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Original Research Article

The Impact of External Debt and Exchange Rate Volatility on Domestic Consumption in Sub-Saharan Africa

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Abstract

Domestic consumption as the driver of economic growth in any country influences productive activities, employment, and macroeconomic policy decisions. The literature concentrated mostly on income and the interest rate as the determinants of domestic consumption with the recent addition of changes in the real exchange rate and its volatility as critical factors influencing consumption decisions, as countries are becoming open to the global market. However, with the current external debt crisis in Sub-Saharan African countries, this study examined the impact of external debt and exchange rate volatility on domestic consumption in Sub-Saharan Africa in both the short run and long run; sampling twelve Sub-Saharan African countries for the period of 1990–2021. The study utilized a pooled mean group (PMG) estimator of dynamic heterogeneous panel technique and generated exchange rate volatility using generalized autoregressive conditional heteroscedasticity (GARCH). Our study discovered that while external debt service has a huge negative impact on domestic consumption in the long run, the external debt stock has a long-run positive and significant impact on domestic consumption. Moreover, the exchange rate in Sub-Sahara Africa is persistently volatile and its volatility has both positive and negative impacts on domestic consumption. Our study suggests that external debt may be used to stimulate domestic consumption if it is channeled into infrastructure development and productive activities with high yields to service and liquidate the debt while stabilizing the exchange rate.

Keywords: Domestic Consumption; Exchange Rate Volatility; External debt; PMG; GARCH; Sub-Sahara Africa.

1. INTRODUCTION

Domestic consumption is an essential element of Gross Domestic Product (GDP) of every country as it has contributed largely to Gross Domestic Product (GDP) in virtually every economy across the world including Sub-Saharan Africa. It accounts for almost 70% of aggregate demand in most developing countries. According to Bahmani-Oskooee, Kutan and Xi (2015), domestic consumption is the basis of all economic activities. The level of domestic consumption in the economy has always been given attention by contemporary economists because it describes a nation's economic system.

Domestic consumption plays an important role in the determination of welfare and the dynamic impact of economic shocks; Its enhancement is an effective means of maintaining economic growth (Keho, 2019; Liu *et al*., 2018). Therefore, it is crucial for economists and policymakers to identify and establish the determinants of domestic consumption that can increase or inhibit economic activities at different periods (Hamano, 2013). The traditional economists identified income and interest rates as the main determinants of domestic consumption. A few studies argued that inflation can also affect the level of consumption; since inflation increases the cost of living via the increase in prices of commodities and cuts down the opportunities of getting good jobs consequently, reduction in income level and ultimately causing a fall in household consumption expenditure (Olusola *et al*., 2022).

In recent studies, there is more focus on exchange rate and its volatility as determinants of consumption because countries are becoming more receptive to global market (Iyke and Ho, 2017). Exchange rate is an essential macroeconomic variable in the making of economic policies, particularly, to support the speeding up of macroeconomic goals. Khan and Syed (2014) affirmed that all countries tend to gain the benefits of globalization through trade openness, and this trade openness makes the exchange rate become a crucial

factor impacting not only a country's trade movements in other countries but also a contributing factor to other macroeconomic variables; like domestic consumption (Kumar *et al*., 2019). Given that exchange rate influences consumption, definitely, its fluctuation may also impact consumption.

Alexander (1952) was the first to relate exchange rates to consumption in his seminar study. He asserted that consumption is being influenced by the pass-through effects of exchange rate on inflation. That is, exchange rate volatility influences household consumption decisions through inflation uncertainty. The relationship between exchange rate and domestic consumption was established based on the inflationary impact of currency depreciation that enables the inflation driven by global development to traverse to the domestic economy. Exchange rate volatility has substantial effect on the welfare and the social life of the entire economy which are measured by domestic consumption as countries are becoming more globalized; hence, stabilizing the exchange rate can boost stable domestic consumption (Sin-Yu and Iyke 2017; Mumtaz and Ali, 2020). In Africa, where there is excessive dependence on exportation of raw material and consumer goods importation; fluctuations in the exchange rate affect domestic consumption level because the importation of goods is shaped by changes in the foreign exchange rate market. Oseni (2016) asserted that exchange rate volatility creates uncertainty in the future price level expectations which raises production costs, decreases trade, causes unanticipated wealth redistribution, and leads to instabilities in the real economy, with a negative effect on the growth of domestic consumption in Africa.

Aside the income, interest rate, inflation rate, exchange rate, and exchange rate volatility, external debt could also have impact on domestic consumption. Usually, external debt is more needed when any economy faces shortage of domestic savings and deficiency of foreign exchange to bridge the country's domestic resource gap, speed up economic development, and finance national objectives. Developing countries like the Sub-Saharan African nations who seek better living standards for citizens have limited resources to meet the country's financial requirements of consumption and investment which result in opting for external financing to balance the domestic resources gaps. (Soydan & Bedir, 2015; Waheed, 2017). External debt may be beneficial in boosting the economy when it is proficiently utilized in the productive income-generating activities that aid external debt servicing and liquidation of the debt but it may also adversely affect the economy by compressing it under the burden of debt service which may hinder sustainable growth and poverty alleviation (Oke and Sulaiman, 2012; Pattillo, Poirson, and Ricci, 2011).

