Savinginpresence of volatilities in interest rate and exchange rate devaluation

Abstract

Many developing countries have rationalized their economies in response to the liberalization of financial markets giving renewed concerns to the role of exchange rate management and interest rate deregulation. The study examined the effects of interest rate volatility and exchange rate devaluation on aggregate savings in ECOWAS using a panel group of grouped means (PMG) estimator. The study also applied GARCH/ARCH (1,1) models to ascertain volatility in interest rates amongst the countries.In Burkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo, holding bank savings accounts in form of demand and time deposits serves as a buffer to higher volatility in interest rates. This could be informed by increase in yearly percentage yield on a certificate of deposits for savings account holders. In Liberia, Guinea-Bissau, Gambia, Mali, Nigeria, Sierra Leone, Cote d'Ivoire, and the Republic of Benin, holding bank savings accounts in form of demand and time deposits because of higher volatility in interest rate is not a buffer compared to the acquisition of stocks and securities. Further finding from the study is that exchange rate devaluation had a negative drift on aggregate savings in all countries except Niger. This was attributed to undeveloped export sectors in these countries.

Key word: exchange rate devaluation, interest rate volatility, aggregate savings, panel ARDL, ECOWAS, GARCH/ARCH models

JEL classification*:* G40, G32, G20

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1. Introduction

Over the years, the issues of exchange rate devaluation, interest rate volatility, and macroeconomic performance especially in terms of aggregate savings and investment have continued to occupy the front banner in macroeconomic research all over the world. Different methods have been employed by various researchers and scholars both in developed and developing economies to unravel the impact of exchange rate volatility on these macro-economic variables such as (Dincer&Kandil 2011; Erdal et al. 2012; Alagidede&Ibrahim 2016). Many developing countries have rationalized their economies in response to the liberalization of financial markets giving renewed concerns to the role of exchange rate management and interest rate deregulation (Danladi & Uba 2016). Some ECOWAS member countries have in the past undertaken measures to ensure an increase in the output of goods and services; one of such measures is to adopt a floating exchange rate thereby devaluing their currency for purpose of rendering products cheaper at the world market and promoting output growth. However, after some of the ECOWAS countries adopted a floating exchange rate regime, the nominal exchange rate became more volatile (Suranovic 2005).

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Many developing countries have restructured their economies in response to crippling debt and other external imbalances. The liberalization of financial markets and a greater role for market services in the distribution of financial resources are key workings of such adjustment programs, which often include interest rate deregulation and the relaxation or termination of directed credit policies. The McKinnon-Shaw (M-S) theory of finance, which states that interest rates respond positively to savings, appears to have underpinned interest rate policy in emerging nations (McKinnon 1973; Shaw 1973 as cited in Alagidede&Ibrahim 2016).The McKinnon-Shaw hypothesis proposes that investment is the associationlinking interest rate responsiveness and savings. Savings and investment, differ concerningbehavior and operations (Alagidede, Ibrahim 2016). The availability of investment possibilities with returns surpassing the cost of money, the presence of private and societal profitability discrepancies, institutional limits, and the cost of managing funds are all examples of such issues. Regrettably, studies of financial liberalization programs have taken the relationship between savings and investment for granted and/or failed to specify it.

One major gap which the paper tends to fill is the paucity of research that combines the effect of interest rate and exchange rate on aggregate savings simultaneously. Various studies especially by Uba (2013) and Adeola & Evans (2017) as well as others in the same category considered either interest rate volatility or exchange rate devaluation but not simultaneously. This study shall fill this gap to provide a one-stop shop to examine the two variables and their impacts on aggregate savings. Secondly, most of the reviewed studies failed to apply GARCH techniques to measuring volatility which is indeed inappropriate, this study shall measure interest rate volatility using this technique. Thirdly, most of the studies merely used GARCH to determine the existence of volatility and failed to proceed into measuring the effect of the identified volatility of the variable which in this case is aggregate savings. They also failed to generate separate series for this volatility. This study shall not only identify volatility in interest rates but also proceed to generate separate series for interest rate volatility upon its identification and also measure its effect on aggregate savings.

This study appraisesthe effects ofexchange rate devaluation and interest rate volatility on savings in developing countries. The study attempted to find out if exchange rate devaluation and interest rate volatility havean essential impact on aggregate savings in developing countries. This study distinctively contributes to the knowledge that the effect of volatility in the interest rate on savings differed for the ECOWAS region whereas, savings effects of currency devaluation are somewhat similar for all ECOWAS countries except Niger.Accordingly, the research remains a contribution to the knowledge that in ECOWAS, holding bank savings accounts in form of demand and time deposits serves as a buffer to higher volatility in interest rates for some countries and also not a buffer for others compared to the acquisition of stocks and securities.The originality and value of this research drive from the result obtained that higher volatility in interest rate implies high savings and low borrowing rates for countries such as Burkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo while for others, higher volatility in interest rate implies low savings, a pointer to high rates of inflation in these countries. Further value from the study is that exchange rate devaluation discourages ECOWAS savers from saving in domestic currencies. In effect, the paper contributed to the implications of interest rate variability on savings with emphasis on the fact that welfare-enhancing investment is being constrained by higher variations in the cost of capital. Also, the research contributes to the debate on currency devaluation and interest rate variability effects on aggregate savings in Africa by employing a dynamic ARDL model estimation of both short and long-term savings effects of exchange rate devaluation and variations in interest rates. The study is separated into five parts. Part two deals with the appraisal of related literature. Part three is centered on the research methods and the theoretical framework. Part four has the presentation of data, analysis, and discussion of results while part five is the summary, conclusion, and recommendations.

2. Literature review

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Various authors have examined the effects of interest rates as well as their volatility on savings in developing economies. In the same vein, some other authors researched exchange rate devaluation on economic growth as well as on macroeconomic variables such as savings and investment. Savings, national, public, or private are related in one unique way in that they are conveniently measured using bank deposits or bank savings. Also, variations in interest rates are the rental charges by lenders to the borrowers (Beck et al. 2018), while exchange rate devaluation is a percentage ratio of the current exchange rate to the difference between current and previous rates of currency exchange (Umoru & Shaibu, 2022). According to Osuji (2020), the short and long- term variability in interest rates are considerable driving forces of investment in any economy. In a recent study, Marco et al. (2022) reported that the strength of influence of interest rate spread to savings fluctuates with the level of nominal interest rates such that the response is positively high whenever interest rates are high and progressively declines whenever interest rates are low. Marco et al. (2022) found evidence to support the fact that "news" shock in terms of exogenous announcements by the central banks causes a reversal in response of savings to interest rates below a nominal rate of interest of 0.5%.Recent empirical research namely, Altavilla et al. (2021), Bubeck et al. (2020), Abildgren & Kuchler (2020), Heider et al. (2019), and Amzallag et al. (2019), have all evaluated the effects of interest rate fluctuations on bank profitability and borrowing.

