 and an adjusted R-squared of 0.5622, elucidated that debt sustainability variables significantly elucidate variations observed in macroeconomic stability. This corroborated previous research emphasizing the interconnectedness of debt and economic stability (Reinhart and Rogoff, 2010; Cecchetti 2010).

The study's findings resonate with the conclusions drawn by Matthew and Adetayo (2022) and Eke and Akujuobi (2021), accentuating the pivotal role of debt sustainability in fostering economic expansion. Furthermore, the adverse impact of the debt to exports ratio on macroeconomic stability aligned with the observations of Odejimi and Ozor (2018), where debt exerted a pronounced effect at a 1% significance level.

In contrast to Chudik's (2017) study, which found no universally applicable debt threshold, our findings substantiated that specific debt ratios, such as debt to GDP and debt to exports, indeed exerted discernible impacts on macroeconomic stability within the Sub Saharan African context.

Focusing on the specific debt metrics, the study meticulously evaluated the influence of the Debt to GDP ratio, Debt to Export ratio, Debt to Gross National Income ratio, External reserve to Debt ratio, and Debt Service to

Exports ratio on macroeconomic stability.

The positive association between the Debt to GDP ratio and macroeconomic stability, mirrored by the coefficient of 0.538938, suggested that an escalation in this ratio corresponded to a proportional upsurge in macroeconomic stability. This finding, aligned with expectations, echoes the empirical evidence presented by Matthew & Adetayo (2022) and Owusu (2019). The rejection of the null hypothesis further underscored the significance of the Debt to GDP ratio as a determinant of macroeconomic stability in Sub Saharan Africa.

Conversely, the negative correlation between the Debt to Export ratio and macroeconomic stability, encapsulated by the coefficient of -0.264951, intimated that an escalation in this ratio led to a proportional decrement in macroeconomic stability. This finding accentuated the significance of export-driven growth and debt management in nurturing macroeconomic stability within the region. The negative correlation between the Debt to Export ratio (DXP) and macroeconomic stability aligned with the consensus in the literature (Brida et al., 2017; Kim et al., 2017). The repudiation of the null hypothesis reinforced the argument that the Debt to Export ratio significantly influences macroeconomic stability in Sub Saharan Africa.

While the positive correlation between the Debt to Gross National Income ratio and macroeconomic stability, represented by the coefficient of 0.055648, exists, it lacks statistical significance. This result was consistent with the caution expressed by Nega (2021) regarding the sustainability of external debt in low-income Sub Saharan African countries. Additionally, the positive relationship established between the Debt to Gross National Income ratio and macroeconomic stability aligned with the conclusion of Owusu (2019). The lack of statistical significance between the Debt to Gross National Income (DGNI) ratio and macroeconomic stability diverged from some previous studies like Swamy (2019), possibly due to specific dynamics within Sub Saharan African economies.

The positive coefficient of 0.260506 associated with the External reserve to Debt ratio implied a potential positive correlation with inflation, suggesting that higher external reserves relative to debt might be associated with increased inflation rates. However, the lack of statistical significance, indicated by the t-test value of 1.785297 with a probability value of 0.0772, suggested that this relationship lacked robustness and may be influenced by random variation. This finding is in contrast with expectations and underscored the need for further exploration into the dynamics of external reserve and debt interactions. While the positive coefficient of the reserve to Debt ratio (RD) suggested a potential stabilizing effect, its lack of statistical significance aligned with findings by Karadam (2018), highlighting the nonlinear and context-dependent nature of this relationship.

The positive correlation between the Debt Service to Exports ratio and macroeconomic stability, represented by

the coefficient of 2.597979, is both substantial and statistically significant. This suggested that an increase in the debt service to exports ratio significantly led to an increase in inflation rate. The significant positive impact of the Debt Service to Exports ratio (DSXP) on macroeconomic stability, as measured by inflation, resonated with findings by Owusu (2019) and explained the importance of debt service management in maintaining economic stability. High debt service obligations can strain government resources, potentially leading to inflationary pressures. The repudiation of the null hypothesis underscored the importance of considering the debt service to exports ratio as a crucial determinant influencing inflation rates in Sub Saharan Africa.

In conclusion, this study furnishes robust evidence of the significant relationship between debt sustainability variables and macroeconomic stability in Sub Saharan African economies. The findings underscored the impacts of different debt metrics, with Debt to GDP ratio, Debt to Export ratio, and Debt Service to Exports ratio emerging as particularly influential factors.

Discussions of Findings

This research illuminated the relationship between debt sustainability and macroeconomic stability in Sub Saharan African economies, revealing both positive and negative impacts contingent upon policy effectiveness. While strategic borrowing for capital projects can stimulate growth, excessive public borrowing leading to high debt burdens may impede sustainable development. By incorporating a mix of control variables and employing a comprehensive panel data approach spanning from 2010 to 2021, the study deepened understanding of this complex interplay within the unique economic landscape of Sub Saharan Africa. Findings indicated significant effects of Debt to GDP ratio, Debt to Export ratio, and Debt Service to Exports ratio on macroeconomic stability, while the influence of Debt to Gross National Income ratio and External reserve to Debt ratios lacked statistical significance.

Conclusion

To navigate these dynamics effectively, policymakers should adopt prudent debt management practices, emphasize export diversification, and exercise caution with gross national income debt metrics. Additionally, evidence-based external reserve management and proactive debt service planning are crucial to maintaining economic stability. This study not only contributed to the scholarly discourse on debt sustainability and macroeconomic stability but also offered practical insights for policymakers and practitioners to inform more effective economic strategies tailored to the unique challenges and opportunities of Sub Saharan African countries.

In the course of the study, some limitations were encountered which include but not limited to weak/unstable internet services within the sub region. Complexities with respect to different countries that were studied in terms of financial systems. The limitations were over by careful going through the specific financial systems of the ten countries that have the average regional GDP, late

access to internet facilities and visit to cyber café where there is stronger internet access.

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