Although issues on whether external debt impacts domestic consumption have not been documented amid studies that revolve around the relationship between external debt and macroeconomic performance in Sub-Saharan Africa, but a lot of literature has proven that excessive external debt hinders economic growth. So, it is evident that a country's economic growth has a direct impact on disposable income, hence, on saving and consumption decisions (Kumar *et al*., 2019).

We noticed that empirical literature has thrived on the relationship between exchange rate volatility and domestic consumption but most economic debates and research centred around the relationship between external debt and economic growth; However, issues on whether or not external debt affects domestic consumption has not been recorded among the studies that surround the correlation between external debt and macroeconomic variables in Africa; to the best of our knowledge. Meanwhile, economists have argued that the contribution of domestic consumption to the of Gross Domestic Product of a country is about 70 % (Mankiw, 2012). To fill this gap in the literature, this study examines the impact of exchange rate volatility and external debt on domestic consumption in Sub-Saharan Africa. The rest of the paper is organized as follows: the next section provides a review of the existing literature, followed by a discussion of the methodology in Section 3. The empirical results are presented in Section 4, whilst Section 5 concludes with policy recommendations.

2. LITERATURE REVIEW

Economic literature acknowledged domestic consumption as the driver of economic activities as it aids aggregate demand significantly, which eventually spreads to economic growth with viable spread-out aids to poverty alleviation. Domestic consumption has contributed primarily to Gross Domestic Product (GDP) in virtually every economy across the world including Sub-Saharan Africa. Ezeji and Ajudua (2015) considered the level of domestic consumption in an economy as a fundamental determinant of productivity success in that economy. Signe (2018) found out that Africa is one of the fastest growing consumer markets in the world, with domestic consumption increasing faster than GDP in recent years with consumer expenditure growing at an annual compound rate of 3.9% since 2010 reaching $1.4 trillion in 2015 and anticipated to reach $2.1 trillion by 2025. Keho (2019) also indicated that understanding the factors influencing domestic consumption will give necessary information that can guide policies on poverty reduction and economic growth.

A lot of studies have established domestic consumption as the key component of aggregate demand and prove that income, inflation, and interest rate are consumption determinants. The Keynesians and Classicalists argued that income and interest rate are the main determining factors of consumption (Hamano, 2013). Palumbo, Rudd, and Whelan (2002) study revealed a substantial strong positive, and steady

correlation between consumption and financial wealth. Bondt, Giesek, and Tujula (2020) also supported that wealth enhances households' future certainty and boosts domestic consumption. They further stated that the level of household wealth is a strong factor that determines choices and the level of domestic consumption in the long term. Bloom (2014) asserted that interest rate influences domestic consumption. He argued that high interest rates slow down investment, which in turn impedes economic activities and decreases aggregate consumption in the economy. The work of Fernandez-Villaverde *et al*., (2011) also discovered that real interest rate volatility significantly impacts consumption and other economic variables such as investment, output, and prices in developing economies.

A few studies also connected inflation and the level of consumption (Kugler, 1985; Onodje, M., 2009). The study of Hausman and Wieland (2014) showed that changes in price levels and inflation anticipations may influence household consumption expenditure; higher inflation may stimulate an increase in inflation uncertainty, which in the long run decreases domestic consumption through a precautionary savings channel (Pastor and Veronesi, 2013). However, Mian A., Rao K., and Sufi A. (2013) argued that higher inflation anticipations may raise household consumption spending through a wealth-redistribution channel if the households have higher marginal propensities to consume out of wealth.

Iyke and Ho (2018) discovered that the increase in international trade among countries made exchange rates one of the important key determinants of domestic consumption level. Alexander (1952) was the first researcher to establish the relationship between exchange rate, its volatility, and domestic consumption. He argued that the exchange rate may determine the level of consumption through its pass-through effect on inflation. Domestic consumption decisions may be shaped as a result of inflation uncertainty induced by real exchange volatility.

Obstfeld and Rogoff (1998) analyzed the impact of exchange rate volatility on domestic consumption through direct and indirect channels citing Carroll (1997) who examined the optimal behavior of consumers with standard attitudes toward risk facing income uncertainty. He realized that it is ideal for an average household spending patterns to reflect average household income profiles over much of the life cycle, subject to households' income profiles and their degree of anxiety. They indicated that exchange rate volatility contributes directly towards inflation uncertainty which has an adverse effect on domestic consumption; by making the people circumspect in their spending and saving more. They further argued that price instabilities generated by exchange rate volatility adversely affect the trade and production levels, then decrease the income and hence, domestic consumption. Indirect channel assumes that oscillation of exchange rate upsurges the business risk and the firm may charge risk premium on goods and services by fixing higher prices, which slowly reduces the domestic consumption level.