Gini &Akokaike (2021) found significant positive portfolio investment effects of variations in interest rates. In related research, Schnabel (2020) reported that cash deposits of households in microfinance institutions across the euro area earned a small negative rate of interest. To Bilbiie (2018), interest rate reductions are restrictive in a confidence-driven liquidity trap. Other researchers have also provided macro evidence in support of dwindling interest rate transmission to saving at a low-level variation of interest rates (van den End et al. 2020,Barrero & Bloom 2020, Aizenman et al. 2019).According to Bayer et al. (2020), when variations in interest rates are low, households are encouraged to escalate existing savings in reaction to a drop in interest rates necessitated by consumption at retirement. Greenwald et al. (2021) also upheld that fluctuations in savings behavior are a result of low-level variations in interest rates. In other words, there is always a propensity to escalate savings even in presence of a low-interest rate given future consumption spending. According to Bracha (2020), declining variability in interest rates stimulates current savings in response to risk associated with future consumption expenditure and wealth accumulation. Muntanga (2020) reported a significant positive effect of interest rate changes on aggregate savings in Zambia. Similarly, Osuji (2021) found a negative insignificant investment effect of the prime lending rate in Nigeria during and after the era of liberalization. The author also found an insignificant investment effect of nominal exchange rate variability in Nigeria.Repullo (2020), van den End et al., (2020), Colciago et. al. (2019), Aizenman et al., (2019), and Brunnermeier& Koby (2018) have all supported the reversal effect in interest rate variation to savings to banks loans. Basing an analysis of a structural VAR model in a related study, Umoru & Hussaini (2022) found significant investment effects of policy shocks in interest rate volatility and exchange rate devaluation for ECOWAS countries.Hatmanu et al. (2020) also reported a significant negative growth effect of variations in interest rates, and a significant positive growth impact of variability in exchange rates. According to Jarociński& Karadi (2020), household savings are significantly influenced by two exogenous shocks or movements in monetary policy rates that transmit through to other interest rates in the economy. In Nigeria, Ogwuma& Nwaeze (2019) reported significant positive fluctuations in market interest ratesthat influenced depositors' savings and profitability of commercial banks. Olaniyi (2019) established a threshold interest rate that enhances investment growth in Nigeria. Inimino et al. (2018) reported negative insignificant domestic investment effects of the prime lending rate in Nigeria.

According to Hadjimatheou (1987) as cited in Keshtgar et al. (2020), for a net saver, an increasing rate of interest has two fractional effects: increased present consumption owing to income impact and lower present consumption due to substitution effect.Aizenman et al. (2017) studied the

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effects of interest rate volatility on the behavior of savings among developing countries using data from 135 countries from 1995 to 2014. The study discovered that, depending on the economic condition, a low-interest rate environment might have diverse effects on private savings across nations. The relationship with interest rate savings may be negative due to the development of financial markets, an aging population, and the unpredictability of outputs. Mushtaq & Siddiqui (2017) used the panel ARDL approach to explore the impact of interest rates on bank deposits in Islamic and non-Islamic economies, utilizing data from 23 non-Islamic and 23 Islamic nations from 1999 to 2014. They went on to say that interest rates have no influence on bank deposits in Islamic nations, but interest rates and bank deposits in non-Islamic countries have a positive relationship. Hassan & Makinde (2016) used the Ordinary Least Square Method multiple regression approach to analyze the association between interest rates and bank deposits in Nigeria. Commercial Bank Deposits (CBD) were chosen as the dependent variable, with interest rate and GDP as instructive factors. The findings revealed a negative relationship linking interest rates and commercial bank deposits, indicating that interest rates did not affect commercial bank payments in Nigeria. Siaw & Lawer (2015) used a co-integration technique to investigate the long- and short-term drivers of bank deposits in Ghana. The outcomes demonstrated that bank deposits are negatively influenced by inflation and money source growth in the short run, but positively affected by money source growth and adversely affected by inflation and deposit interest rate in the long run. Boadi et al. (2015) investigated the bases of Ghanaian bank deposits with the help of E-views and found that in Ghana, 78 percent of bank deposits are influenced by interest rate liberalization and GDP, as well as a negative relationship linking saving rate and real Treasury bill rate. Nathanael &Eriemo (2014) looked at the macroeconomic drivers of bank deposits in Nigeria and found that prior price levels and interest rates had an important positive impact on deposits in Nigerian banks. By employing the quartile regression estimation approach, Ojeaga&Odejimi (2014) examined the influence of interest rates on bank deposits in Nigeria. The findings have shown a strong positive correlation linking interest rates and bank deposits, as well as a substantial correlation between income and interest rates. Ostadi& Sarlak (2014) presented the active elements of the absorption of bank deposits to improve Isfahan Sepah Bank's relative share. Their findings showed an inverse relationship linking inflation and bank deposits, as well as a strong positive relationship between interest rate and money supply and bank deposits. Mashamba et al. (2014) concluded that in Zimbabwe Commercial Banks, there is a strong and positive relationship between bank deposits and deposit interest rates.

Onwumere et al. (2012) used a basic regression approach and SPSS statistical software reported interest rate liberalization had a negative and little influence on saving but had a significant impact on investment. They proposed a distinction linking loan and deposit transactions, as well as wholesale and retail operations. The interest rate must be different from the rate of the loan and the rate of the deposit. Orji (2012) examine factors of bank savings and bank credits in Nigeria, as well as their influence on economic growth. According to the study, the size of private local savings is positively affected by per capita GDP, fiscal depth, and interest rate, but it is negatively affected by real interest rates. The exchange rate was lower than the total amount of private savings, and a study found that the range of interest rates, private credit, public sector credit, and economic development had a favorable effect. Nabar (2011) looked at objectives, interest rates, and household savings in urban China from 1996 to 2009, when saving rates were on the rise. The study's findings confirmed the adverse relationship linking real interest rates and urban saving rates. According to the study, to promote domestic consumption, household savings must be reduced, which is achievable when the actual deposit rate rises. Haron et al. (2006) used a co-integration method approach to investigate the determinants of Malaysian commercial banks. The findings were that the rate of interest, money supply, and other regressors all had a positive impact on bank deposits, however, return on deposit and inflation had a negative impact. Savings and bank deposits are inextricably linked. In their study of household saving in Taiwan, Athukorala and Tsai (2003) discovered an unfavorable relationship linking inflation and saving, but a positive relationship linking interest rate and saving. Kwan looked at the influence of Hong Kong's

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deposit rate deregulation on the market value of commercial banks (2002). Regulations and deregulation, according to the study, decrease deposit interest rates, which affects market pricing. The deposit-to-asset ratio may fall, and interest rate deregulation may have a detrimental impact on deposit returns. Financial institutions, according to Tsuru (2000), have an impact on saving rates, growth, and capital formation in four distinct ways, including liquidity constraints, idiosyncratic risk, rate of interest, and rate of return concerns. Galacand Kraft (2000) investigated the deposit interest rate in the United States and discovered that international banks provide lower deposit interest rates than domestic banks. This negative interest rate elasticity might make a major difference if the economy slows down.Loayza and Shankar (2000) investigated the relationship between real interest rate, per capita income, and GDP in the Indian agricultural industry; they discovered a positive relationship between these variables in terms of GDP.

3. Methodology

The exchange rate does not share a direct theoretical relationship with aggregate savings as it does with Investment. Nevertheless, the study adopts the Keynesian-Kaleckian indirect theoretical framework that was formally developed by Bhaduri & Marglin (1990) and cited in Gala & Rocha (2012). Theoretically, the framework explains the relationship betweenthe real exchange rate, national income, and aggregate savings. With this framework, workers' savings are equated to zero due to absolute consumption behavior. Therefore:

$$S = s\left(\frac{I}{Z}\right)\left(\frac{Y}{Z^*}\right)Z^* \quad (1)$$

where *I*is capitalists' income and Z * is potential output, and S is aggregate savings. By extension, exports *Xe* and imports *Mx* depend on elasticities for the real exchange rate and installed capacity utilization level.

$$\left(\frac{dX_e}{d\theta}\right)\left(\frac{\theta}{X_e}\right) = \eta_E \quad (2)$$

$$\left(\frac{dM_x}{d\theta}\right)\left(\frac{\theta}{M_x}\right) = \eta_M \quad (3)$$

$$\left(\frac{dM_x}{dz}\right)\left(\frac{z}{M_x}\right) = u \quad (4)$$

where *Xe* is export, *Mx* is the volume of imports, η_E is the price elasticity of demand for exports, η_M is the price elasticity of demand for imports, z is the level of installed capacity utilization, and θ is the real exchange rate elasticity. In effect, with a given level of production, real exchange rate devaluation increases profit margins once the tradable sector overshadowsthe non-tradable sector. Relatively, it is expected,the total effect on the trade balance and current accounts becomes positive provided Marshall Lerner is satisfied. Thus, with Bhaduri andMarglin (1990) framework, the macroeconomic balance could be expressed as:

$$y = C + I + Xe - Mx = C(\theta) + I(h(\theta),z) + Xe(\theta) + Mx(\theta,z) \quad (5)$$

Given that aggregate savings plus import *Mx* must equal total investments plus exports *Xe*, we have that

$$sh(\theta) + Mx(\theta) - Xe(\theta) = I(h(\theta) \quad (6)$$

Accordingly, h is the capitalist's income. The path of savings depends on the real exchange rate, which affects national income, exports, and imports. The McKinnon-Shaw (M-S) hypothesis of a three-period life-cycle model of savings-consumption behavior with a focus on rates and other factors of savings provides the theoretical basis for this study. The theory varies from the traditional Fisherian model in that it allows for the existence of many assets with varying rates of return. The theory clearly explains the position of interest rate in the determination of the level of savings at the three periods covered. More so, the theory relates desired or expected investment as another key determinant of the level of savings, developing economies such as ECOWAS nations depends largely on the importation of

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physical assets and raw materials, hence exchange rate devaluation directly affects this desired investment which in turn affects the level of savings.Accordingly, the Keynesian-Kaleckian framework provides a distinct link between aggregate savings and a depreciated exchange rate through the expected activities of import and import as well as local capacity utilization in the economy. The model for the study is specified as follows:

$$lnSav_t = \beta_0 + \beta_1 Exrdd_t + \beta_2 lnRvol_t + \beta_3 lngdp_t + \beta_4 lnCon_t + \mu t \quad (7)$$

The model restrictions are as follows, $(\beta_1,\ \beta_2) < 0$, $(\beta_3) > 0$, $\mu 1i$is the white noise error term, lnSav represents logarithmic of total savings, Exrdd represents exchange rate devaluation, ln*Rvol*denotes log of interest rate volatility, lngdpdenotes log of national output as measured by gross domestic product, and lnCon is the log of consumption spending.The study engagedpanel mean group (PMG) and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models developed by Bollerslev (1986). The PMGis applicable within a combination of I (0), and I (1), but inapplicable with the I(2) series. We so specify the panel ARDL version of equation (6) as:

$$lnSav_{it} = \sum_{j=1}^{p} \lambda_{ij}\ lnSav_{i,t-j} + \sum_{j=0}^{q} \beta'_{ij} Z_{i,t-j} + v_i + e_{it} \quad (7)$$

where$Z_{i,t-j}$is the vector of independent variables which include, *exrdd, lnRvol, lngdp, and lnCon*; λij is the coefficient of lags of total savings lags,βij is the coefficients of Zi, vector, *v*is the fixed effect, and eit it is the error term. Re-parameterizing equation (7), the panel ARDL error correction equation is here specified as euation (8):

$$\Delta InlnSav_{it} = \omega_i(lnSav_{i,t-1} - \emptyset'_i lnZ_{it}) + \sum_{j=1}^{p-1} \gamma_{ij}\ \Delta lnSav_{i,t-j} + \sum_{j=0}^{q-1} \alpha_{ij}\, \Delta lnZ_{i,t-j} + v_i + e_{it} (8)$$

where $\emptyset_i{}'$ is a vector of coefficients in long-run; γ_{ij} and α_{ij} are short-term coefficients, and$\omega_i$is the coefficient of adjustment speed.The GARCH model (9) was deployed forcalculating interest rate volatility for the chosen ECOWAS nations across the research period by postulating a structural relationship between volatility and its historical values.

$$\rho_t = \tau_0 + \tau_1 \rho_{t-1} + \tau_1 \hat{v}_{t-1}^2 \quad (9)$$

where ρ_t is the conditional variance, $\tau_1$epitomizes the ARCH parameters, $\tau_1$designates the GARCH parameter, $\hat{v}_{t-1}^2$ depicts residual information about previous volatility and ρ_{t-1} is the previous prediction error variance.In terms of sample, variables, and data, the study sample is the fifteen countries of ECOWAS, namely, Benin, Burkina Faso, Cabo Verde, Cote-Divoire, Guinea, Gambia, Ghana, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Numerous estimation techniques can be implemented to evaluate the response of savings to interest rate fluctuation and exchange rate devaluation. These include the VaR based on the GARCH (VAR-GARCH) estimation method, factor-augmented vector autoregressive VAR (FAVAR) method, Generalized Method of Moment (GMM) estimation, structural VAR, vector error correction model (VECM), quintile regression method, and the two-stage least squares. Also, the non-linear autoregressive distributed lag (NARDL) estimation method which can independently estimate responses of the dependent variables to positive and negative shocks of explanatory variables following asymmetric dynamic multipliers can be utilized. We have chosen to use the linear ARDL method.The major advantage that spurs the authors to utilize the ARDL method is the fact that it serves as a remedy for spurious regression results. In effect, estimation robustness is guaranteed especially when the error correction coefficient of the underlying ARDL model adjusts short and long-run equilibrium without dropping long-term information. The error correction coefficient of the underlying ARDL model adjusts short and long-run equilibrium without dropping long-term information. The significance of the coefficient of the lagged error-correction term is also proof of the long-run association between the variables in the study. With a co-integrating relation among variables, robust coefficient estimates are obtainable even in presence of a smaller sample (Chung et al. 2020, González de la et al. 2020).The study also applied GARCH/ARCH (1, 1) models developed by Bollerslev (1986) to ascertain volatility in interest rates amongst the fifteen

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countries, individually as well as in aggregate. The volatility of interest rate was calculated as the standard deviation of yearly real interest rates, savings include all demand and time deposits in the deposit money banks of ECOWAS countries, and exchange rate devaluation was calculated as a unit change in the official exchange rate of the currencies of ECOWAS countries to the US dollar. We utilized a panel dataset for 15 African countries making up ECOWAS spanning from 1980 to 2021.With 15 ECOWAS countries in our sample, we recorded a total of 615-panel data observations. All data are obtained from the IMF International Financial Statistics 2021, GlobalFinancial Development database of World Bank, 2021, and World Development Indicator 2021.