Bahmani-Oskooee, Kutan, and Xi (2015) studied the influence of exchange rate volatility on domestic consumption in some developing economies. The study sampled twelve countries which includes Armenia, Bolivia, Bulgaria, Chile, Colombia, the Czech Republic, Hungary, Malaysia, the Philippines, Poland, Russia, and South Africa. They used dynamic heterogeneous panel estimation techniques and generalized autoregressive condition heteroskedasticity (GARCH) Model and quarterly data covering periods of 1991Q1 to 2014Q4. The study emphasized that exchange rate volatility affected domestic consumption in most of the sampled economies in the short-run but a sustained long-run effect was apparent in half of the economies. They deduced that, the exchange rate and its volatility are significant determinants of consumption.

Iyke and Ho (2019) also analyzed the effects of exchange rate uncertainty on domestic consumption in selected Asian countries incorporating both short and long-run effects. The sampled countries are China, Hong Kong, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, and Thailand. They also utilized dynamic heterogeneous panel estimation techniques and the generalized autoregressive condition heteroskedasticity (GARCH) Model to analyze quarterly data from 1993Q1 to 2017Q4. The authors discovered that exchange rate uncertainty has an insignificant effect on domestic consumption in the short run but exerts a significant unfavorable influence on domestic consumption in the long run.

Okafor and Lokossou (2020) analyzed the reaction of real consumption to real exchange rate uncertainty in both the short and long run for the monetary union- the Eurozone. They sampled twelve countries from the monetary union for the period 1995Q1-2019Q4; using pooled mean group (PMG) and generalized autoregressive conditional heteroskedasticity (GARCH). Their results showed that exchange rate uncertainty significantly dampened long-run domestic consumption while there was a mixed short-run effect. The study also discovered that in the benchmark model, the eurozone domestic consumption returns to the long-run equilibrium path following short-run deviations is slow.

Mumtaz and Ali (2020) examined the impact of the exchange rate and its volatility on consumption in Pakistan and India using time series data covering the period of 1980 to 2018. Their models differentiate between the real and nominal variables to separate the inflation pass-through effect. The long-run and short-run relationships are obtained using the autoregressive distributive lag method. The study discovered a long-run

relationship between exchange rate volatility and consumption in both countries and suggested that stabilizing the exchange rate may enhance sustainable consumption in India and Pakistan.

Adewuyi and Akpokodje (2013) also recorded that exchange rate volatility on consumption in Africa from 1986 to 2011 was both significantly positive and negative for expected and unexpected depreciation respectively. Oseni (2016) used a System-Generalized Method of Moment dynamic panel regression model to examine the relationship between exchange rate volatility and private consumption in Sub-Saharan African countries. The study established that exchange rate volatility has a significant adverse effect on private consumption in Sub-Saharan Africa, and concluded that instabilities in exchange rate weaken the local currency and make the importation of goods more costly; it also encourages foreign capital leakage which dissuades foreign investors causing aggregate investment decline, consequently, reduces household income and domestic consumption which is detrimental to economic growth having ascertained that domestic consumption contributes to a greater part of the real GDP and a sustainable growth in real GDP precedents economic growth in the literature.

Okwu *et al*., (2020) also researched the short and long-run effect of oil export revenue and exchange rate on households' consumption expenditure in Nigeria from 1981 to 2016. They showed that exchange rate has a significant positive impact on domestic consumption both in the short and long run. Wang, Ye, and Lie (2016) affirmed that the depreciation of the exchange rate could lead to a contractionary effect on the economy by reducing product supply, causing inflation, and increasing debt burden which leads to foreign capital outflow. This crowd-out public expenditure and lower purchasing power hence domestic consumption.

Moreover, it has remained a sustained discussion among the researchers that excessive debt discourages investment, hence retards economic growth by increasing the tax burden to pay the debt services. This is supported by overhanging hypothesis of Krugman (1988). Ejigayehu and Person (2013) also asserted that external debt affects economic growth by debt crowding out effect of private investment in African countries using the data of some selected heavily indebted poor African countries. The recent research work of Sandow *et al*., (2022); Agyeman *et al*., (2022) and Manasseh *et al*., (2022) using the recent econometrics technique and updated panel data also discovered negative relationship between external debt and economic growth in the Sub-Saharan African countries. All the aforementioned works imply that external debt may dampen economic growth resulting in a decrease in income and consequently domestic consumption.

Kumar *et al*., (2019) applied bounds-testing approach to cointegration and error correction modeling techniques to investigate the impact of external debt and exchange rate volatility on domestic consumption in Pakistan. Using the annual time series data from the period of 1980 to 2014; they proved that exchange rate volatility and external debt have negative impact on domestic consumption in both the short run and long run in Pakistan. Cochrane (2011) also argued that higher debt levels may amplify uncertainty in an economy which may lead to future inflation and financial repression. This implies that the negative effect of debt on domestic consumption is reflected through prices increase.