4. Results and discussions

Table 1 shows summary statistics. In the ECOWAS region, aggregate savings average around USD9.21 billion while the highest and lowest values are USD15.1 and the USD2.6 respectively. The standard deviations for aggregate savings, exchange rate devaluation, GDP, consumption expenditure, and interest rate are 5.4, 29.7, 6.5, 10, and 2.06 respectively. This implies that GDP with a value of USD107trillion was the most volatile series while interest rate with a value of 9.9% was the least volatile. The skewness statistics showed that all the variables are positively skewed.The kurtosis statistics of aggregate savings, exchange rate, gdp, consumption expenditure, and interest rate are 1.14, 3.8, 0.6, 0.26, and 0.6 respectively. In effect, only the kurtosis of devaluation is platykurtic since the value eceeds3. This suggests that the distributions of the series are flat relative to normal distribution.The Jarque-Bera (JB) statistics for the series showed that aggregate savings, exchange rate, gdp, and consumption expenditurewith the value of 1.71, 1.238, 1.2424, and 1.1803 respectively, and pro-values greater than 0.05 are normally distributed at a five percent level of significance.

Table 1.Summarystatistics

Statistics	lnSav	exrdd	lncons	lngdp	lnRvol
Mean	9.21000	120.0162	307000	14.2000	11.06599
Median	8.00000	113.0470	7.50000	10.3000	8.072618
Maximum	15.1000	169.8530	39.2000	34.7000	3.059046
Minimum	2.64000	103.2000	2.75000	16.0000	0.863239
Std. Dev.	5.40000	29.7308	6.50000	10.0000	2.06856
Skewness	1.60000	1.48000	0.60000	2.55000	1.59743
Kurtosis	1.14000	3.80000	0.60000	0.26000	0.61344
Jarque-Bera	1.71000	1.23800	1.24240	1.18030	1.04295
Probability	0.7231	0.43211	0.05321	0.05210	0.00000
Sum Sq. Dev.	9.19E+22	8.95E+08	9.64E+23	1.81E+24	15605.18

Table 2 presents the results of the panel unit root test. It can be seen that all variables except Rvol became stationary after the first difference. The volatility in interest rates however is stationary at levels. Given this finding, it is said that the variables used in this study are composed of orders I (1) and I (0). This order of integration allows us to use the technique of estimating autoregressive distributed lags (Pesaran et al. 1999, 2001).

Table 2.Results of unit root test

Variables	Levels		Difference	
	W. Statistics	Prob. Value	t-statistics	Prob.Values

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lnSav	-0.19647	0.4221	-15.2018	0.0000
exrdd	4.22713	1.0000	-10.5495	0.0000
lncons	8.77811	1.0000	-12.5084	0.0000
lngdp	11.0406	1.0000	-10.7869	0.0000
lnRvol	-3.07930	0.0010	-16.5216	0.0000

The co-integration test results are presented in Table 3. With most of the test statistics rejecting the null hypothesis of no co-integration in table 3 considering significant probability values; it is established that there is a co-integration connection linking the variables used.

Table 3. Results of the co-integrating test

Test	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.194253	0.0070	-0.746656	0.0024
Panel rho-Statistic	-1.419622	0.0079	-2.255918	0.0020
Panel PP-Statistic	-3.841142	0.0001	-5.191490	0.0000
Panel ADF-Statistic	-2.043021	0.0205	-1.659681	0.0085
Test	Statistic		Prob.	
G-rho-Statistic	-0.537172		0.2956	
G-PP-Statistic	-4.643239		0.0000	
G-ADF-Statistic	-0.942471		0.1730	

Table 4 showsthe main results foraggregate savings asthe dependent variable in the model. Firstly, we proceed to a short-run analysis. Among ECOWAS Countries, the results show that in the short run, exchange rate, interest rate, GDP and consumption expenditure have an important impact on aggregate savings. Whereas GDP and volatility in interest rate revealed a positive relationship with aggregate savings, exchange rate devaluation and consumption expenditure revealed negative relationships. A 1% devaluation in the currency of the ECOWAS region results in a 12% reduction in the level of aggregate savings. This result is in harmony with the outcome by Awe and Olalere (2011). Also, a 1% increase in consumption expenditure reduces aggregate savings by 11%. However, a 1% increase in the level of interest increases savings by 34% among the ECOWAS countries, and a 1% increase in the level of income (GDP) raises aggregate savings by 40%. This could be seen as a confidence builder in these countries leading to a boost in the quantum of savings deposits attracted within the Region. The exchange rate devaluation estimates from this study could be adduced to the fact that a further devaluation of currencies among ECOWAS countries is a discouragement to the level of savings that will be attracted in these countries, especially as the countries are heavily import dependent. The error correction statistics are correctly signed and havea -0.331308 value. This indicates that the speed of adjustment is 33%, revealing the rate at which the aggregate savings function model will return to equilibrium given any changes among the regressors.

Regarding long-run analysis, the estimation reveals that among ECOWAS countries, GDP, exchange rate, interest rate volatility, and consumption expenditure have a significant long-run relationships with aggregate savings. A 1% further devaluation of currency among the ECOWAS

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countries, in the long run, will reduce aggregate savings by 22% whereas a 1% rise in interest rate volatility escalates aggregate savings by 14.8%. The result is in tandem with the short-run outcomes. More so, GDP which represents the level of output and income among ECOWAS countries revealed a positive relationship with aggregate savings, indicating that a 1% increase in income will result in an upward movement of the Aggregate savings by 57%. In the Long run, also, a 1% rise in consumption expenditure increases the level of aggregate savings by 37%. The Long run result in respect of the exchange rate and interest rate is in line with the result by Danladi & Uba (2016).

Table 4: Panel ARDL/PGM estimation results for savings

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short run equation				
cointeq01	-0.331308	0.071515	-4.632681	0.0000
d(lngdp)	0.401356	0.084163	4.768769	0.0016
d(lncons)	-0.115762	0.034872	-3.319598	0.0003
d(lnRtvol)	0.343605	0.108061	3.179729	0.0022
d(exrdd)	-0.126309	0.023845	-5.296971	0.0421
c	-18.20231	3.984650	-4.568109	0.0000
Long run equation				
lngdp	0.56622	0.06536	8.662995	0.0000
lncons	-0.37335	0.07790	-4.792846	0.0000
lnRtvol	0.14857	0.02112	7.034843	0.0000
exrdd	-0.22244	0.04904	-4.536343	0.0231
Mean dependent var	0.025333	S.D. dependent var	1.145249	
S.E. of regression	0.954829	Akaike info criterion	2.334666	
Sum squared resid	60.17210	Schwarz criterion	3.746375	
Log-likelihood	-87.75330	Hannan-Quinn	2.908291	

Thissection discusses country-specific results beginning with Benin.

Table: 5A: Panel ARDL results -REPUBLIC OF BENIN

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.050235	0.003289	-15.27484	0.0006
d(lngdp)	84.70619	38.51905	2.199073	0.1153
d(exrdd)	-0.000225	2.32E-05	-9.706664	0.0023
d(lnRvol)	-0.067096	0.031095	-2.157782	0.1198
d(lncons)	-86.84239	40.32372	-2.153631	0.1203

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c	-5.369465	37.87972	-0.14175	0.8963

Results for the Republic of Benin revealed that the exchange rate had a significant negativelink with aggregate savings and is in line with apriori. A 1% rise in exchange rate devaluation reduces aggregate savings by 0.02%. However, GDP, Rvol, and Cons all had significant relationships with aggregate savings. The results from the Republic of Benin revealed the responsiveness of the country to shocks from interest rates and exchange rates contemporaneously.