3. METHODOLOGY

3.1 Nature and Source of Data

The set of panel data that was utilized in this study for the empirical analysis is annual and it covers the period 1990 to 2021, and was sourced from the World Bank's World Development Indicators (WDI). The selection of WDI data is due to the comprehensiveness of the data set which comprises different economic indicators. Data was collected on Household and Non-Profit Institutions Serving Households (NPISHs) final consumption expenditure per capita in constant US$ as a proxy for domestic consumption, GDP per capita as a proxy for household income, inflation rate-GDP deflator (annual %), real effective exchange rate, external debt stock (% GNI) and external debt service (% GNI) for twelve selected Sub-Saharan African countries namely Angola, Burundi, Democratic Republic of Congo, Ghana, Gambia, Kenya, Lesotho, Mozambique, Nigeria, Uganda, Sierra Leone, and South Africa.

3.2 Model Specification

In literature, the Keynesians and the Classicalists emphasized the role of income and interest rate in influencing the consumption decisions of households.

The theoretical underpinning of the relationship between consumption and real exchange rate volatility can be traced back to the seminal work of Alexander (1952), who recognized that the exchange rate may influence the consumption level through its pass-through effect on inflation. He affirmed that real exchange rate volatility plays a critical role in domestic consumption decisions because it causes inflation uncertainty The recent studies modelled domestic consumption as a function of real income, the nominal interest rate and the real exchange rate, real exchange rate volatility, and external debt stock (Bahmani-Oskooee, Kutan and Xi, 2015; Iyke and Ho, 2017; Kumar *et al*., 2019; Mumtaz and Ali, 2020).

This study examines the impact of external debt as well as exchange rate volatility on domestic consumption in Sub-Saharan Africa using income, inflation rate, exchange rate and its volatility, external debt stock and external debt serving payment assuming

the debt overhang hypothesis exists in Sub-Saharan Africa. The model is stated in its functional form as

$$DC_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 EXV_t + \alpha_3 EXD_t + \alpha_4 EDS_t + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots (1)$$

In the above equation, *DC* represents the domestic consumption in real terms. While *Y* represents of the household income measured as Gross Domestic Product GDP per Capita, and volatility of the real exchange rate is measured with the symbol *EXV* proxy based on the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) (1,1) model. However, external debt stock and external debt service are represented by symbol *EXD* and *EDS* respectively. α_0, α_1, α_2, α_3, and α_4 are the coefficients of the model; ε is the stochastic error term; t is the time subscript.

According to the theory of consumption, household income and domestic consumption are expected to have a positive relationship because the increase in income also lifts domestic consumption. The sign of α_1 is expected to be positive. Exchange rate volatility is expected to increase or impede domestic consumption subject to household consumers' reaction to instability in the exchange rate (Obstfeld and Rogoff 1998). The sign of α_2 is expected to be negative or positive because it is dependent upon the reaction of the consumers toward the volatility of inflation caused by exchange rate volatility, it will be positive if consumer increases the current domestic consumption to beat the future inflation and vice versa (Bahmani-Oskooee, Kutan and Xi, 2015). Lastly, the expected signs of α_3 and α_4 are negative if the debt overhang hypothesis exists in the case of the selected Sub-Sahara African economies this study covers.

The domestic consumption model in. (1) fails to capture the short-run behavior of the variables. In other words, we cannot evaluate the short-run effects of uncertainty and other factors on domestic consumption. Adding lags to the model will help to recover the short-run dynamics and overcome the issues of endogeneity and autocorrelation so the estimated parameters are unbiased and efficient. Hence, we reformulated Eq. (1) as an error-correction domestic consumption model as follows:

$$DC_{it} = \sum_{j=1}^{p} \Lambda_{ij} \Delta HC_{it-j} + \sum_{j=0}^{q} \delta'_{ij} X_{it-j} + \mu_i t + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Which is a suitable parameterization of the following for panel using a distributed lag model (p, q, k) form as follows:

$$\Delta DC_{it} = \emptyset\,(DC_{it-1} - \theta'_i X_{it}) + \sum_{j=1}^{p-1} \Lambda^*_{ij} \Delta DC_{it-j} + \sum_{j=0}^{q-1} \delta'_{ij} \Delta X_{it-j} + \mu_i t + \varepsilon_{it} \quad \ldots\ldots (3)$$

Where, for notational convenience, *DC* is domestic consumption and *X* replaced the explanatory variables; μ_i and ε_i are the individual specific effect and cross-sectional random effect error terms respectively; Λ_{ij} and δ_{ij} are scalars and coefficient vectors coefficients of the lagged dependent variables respectively. The additional definitions are: $\emptyset i = -\left(1 \sum_{j=1}^{p} \Lambda_{ij}\right)$; $\theta_i = \sum_{j=0}^{q} \delta_{ij} / (1 \sum_k \Lambda_{ik})$; $\Lambda^*_{ij} = -\sum_{m=j+1}^{p} \Lambda_{im}$, $j = 1, 2, 3.., p-1$; $\delta^*_{ij} = -\sum_{m=j+1}^{q} \delta_{im,} j = 1, 2 \ldots, q-1$ …… (4)

The parameter $\emptyset$ is the error-correction term, which shows the speed of adjustment of variables back to equilibrium when they move apart in the short run. Therefore, the variables are said to be cointegrated or move closely in the long run if the estimated value of $\emptyset_i$ is negative and statistically significant as expected. θ'_i is the cointegrating vector, explaining the number of long-run relationships in the model.

The error-correction model Eq. (2) differentiates the short-run effects from the long-run effects of the external debt and exchange rate volatility on domestic consumption. It also captures the feedback causal flow from domestic consumption to explanatory variables and the adjustment to equilibrium paths of domestic consumption and its explanatory variables thereby modeling the cross-sectional heterogeneities in the domestic consumption by allowing the parameters in Eq. (2) to vary (Kim and Lin, 2010; Chudik *et al.*, 2017; Okafor and Lokossou, 2020).

3.2 Estimation Techniques

To ensure non-spurious regression results, before the Pool Mean Group estimation analysis; Levin, Lin & Chu t* W- Statistic test and Im, Pesaran and Shin W- Statistic test were used to check the stationarity of variables in a panel dataset. Testing for cointegration is a necessary step to checking if the modeling exhibits empirically meaningful relationships. The Breusch-Pagan Lagrange Multiplier (LM) statistic test was performed to test whether the residuals are correlated across entities to ensure estimator efficiency and unbiased test statistics.

This study adopted the Pool Group Mean (PMG) estimator; a dynamic heterogeneous panel technique proposed by Pesaran, Shin, and Smith (1999) to capture the short-run and long-run effects and the speed of adjustment to the long-run in the panel model. The PMG estimator is relevant to this study because it is suitable for unbalanced panel and modeling panel data of long dimensions where the time dimension is larger than the cross-section dimension; i.e., T > N (long panel data), which is the dimension of this study data to control dynamic panel bias. It is also suitable to study relationships between variables that are at level, I(0) and at first difference, I(1) (Kim and Lin, 2010; Oseni, 2016; Okafor and Lokossou, 2021).

Moreover, the use of the PMG estimator takes care of flaws and statistical problems that are associated with ordinary least squares, fixed and random effect

models, endogeneity bias, and stationary restriction in the choice of the model by producing consistent and efficient parameter estimates. It also allows us to formally determine whether there is a reversion to the estimated long-run equation after a shock that causes deviations from the estimated long-run and estimate the speed of adjustment to the estimated long-run equilibrium in instances where such reversion is plausible.

To analyze the effects of exchange rate volatility on domestic consumption, the baseline measure of exchange rate volatility which is derived as the annualized conditional variance of a generalized autoregressive conditional heteroskedastic, GARCH (1,1) model of the real effective exchange rate (REER) was calculated.

3.2.1 The GARCH (1, 1) Estimation Process for Exchange Rate Volatility

Exchange rate volatility is measured as the conditional variance exchange rate level constructed from annual data. The conditional variance measures the volatility of a variable in a given model and data set. The study utilized GARCH (1, 1) specification to obtain conditional variance of exchange rate, as follows:

$$REER_t = \emptyset_0 + \emptyset_i REER_{t-1} + \mu_i \quad \ldots\ldots\ldots\ldots (5)$$

$$\sigma_t^2 = \theta + \sum_{i=1}^{p} \vartheta \mu_{t-1}^2 + \sum_{j=1}^{q} \varphi_j \sigma_{t-1}^2 \ldots\ldots\ldots\ldots (6)$$

Where , $\theta = \gamma \sigma_{lk}^2, \gamma, \vartheta, \varphi > 0$ and $\gamma + \vartheta + \varphi = 1$

In Eq. (5), ϑ and$\varphi$are parameter coefficients to be estimated, θ is a constant deterministic term representing the lowest value that the conditional variance can achieve in any period, σ_{lk}^2 is the non-time varying, unconditional long-run variance, and$\gamma$is some scaling factor such that $\gamma = \theta/, \sigma_{lk}^2$ Given θ,ϑ and φ the long-run variance can be obtained from (5) as $\sigma_{lk}^2 = \frac{\theta}{1-\vartheta-\varphi}$, $\vartheta + \varphi < 1$. σ_t^2 is the one-period ahead forecast for the conditional variance of real effective exchange rate based on past information or volatility, σ_{t-1}^2 is the previous volatility (GARCH term) and μ_{t-1}^2 denotes the previous information about volatility (ARCH term) while the equation is called conditional variance equation. Note that one function of θ, as a constant deterministic term, is to allow the conditional variance σ_t^2 to reach a positive level (as $\theta > 0$) provided the condition $\vartheta + \varphi < 1$ is satisfied.

The exchange rate volatility for the yearly data set is generated using the GARCH (1,1) equation in Eq. (6) above which is included in the panel data model in Eq. (1) above as EXV_t. This approach for calculating the exchange rate volatility has been used in various studies. (Oseni, 2016; Iyke and Ho, 2017; Okafor and Lokossou, 2020).

4. RESULTS AND DISCUSSIONS

The empirical analysis of data in this study was performed in four phases. It consists of the descriptive statistics analysis of the data, cross-sectional dependence test-unit root test, ARCH effect and volatility clustering and thereafter it investigates the model using Pool Mean Group (PMG) and generalized autoregressive conditional heteroskedastic (GARCH 1,1) estimation techniques.