Table: 5B: Panel ARDL results -COTE D'IVOIRE

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.181988	0.009929	-18.32896	0.0004
d(lngdp)	37.83699	244.3644	0.154838	0.8868
d(exrdd)	-0.018639	0.000774	-24.09143	0.0002
d(lnRvol)	-0.9029	1.587593	-0.568723	0.6093
d(lncons)	-29.79672	289.4572	-0.10294	0.9245
c	-25.10012	197.3864	-0.127162	0.9069

Panel ARDL on Cote d'Ivoire revealed that Consumption expenditure and Interest rate volatility hasa negative but insignificant connection with aggregate savings while GDP hasa positive but insignificant relationship with aggregate savings. The exchange rate has a significant connection with aggregate savings. A 1% rise in Exchange rate devaluation will reduce aggregate savings by 1.8%. The result from Cote d'Ivoire is in line with Appriori as in the case of the Republic of Benin. It further reveals that any case of volatility in the exchange rate in such a country will have serious adverse effects on aggregate savings.

Table: 5C: Panel ARDL results- BURKINA FASO

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.504591	0.01309	-38.54738	0
d(lngdp)	25.36812	90.47625	0.280384	0.7974
d(exrdd)	-0.03248	0.000135	-241.1872	0
d(lnRvol)	0.023946	0.038378	0.623949	0.5769
d(lncons)	-12.86295	49.0232	-0.262385	0.81
c	-57.14037	204.4594	-0.27947	0.798

The ARDL result revealed that the trio of GDP, consumption expenditure, and interest rate have an insignificant connection with aggregate savings. However, as expected due to the overdependence of ECOWAS countries on the importation, exchange rate devaluation poses a negative and significant association with aggregate savings. A 1% rise in exchange rate devaluation decreases aggregate savings in domestic currencies by 3.2%. This validates the Apriori expectation.

Table: 5D: Panel ARDL results-GHANA

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Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.016981	0.001741	-9.752408	0.0023
d(lngdp)	0.255515	0.06374	4.008697	0.0278
d(exrdd)	-0.315664	0.176217	-1.791337	0.1712
d(lnRvol)	0.002359	0.001967	1.199444	0.3164
d(lncons)	-0.38432	0.304437	-1.262397	0.296
c	-1.307774	8.771599	-0.149092	0.8909

The ARDL result for Ghana revealed that aggregate output and or income in the form of GDP are the only significant macroeconomic variables in relationship with aggregate savings. It portends that a 1% rise in GDP in Ghana raises aggregate savings by 25%. However, exrdd, Rvol, and Cons all had an insignificant relationships with aggregate savings in Ghana. The interest rateshad a positive but insignificant association with aggregate savings. The abysmal trend could be due to the shallow nature of the foreign exchange market and the non-liberalization of the banking sector in that economy.

Table: 5E: Panel ARDL results-GUINEA

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.120873	0.002986	-40.47688	0
d(lngdp)	0.008872	0.373361	0.023763	0.9825
d(lncons)	-0.133729	1.229722	-0.108747	0.9203
d(lnRvol)	0.152861	0.001273	120.0625	0
d(exrdd)	-0.000875	0.000000119	-7346.489	0
c	-7.51401	10.25776	-0.732519	0.5169

ARDL result for Guinea is quite similar to the one for Burkina Faso. The results revealed that interest rates and exchange rates have a significant relationship with aggregate savings. Both variables agree with Apriori as interest rates showed a positive connection with aggregate savings. A 1% increase in the interest rate on payments with increase the level of aggregate savings by 15%. In a similar vein, the exchange rate revealed a negative but significant connection with aggregate savings. A 1% devaluation of the currency in Guinea reduces aggregate savings by 0.08%. It is often argued that these economies that are largely import dependent tend to pattern their consumption and savings towards events in the foreign market. In Guinea, however, GDP and Household consumption did not show a significant relationship with aggregate savings.

Table: 5F: Panel ARDL results- GUINEA-BISSAU

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.284503	0.014833	-19.17978	0.0003
d(lngdp)	48.90846	171.2272	0.285635	0.7937

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d(exrdd)	-0.00436	0.000214	-20.34195	0.0003
d(lnRvol)	-1.547948	0.731293	-2.116728	0.1246
d(lncons)	-55.16053	170.7354	-0.323076	0.7678
c	-27.10266	153.3525	-0.176734	0.871

ARDL result for Guinea-Bissau is quite similar to the one for Guinea. The results revealed that exchange rate devaluation impacted savings negatively and also significantly. The variables agree with Apriori as exchange rate devaluation showed a negative relationship with aggregate savings. A 1% rise in exchange rate devaluation reduces the level of aggregate savings by 0.4%. It is often argued that these economies that are largely import dependent tend to pattern their consumption and savings towards events in the foreign market.

Table: 5G: Panel ARDL results-GAMBIA

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.155585	0.007119	-21.85602	0.0002
d(lngdp)	82.3508	346.3862	0.237743	0.8274
d(exrdd)	-0.255228	0.247694	-1.030414	0.3786
d(lnRvol)	-0.191528	0.053131	-3.604891	0.0019
d(lncons)	-84.82501	277.267	-0.305933	0.7797
c	-14.63421	63.74407	-0.229578	0.8332

The ARDL cross-sectional result revealed that The Gambia has only interest rate as the significant variable capable of defining the level of aggregate savings in such an economy. Gdp, exrdd, and cons however have insignificant relationships. A 1% rise in the volatility of interest rates in the country drops aggregate savings by 19%

Table: 5H: Panel ARDL results-LIBERIA

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.133317	0.003363	-39.64142	0
d(lngdp)	-2.18636	7.510649	-0.291101	0.7899
d(exrdd)	-0.033663	0.002013	-16.72531	0.0005
d(lnRvol)	-0.279398	0.043329	-6.448325	0.0076
d(lncons)	-2.040078	6.653483	-0.306618	0.7792
c	-11.64009	30.35117	-0.383514	0.7269

The ARDL Cross-sectional result for Liberia revealed that, unlike The Gambia which has only one significant variable among those considered, Liberia showed that both exchange rate and interest rate have an importantconnection with aggregate savings. A 1% rise in the exchange rate and interest rate results in a 3.3% and 28% reduction in aggregate savings respectively.