4.1 Descriptive Statistics

The summaries of the descriptive statistics for the variables used in this study are presented in Table 1 below. It shows the mean, median, maximum, minimum, and standard deviation values etc.

Table 1: Descriptive Statistics Results

	HC	Y	EVX	EXD	EDS
Mean	983.1709	3235.688	114.8201	58.43414	2.474842
Median	558.8500	1909.921	103.4835	41.29856	1.897856
Maximum	4051.704	14017.41	511.0512	283.9147	19.90618
Minimum	120.3639	690.6596	49.77631	4.950816	0.100218
Std. Dev.	1019.773	3564.740	48.79685	53.34361	2.223832
Skewness	1.773176	2.007784	3.735014	1.977140	3.010092
Kurtosis	5.146197	5.889218	24.18153	6.792875	19.25775
Jarque-Bera	173.2597	246.7630	5086.625	302.7242	3030.618
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	237927.4	783036.6	27786.47	14141.06	598.9117
Sum Sq. Dev.	2.51E+08	3.06E+09	573853.0	685775.4	1191.848
Observations	242	242	242	242	242

Source: Authors' Computation EVEIW 12

The calculated values for the skewness statistic for all the variables (i.e., domestic consumption, household income, exchange rate volatility, external debt stock, and external debt service) are positively skewed indicating that their distributions have a long right tail. The positive values of the kurtosis for all the variables suggest that these variables are leptokurtic. However, the values of the Jarque-Bera statistic show that the series was not asymmetrically distributed since the p-values of all the series are statistically significant at 5% level.

4.2 Unit root test

After confirming that the panel data are not cross-sectionally dependent given the coefficient of the Breusch-Pagan Lagrange Multiplier (LM) test of 35.29148 with a p-value of 0.9993. The study used analysis of Levin, Lin & Chu t* W- Statistic test and Im, Pesaran, and Shin W- Statistic test to test for the presence of the unit roots in the panel data. It is observed that domestic consumption is stationary at the first difference I(1) at 5% significance while household income, exchange rate volatility, external debt stock, and external debt service are stationary at level I(0) at 5% significance level using both techniques as shown in Table1 below.

Table 2: Unit Root Test Result

Variables	Coefficients		Integration
	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	
DC	-5.2131 (0.6201)	-5.2821 (0.800)	I(0)
D(DC)	-90523 (0.0000)	-14.8763 (0.0000)	I(1)
Y	-5.41791 (0.0000)	-6.38868 (0.0000)	I(0)
EXV	-10.1844 (0.0000)	-10.7104 (0.0000)	I(0)
EXD	-9.31260 (0.0000)	-9.95858 (0.0000)	I(0)
EDS	-11.4481 (0.0000)	-12.7073 (0.0000)	I(0)

Source: Authors' Computation E-VIEW 12 Notes: p-values are in the parenthesis.

4.3 ARCH Effect and Volatility Clustering

To test if the exchange rate is volatile over the periods of study, the residual obtained from the exchange rate volatility model using GARCH (1, 1) must have an ARCH effect and be clustered, or else the variable (EXV) is not volatile. Table 3 presented below indicates that the residual has ARCH effects, the ARCH coefficient is positive and significantly less than 0.05, implying that we reject the null hypothesis of no ARCH effect. The coefficient of the ARCH deterministic constant term is positive, greater than zero, and significant revealing that the exchange rate volatility is clustered. This shows that there is a long-run relationship between exchange rate volatility and domestic consumption in Sub-Sahara Africa in agreement with the study of Mumtaz and Ali (2020).

Table 3: ARCH Effect Test Result

	Coefficient	Std. Err.	Prob.
EXV Constant	4.637357	0.0089822	0.000
ARCH	0.9052834	0.1672334	0.000
Constant	0.0077271	0.0009945	0.000

Source: Authors' Computation STATA 10

4.4 Panel Regression Results

The Pool Mean Group and GARCH estimation results for the model is presented in Tables 3 below.

Table 3: Pool Mean Group and GARCH Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
Y	0.271269	0.007255	37.39102	0.0000
EXV	1.983738	0.205017	-5.931055	0.0000
EXD	2.064662	0.365480	5.649176	0.0000
EDS	-52.43383	6.193260	-8.466272	0.0000
Short Run Equation				
COINTEQ01	-0.593956	0.041362	-14.36010	0.0000
D(Y)	0.102072	0.015902	6.418904	0.0000
D(EXV)	0.929833	0.212394	9.339885	0.0000
D(EXD)	-1.321309	0.301025	-4.389367	0.0000
D(EDS)	-15.53070	11.49913	-1.350598	0.1778
C	190.9265	18.28297	10.44286	0.0000

Source: Authors' Computation EVIEW 12 & STATA 10

In the Pool mean group estimation, the coefficient of error-correction term is negative, significant, and considerably lower than unity in absolute terms. This indicates that there is a stable long-run relationship among the variables incorporated in the model. The variables tend to converge together in the long run if they drift apart in the short run.

The coefficients of household income are positive and statistically significant at 5% level both in the short run and long run. This conforms with the economic theory which states that Change in consumption depends on change in income. Thus, a unit percent increase in household income would result in 0.1 and 0.27 percent increase in domestic consumption in the short run and long run respectively in Sub-Saharan African countries.

The coefficients of exchange rate volatility were generated from GARCH (1,1). The estimated exchange rate volatility coefficients have a positive and significant impact on domestic consumption both in the short run and long run. The results suggest that exchange rate volatility enhances domestic consumption if the local currency appreciates but it inhibits domestic consumption as the local currency depreciates, thereby, supporting the work of Alexander (1952). The positive relationship between exchange rate volatility and domestic consumption is due to inflation pass-through effects; the inflation reduces households purchasing power that subsequently shrinks domestic consumption. The exchange rate volatility has a significant positive impact on domestic consumption in Sub-Saharan Africa because the consumption basket of the households of these countries consists more of imported consumer goods.

The results indicate that there is a negative relationship between external debt stock and domestic consumption in the short run but a positive relationship in the long run. That is, a percentage increase in external debt stock would decrease domestic consumption by 1.32 percent in the short run while a percentage increase in external debt stock in Sub-Saharan Africa would increase domestic consumption by 2.06 percent in the long run. This shows that funds borrowed abroad can be used to enhance domestic consumption in Sub-Saharan Africa if invested in productive investment and infrastructures thereby creating a conducive business environment for the entrepreneurs, boosting household income and standard of living in the region.

However, the results also indicate an insignificant negative relationship between external debt service and domestic consumption in the short run but a significant negative relationship between external debt service and domestic consumption in the long run. A percentage rise in external debt service would decrease domestic consumption by 52.43 percent. This signifies the presence of debt overhanging in Sub-Saharan African economies. It is evident that external debt servicing obligations result in a huge outflow of foreign earnings in Sub-Saharan Africa which crowd out private investments, eventually plummets employment levels leading to a decline in household income and consequently dampening domestic consumption. This result supports the study of Kumar *et al*., (2019).

5. CONCLUSION

Domestic consumption is a crucial macroeconomic variable that the policy makers use in adjusting the economy of every country, since it constitutes largely to the component of Gross Domestic Product of a country. The results of this study show that there is negative relationship between external debt and domestic consumption in Sub-Sahara Africa. The external debt stock has a long run positive significant impact on domestic consumption while external debt service has a huge significant negative impact on domestic consumption in the long run. The exchange rate in Sub-Sahara Africa is persistently volatile and its volatility has both positive and negative impact on domestic consumption. The implication of these empirical results is that funds borrowed abroad could be used to stimulate domestic consumption if directed into high return investment and infrastructural development thereby creating conducive business environment for investors, enhancing employment level, boosting household income hence, improving the standard of living in the country as well as yielding income for debt servicing and liquidation. Exchange rate volatility shrinks domestic consumption as local currency depreciates as it causes more uncertainty in inflation making commodities expensive to consume. This maybe associated to perpetual poverty in the region. Our study recommends that Sub-Saharan African governments should pursue monetary and fiscal policy that can reduce exchange rate pressure to keep inflation expectations in check and external debt stock sustainable.

Date: 03/03/24 Time: 18:06 Sample: 1990 2022					
	HC	Y	EVX	EXD	EDS
Mean	983.1709	3235.688	114.8201	58.43414	2.474842
Median	558.8500	1909.921	103.4835	41.29856	1.897856
Maximum	4051.704	14017.41	511.0512	283.9147	19.90618
Minimum	120.3639	690.6596	49.77631	4.950816	0.100218
Std. Dev.	1019.773	3564.740	48.79685	53.34361	2.223832

Skewness	1.773176	2.007784	3.735014	1.977140	3.010092
Kurtosis	5.146197	5.889218	24.18153	6.792875	19.25775
Jarque-Bera	173.2597	246.7630	5086.625	302.7242	3030.618
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	237927.4	783036.6	27786.47	14141.06	598.9117
Sum Sq. Dev.	2.51E+08	3.06E+09	573853.0	685775.4	1191.848
Observations	242	242	242	242	242

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in weighted residuals
Equation: Untitled
Periods included: 32
Cross-sections included: 12
Total panel (unbalanced) observations: 382
Note: non-zero cross-section means detected in data
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	35.29148	66	0.9993
Pesaran scaled LM	-2.672834		0.0075
Pesaran CD	0.574164		0.5659

Panel Unit Root Test on DC

Panel unit root test: Summary
Series: DC
Date: 23/24/24 Time: 18:11
Sample: 1990 2022
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.80011	0.9974	12	266
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.24768	0.1061	12	266
ADF – Fisher Chi-square	42.3159	0.0119	12	266
PP - Fisher Chi-square	263.676	0.0000	12	296

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test on D(DC)

Panel unit root test: Summary
Series: D(DC)
Date: 02/24/24 Time: 10:03
Sample: 1990 2021
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.05232	0.0000	12	344
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-14.8763	0.0000	12	344
ADF - Fisher Chi-square	218.540	0.0000	12	344
PP - Fisher Chi-square	239.389	0.0000	12	357