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Table: 5I: Panel ARDL results- MALI

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.6078	0.003564	-170.5315	0.00000
d(lngdp)	0.496507	0.014367	34.55907	0.00010
d(lncons)	0.203187	0.04313	4.711027	0.01810
d(lnRvol)	-0.869908	0.002034	-427.604	0.00000
d(exrdd)	-0.0087	0.00000226	-3855.973	0.00000
c	-31.89487	22.93408	-1.390719	0.2585

The ARDL result for Mali revealed that all the four exogenous variables considered, namely, GDP, Consumption, Interest rate, and Exchange rate have significant relationships with aggregate savings. A 1% rise in GDP, increases aggregate savings by 50% while a 1% rise in household consumption increases aggregate savings by a whopping 20% and 87% respectively. Whereas, in the case of exchange rate devaluation and interest rate volatility, the relationship is negative. A 1% devaluation of the country's currency and interest rate volatility will reduce aggregate savings by 0.08% and 0.87% respectively. A very important diversion in the case of Mali is the relationship between consumption expenditure and aggregate savings which is positive. However, this could be adduced to the fact that the current consumption drive especially emanating from increased income will surely increase household savings which equally leads to increased aggregate savings

Table: 5J: Panel ARDL results-NIGERIA

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.107137	0.00448	-23.91298	0.00020
d(lngdp)	2.088849	4.684477	0.445909	0.6859
d(lncons)	-0.351838	0.605259	-0.581302	0.6018
d(lnRvol)	-0.115185	0.010379	-11.09807	0.0016
d(exrdd)	-0.034869	0.001993	-17.49405	0.0004
c	-7.814127	23.63984	-0.330549	0.7627

The ARDL result for Nigeria shows interest rate volatility and exchange rate devaluation had a negative significant relationship with aggregate savings. Whereas the direction shown by household consumption is quite in line with apriori, it is worthy of note that the relationship is insignificant. It could be seen from the outcome that a negative but insignificant connection exists between household consumption and aggregate savings. For interest rate and exchange rate, a 1% rise in interest rate tends to increase aggregate savings by 11% while a 1% devaluation of the Nigerian naira tends to reduce

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savings by 3.4%. The persistent negative relationship that these ECOWAS countries display to devaluation in the official exchange rate and aggregate saving could be attributed to the undeveloped export sectors in these countries. Capacity development of export produce is quite low, and over-dependence on import will surely make an addition to the exchange rate to be transferred to consumers thereby depleting the level of aggregate savings.

Table: 5K: Panel ARDL results-NIGER

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.508587	0.007369	-69.01776	0.0000000
d(lngdp)	-0.053211	0.044582	-1.193546	0.3184000
d(lncons)	-0.089631	0.104888	-0.854539	0.4556000
d(lnRvol)	-0.335412	0.00431	-77.8203	0.0000000
d(exrdd)	0.011647	0.0000112	1038.811	0.0000000
c	-26.03928	21.04252	-1.23746	0.3039000

The result for Niger is quite similar to its closest neighbors such as Nigeria and Gabon. It revealed that interest rate and exchange rate are significant variables to aggregate savings. The result however differs slightly in terms of the direction of the relationship. It revealed that interest rate has a negative relationship with aggregate savings as was the case with Gabon. A 1% rise in interest rate variationdecreases aggregate savings by 33% and a 1% rise in currency devaluation rather escalates aggregate savings by 0.01%. This could be due tothe unique nature of the economy of Niger in terms of non-liberalization of both foreign and money markets could be adduced to be responsible for the divergent trend.

Table: 5L: Panel ARDL results-SENEGAL

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.29558	0.006823	-43.32023	0.00000
d(lngdp)	0.008378	0.004636	1.807235	0.16850
d(lncons)	-0.829357	0.131971	-6.284405	0.00810
d(lnRvol)	-0.122482	0.001144	-107.086	0.00000
d(exrdd)	-0.006999	0.00000813	-860.4881	0.00000
c	-15.28125	18.45552	-0.828004	0.46840

The result for Senegal revealed that household consumption, Interest rate as well as exchange rate have a significant connection with aggregate savings. A 1% increase in household consumption

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tends to reduce aggregate savings by 82% while the variables, interest rate, and exchange rate toed the line of Gabon and Niger where the interest rate has a negative connection with aggregate savings and exchange rate devaluation also a negative relationship with savings. A 1% rise in interest rate tends to reduce aggregate savings by 12.2% while a 1% increase in the exchange rate of the Senegalese currency tends to increase aggregate savings by 0.6%. the variable dlngdp however shows an insignificant relationship with aggregate savings in Senegal.

Table: 5M: Panel ARDL results-SIERRA LEONE

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.099506	0.002883	-34.5145	0.00010
d(lngdp)	0.415838	0.038143	10.90197	0.00170
d(lncons)	0.214495	0.189948	1.12923	0.34090
d(lnRvol)	-0.09148	0.003993	-22.91116	0.00020
d(exrdd)	-0.006761	0.0000524	-129.1298	0
c	-6.421744	11.5277	-0.557071	0.6163

The ARDL result for Sierra Leone revealed that three of the four explanatory variables, namely, GDP, interest rate, and exchange rate have significant connections with aggregate savings. The d(lngdp) and volatility in interest rates have a positive relationship while exchange rates have a negative relationship with aggregate savings. A 1% rise in GDPraises aggregate savings by 41% while a similar rise in the volatility of interest rate reduces savings by 9.1% respectively.Also, a 1% rise in the exchange rate will reduce aggregate savings by 0.6%. The results from Sierra Leone agree with apriori especially as an increased exchange rate in an import-dependent economy such as Sierra Leone will surely lead to a reduction in income as most of these imported products will witness an increase in prices. And if the disposable income is depleted, hence savings also will be reduced. The results from this country however do not show any significant relationship with aggregate savings.

Table: 5N: Panel ARDL results- TOGO

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.249538	0.008313	-30.01675	0.00010
d(lngdp)	5.813438	107.5048	0.054076	0.96030
d(exrdd)	-0.003298	0.000226	-14.56855	0.0007
d(lnRvol)	0.130082	0.849676	0.153096	0.888
d(lncons)	-10.44926	71.6646	-0.145808	0.8933
c	-24.60142	89.48721	-0.274915	0.8012

The result for Togo revealed that the exchange rate has a negative and importantconnection with aggregate savings. A 1% growth in exchange rate reduces aggregate savings by 0.3%.

Table: 5O: Panel ARDL results-CABO VERDE

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Variable	Coefficient	Std. Error	t-Statistic	Prob. *
cointeq01	-0.039646	0.003693	-10.7366	0.00170
d(lngdp)	9.139583	170.7691	0.05352	0.9607
d(exrdd)	0.204976	0.036217	5.659712	0.0109
d(lnRvol)	-1.109771	0.932078	-1.190643	0.3194
d(lncons)	0.07549	7.973494	0.009468	0.993
c	-2.404994	16.76712	-0.143435	0.895

The ARDL cross-sectional result revealed that Cabo Verde has only the exchange rate as the significant variable capable of determining the level of aggregate savings in such an economy. GDP, Rvol, and cons however have an insignificant relationship. A 1% devaluation of the local currency in the country increases aggregate savings by 20%. In terms of the effect of interest rate volatility, we established volatility amongst ECOWAS countries. Having established volatility among ECOWAS countries on the interest rate, the study conducted Panel ARDL again to include interest volatility as a variable as shown in Table 6. The results show that in the long run, interest volatility has a positive and important effect on aggregate savings among ECOWAS countries. This shows that a 1% rise in the level of volatility in interest rates will increase aggregate savings by 16%.