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test on Y

Panel unit root test: Summary
Series: Y
Date: 02/24/24 Time: 16:29
Sample: 1990 2021
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel Balanced observations for each test

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.41791	0.0000	12	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.38868	0.0000	12	360
ADF - Fisher Chi-square	84.5128	0.0000	12	360
PP - Fisher Chi-square	381.632	0.0000	12	372

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test on EXV

Panel unit root test: Summary
Series: EXV
Date: 02/24/24 Time: 16:30
Sample: 1990 2021
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel Balanced observations for each test

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.1844	0.0000	12	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.7104	0.0000	12	360
ADF - Fisher Chi-square	150.972	0.0000	12	360
PP - Fisher Chi-square	360.897	0.0000	12	372

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test on EXD

Panel unit root test: Summary
Series: EXD
Date: 02/24/24 Time: 16:31
Sample: 1990 2021
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.31260	0.0000	12	357
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.95858	0.0000	12	357
ADF - Fisher Chi-square	139.370	0.0000	12	357
PP - Fisher Chi-square	291.648	0.0000	12	370

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test on EDS

Panel unit root test: Summary
Series: EDS
Date: 02/24/24 Time: 16:32
Sample: 1990 2021
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel Balanced observations for each test

Cross-Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-11.4481	0.0000	12	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.7073	0.0000	12	360
ADF - Fisher Chi-square	183.968	0.0000	12	360
PP - Fisher Chi-square	310.111	0.0000	12	372

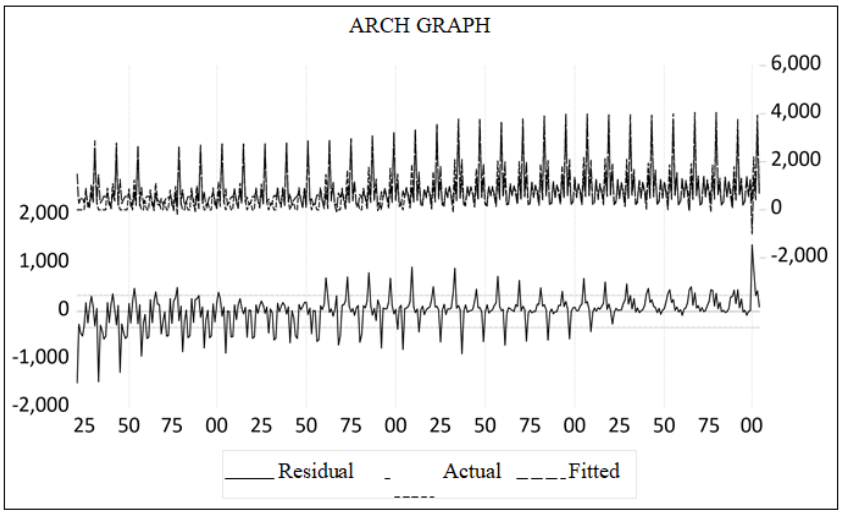
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

ARCH family regression
Sample: 1990 - 2021, but with gaps **Number of obs = 384**
Distribution: Gaussian **Wald chi2(.) = .**
Log likelihood = -250.7454 **Prob > chi2 = .**

	OPG				
EXV	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**
EXV_cons	**4.637357**	**.0089822**	**516.28**	**0.000**	**4.619753 4.654962**
ARCH arch L1.	**.9052834**	**.1672334**	**5.52**	**0.000**	**.5961596 1.251703**
_cons	**.0077271**	**.0009945**	**7.77**	**0.000**	**.005778 .0096763**

ARCH family regression
Sample: 1990 - 2021, but with gaps **Number of obs = 384**
Distribution: Gaussian **Wald chi2(.) = .**
Log likelihood = -245.3166 **Prob > chi2 = .**

	OPG				
EXV	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**
EXV_cons	**4.616748**	**.6939818**	**541.07**	**0.000**	**4.53894 1.259347**
ARCH arch L1.	**.9298331**	**.1676847**	**5.35**	**0.000**	**.5452347 1.224964**
Garch L1.	**1.983738**	**.0355467**	**2.87**	**0.005**	**.0673977 1.991116**
_cons	**.0041654**	**.0051165**	**4.43**	**0.000**	**.0062109 0.006056**



Dependent Variable: D(HC)
Method: ARDL
Date: 02/24/24 Time: 09:11
Sample: 1991 2021
Included observations: 368
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): Y EXDS EDS
Fixed regressors: C
Number of models evaluated: 1
Selected Model: ARDL(1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
Y	0.274232	0.005938	46.18296	0.0000
EXDS	2.639753	0.314250	8.400158	0.0000
EDS	-37.47883	4.975637	-7.532468	0.0000
Short Run Equation				
COINTEQ01	-0.639388	0.038759	-16.49662	0.0000
D(Y)	0.085302	0.011945	7.141558	0.0000
D(EXDS)	-1.754649	0.286156	-6.131789	0.0000
D(EDS)	-24.59579	12.61796	-1.949268	0.0521
C	-63.85292	28.09411	-2.272822	0.0237
Log likelihood	-2466.729			

*Note: p-values and any subsequent tests do not account for model selection.

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