Table 6: PGM post volatility estimation results for aggregate savings

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
short-run equation				
cointeq01	-0.899005	0.319870	-2.638503	0.0065
d(lngdp)	0.090774	0.260261	0.327432	0.7284
d(lncons)	0.381681	0.537123	0.667108	0.4798
d(lnRvol)	0.114412	0.394791	0.272066	0.7729
d(exrdd)	0.24278	0.251220	0.966414	0.1648
c	2.01120	1.211110	1.660625	0.5749
long-run equation				
lngdp	0.56982	0.03422	15.63399	0.0000
lncons	-0.36877	0.03214	-10.77013	0.0000
lnRvol	0.16779	0.00654	24.07327	0.0000
exrdd	-0.13018	0.02154	-5.67363	0.0000

The study tends to reject the null hypothesis for the non-significance of interest rate volatility on the level of aggregate savings among ECOWAS countries and rather accept the alternative hypothesis that interest rate volatility hasa significant effect on aggregate savings among ECOWAS countries. Findings beyond initial theorizations. Theoretically, it is expected that investments and businesses are negatively impacted by volatile interest rates as well as exchange rate movements. High volatility in interest rates on loans dissuades borrowing by raising interest costs on such loans and this deteriorates

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investment growth. In effect, higher volatility in interest rates implies high savings and low borrowing rates. The results from the study revealed that interest rate volatility had positive effects on aggregate savings in Burkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo while it revealed a negative effect in Liberia, Guinea-Bissau, Gambia, Mali, Nigeria, Sierra Leone, Cote d'Ivoire, and the Republic of Benin. However, interest rate volatility had no significant effect on aggregate savings in Cote-Devoir, Burkina-Faso, Ghana, and Togo while for other countries, the effect was highly significant. Characteristically, the research unravels that higher volatility in interest rate implies high savings and low borrowing rates for countries such as Burkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo while for Liberia, Guinea-Bissau, Gambia, Mali, Nigeria, Sierra Leone, Cote d'Ivoire, and the Republic of Benin, higher volatility in interest rate implies low savings, a pointer to high rates of inflation in these countries. Specifically, our findings entail:InBurkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo, holding bank savings accounts in form of demand and time deposits serves as a buffer to higher volatility in interest rates. This could be informed by the increase in yearly percentage yield on the certificate of deposits for savings account holders. In Liberia, Guinea-Bissau, Gambia, Mali, Nigeria, Sierra Leone, Cote d'Ivoire, and the Republic of Benin, holding bank savings accounts in form of demand and time deposits compared to higher volatility in interest rate is not a buffer compared to the acquisition of stocks and securities. Further finding from the study is that exchange rate devaluation discourages ECOWAS savers from saving in domestic currencies.

5. Conclusion

This study examined empirically the effects of interest rate volatility and exchange rate devaluation on aggregate savings among ECOWAS countries. The study applied Panel ARDL to analyze the relationship that exists between aggregate savings and exchange rate, interest rate, interest rate volatility, output, and consumption expenditure. The study applied GARCH/ ARCH (1,1) to test for the presence of volatility in interest ratesamongst the ten selected nations, individually as well as in aggregate. It further re-estimatedthe Panel ARDL in line with relevant studies to examine the outcome of interest rate volatility on aggregate saving among ECOWAS countries. The study anchored its theoretical framework on the McKinnon-Shaw (M-S) hypothesis of a three-period life-cycle model of Savings-consumption behavior with emphasis on rates and other determinants of savings. The results from the study revealed that interest rate volatility had positive and significant effects on aggregate savings in Guinea, Gambia, Mali, Nigeria, and Sierra Leone while it revealed a negative and significant effect in Liberia, Senegal, Niger, and Togo. This corroborates the positive effect of interest rate volatility on investment growth in ECOWAS obtained by Umoru &Hussanni (2022). However, interest rate volatility has no important effect on aggregate savings in the Republic of Benin, Cote-Divoire, Burkina-Faso, Ghana, and Guinea-Bissau. In a similar vein, exchange rate devaluation had negative and significant effects on aggregate savings in all countries with exception of Niger.

The GARCH model results for volatility in interest rate revealed consistent volatility in the ECOWAS region as a whole as well as twelve countries in the region with the GARCH estimate being significant and the sum of ARCH and GARCH effects ranging between 0.5 and 1. This is however not the case in three of the countries namely, Ghana, Niger, and Sierra Leone as volatility of interest rate could not be established having recorded insignificant GARCH estimate. Exchange rate devaluation and consumption expenditure hada negative and significant relationship with aggregate savings among ECOWAS countries. The negative association between Exchange rate devaluation and savings is similar to that obtained by Umoru & Hussaini (2022) between devaluation and investment growth for ECOWAS countries.The findings from this study lead us to the conclusion that interest rate and devaluation in official exchange rate requires moderation in order not to greatly deplete the level of aggregate savings among ECOWAS countries. The case is logical as these countries are import-dependent, hence the higher rate of exchange of foreign currency will reduce aggregate savings. The study recommends the need formonetary authorities of ECOWAS countries should endeavor to promote

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export support to keep the exchange rate at a low level and avoid negative effects on aggregate savings. Lastly, there is need for interest rate liberalization to attract aggregate savings among ECOWAS countries, especially as the result of this study has further explained the importance of interest rate on aggregate savings. It suffixes to report that our sample size was somewhat limited by data requirements. A larger sample that exceeds 15 developing countries could be engaged in additional studies to validate or refute the findings obtained in this research. In particular, the Markov- Switching dynamic regression could be implemented to ascertain the effects of two regimes of low and high variations in interest rates and regimes of currency appreciation and devaluation on aggregate savings.

References

Adenuga, A. O. (2020). Time series analysis of interest rate on investment in Nigeria. Nile *Journal of Business and Economics14*: 52-79.

Aizenman, J., Yin-Wong C., & Hiro I. (2019). The interest rate effect on private saving: Alternative perspectives. *Journal of International Commerce, Economics and Policy* 10:1, 1950002

Aizenman J., Cavallo Y. E., &Noy. I. (2015). Precautionary strategies and household saving. *Open Economies Review*. vol. 26, pp.911-939.

Alagidede P.,&Ibrahim M. (2013). On the causes and effects of exchange rate volatility on economic growth: evidence from Ghana. International Growth Centre (IGC). Working Paper, pp. 1-28.

Aliyu, S., Yakub M., Sanni G., &Duke,O. (2013). Exchange rate pass-through in Nigeria: Evidence from a vector error correction model.EconPaper, pp. 1071-1084.

Altavilla, C., Lorenzo B., Mariassunta G., & Sarah H. (2021). Is there a zero lower bound? The effects of negative policy rates on banks and firms. *Journal of Financial Economics*, Advance online publication.

Amzallag, A., Alessandro C., Dimitris G., & João S. (2019). Monetary policy transmission to mortgages in a negative interest rate environment. ECB Working Paper 2243.

Athukorala, P. C., &Tsai L.P. (2003).Determinants of household saving in Taiwan: Growth, demography and public policy,"*Journal of Development Studies*", vol. 39 no. 5, pp. 69-88.

Awe A. P., &Olalere F. G. (2019). Exchange rate volatility and output growth in the economic community of West African States (ECOWAS) (1980-2015). *International Journal of Innovative Research & Development*, vol. 8 no. 1, pp 12-23.

Babazadeh M., &Farrokhnejad F. (2012). Effects of short-run and long-run changes in foreign exchange rates on banks' profit. *International Journal of Business and Management*, vol. 7 no. 17, pp. 30-46.

Barrero, J. M., & Bloom N. (2020). Economic uncertainty and the recovery. Paper presented at the Economic Policy Symposium, Federal Reserve Bank of Kansas City, Aug. 27-28.

Bayer, C., Guerrón-Quintana P., Herold J., & Kuester K. (2020). The dark side of low(er) interest rates. Mimeo. https://www.frbsf.org/economic- research/files/4-Guerron-Quintana.pdf.

Bilbiie F. O. (2018). Neo-Fisherian policies and liquidity traps. CEPR Discussion Paper 13334, *American Economic Journal*: Macroeconomics.

Bracha A. (2020). Investment decisions and negative interest rates. *Management Science* 66:11, 5316-5340.

Brunnermeier, M. K. & Koby Y. (2018). The reversal interest rate. NBER Working Paper 25406.

Bubeck, J., Maddaloni A., & José- Luis P. (2020). Negative monetary policy rates and systemic banks' risk- taking: Evidence from the Euro Area securities register, *Journal of Money, Credit and Banking*52:S1 197-231.

Caballero R., &Krishnamurthy A. (2004). Exchange rate volatility and the credit channel in emerging markets: a vertical perspective. NBER working paper series, working paper 10517.

Carroll C.D., Overland J.,&Weil D.N. (2000). Saving and growth with habit formation. *American Economic Review*, 90(3): 341-355.

Colciago, A., Samarina A., & de Haan J. (2019). Central bank policies and income and wealth inequality:
A survey. *Journal of Economic Surveys* 33:4, 1199-1231.

Chung Y. S., Robert McNown, Soo Khoon Goh (2019). An augmented autoregressive distributed lag bounds test for co-integration, *Economic Modelling*, Volume 80, pp 130-141.

Danladi J. D., &Uba U. P. (2016). Does the volatility of the exchange rate affect the economic performance of countries in the west Africa monetary zone? A case of Nigeria and Ghana. *British Journal of Economics, Management, and Trade*, vol. 113, pp. 1-10.

Dincer, N. & Kandil, M. (2011). The effect of exchange rate fluctuation on export: sectorial analyses for Turkey. *The Journal of International Trade & Economic Development*, 20(6): 809-837.

Edmister, R. O. (1982). Margin analysis for consumer deposit interest rate policy. *Journal of Bank Research*, pp. 179-184

Erdal, G., Erdal H.,&Esengu K. (2012). The effect of exchange rate volatility on trade: evidence from turkey agricultural trade. *Applied Economics Letters*, vol 19, pp. 297-303.

Galac, T., &Kraft E. (2003). Monetary and financial policies for "de-euroization - a Case study of recent Croatian experience.CroatianNational Bank Publication.

Gini, K. B. &Akokaike, M. N. (2021). Interest rate and portfolio investment in Nigeria (1984-2018). *Global Scientific Journal: 9(9), 2320-9186*

Greenwald, D. L., Leombroni M., Lustig H., &Nieuwerburgh S. V. (2021). Financial and total wealth inequality with declining interest rates. NBER Working Paper 28613.

Grigoli, F., Herman, A. & Schmidt-Hebbel, K. (2014). World Saving, IMF Working Paper WP/14/204. https://www.imf.org/external/pubs/ft/wp/2014/wp14204.pdf. [6.03.2022].

Haron, S., Azmi W. N. W. & Salina H. (2006). Deposit determinants of commercial banks in Malaysia. *Finance India*, vol. 20 no. 2, pp. 23-46.

Hassan,M., &Makinde O., (2016). Effect of interest rate on commercial bank deposits in Nigeria (2000-2013).Proceeding of the first Americanacademic research conference on Global Business, Economics, Finance and Social Sciences (AAR16 New York Conference), N644, 1-17

Hatmanu, M., Cautisanu C., & Ifrim M. (2020). The impact of interest rate, exchange rate and European business climate on economic growth in Romania: An ARDL approach with structural breaks. *Sustainability* 12, 2798.

Inimino, E. E., Abuo, M. A., & Bosco, I. E. (2018). Interest rate and domestic private investment in Nigeria. *International Journal of Research and Innovation in Social Science* 2(10), 198-220.

Jarociński, M., & Karadi P. (2020). Deconstructing monetary policy surprises-the role of information shocks *American Economic Journal: Macroeconomics* 12:2, 1-43.

Kariuki W. G. (2014). Effects of macroeconomic variables on credit risk in the Kenyan banking system, *International Journal of Business and Commerce*, vol. 3 no. 9, pp. 1-26.

Kasman S., Vardar G., &Tunç, G. (2011). The impact of interest rate and exchange rate volatility on banks' stock returns and volatility: Evidence from Turkey, *Economic Modelling*,vol. 28, pp. 1328-1334.

Kemisola O. C., Olamide J. O., &Moses O. I. (2016). Exchange rate volatility and banks performance: evidence from Nigeria. *International Journal of Economics and Business Manag*ement, vol. 2 no. 4, pp. 123-141.

Keshtgar, N., Pahlavani, M. &Mirjalili, S. (2020). The impact of exchange rate volatility on banking performance-case of Iran. *International Journal of Business and Development Studies*, 12(1), 39-56

UNDER PEER REVIEW

Kwan S. H. (2002). Impact of deposit rate deregulation in Hong Kong on the market value of commercial banks. Federal Reserve Bank of San Francisco, Hong Kong Institute for Monetary Research.

Lama R.,&Medina J. (2010). Is exchange rate stabilization an appropriate cure for the Dutch disease?*International Journal of Central Banking*, vol. 8 pp. 5-46.

Loayza N., Schmidt–Hebbel K. L., &Servén. A. (2000). Saving in developing countries: an overview. *The World Bank Economic Review*,vol. 14 no. 3, pp. 393-414

Loayza N., &Shankar R. (2000), Private savings in India. *The World Bank Economic Review*, vol. 14 no. 3, pp. 571-594

Marco F., Geoff K., & Roberta F. (2022). Consumer savings behavior at low and negative interest rates. Working Paper Series No 2736 / September.

Mashamba I., &Rashmi A. (2014). Analyzing the relationship between banks' deposit interestrate and deposit mobilization: Empirical evidence from Zimbabwean Commercial Banks. *IOSR-JBM*, vol. 16 no. VI, pp. 64-75.

Mbutor O. M. (2010). Exchange rate volatility, stock price fluctuations, and the lending behavior of banks in Nigeria. *Journal of Economicsand International Finance*, vol. 2 no. 11, pp. 251-260.

Mohammadi T., shakeri A., Eskandari, F., &Karimi D. (2016). The effect of exchange rate volatility on the non-performing loans in Iran. *Journal of planning and budget*, vol. 21 no. 2, pp. 3-24.

Munib B.,&Yasmin A. J. (2013). Impact of macroeconomic forces on non-performing loans: an empirical study of commercial banks in Pakistan. *WSEAS Transaction on Business and Economics*, vol. 10 no. 1, pp. 40-48.

Muntanga M. S. (2020). The impact of interest rates on savings and investment in Zambia (1980-2018). School of Social Sciences Cavendish University Zambia

Mushtaq S.,&Siddiqui D.A. (2017).Effect of interestrate on bank deposits: Evidence fromIslamic andnon-Islamic economies. *Future Business Journal*, vol. 3, pp. 1-8.

Nabar M. (2011).Targets, interest rates, and household saving in urban China. IMF Working Paper, Asia and Pacific Department, WP/11/223.

Obi, C. I.(2022). Impact of interest rate on savings and investment in Nigeria*African Journal of Business and Economic Development*. Vol. 2, Issue 6, June.

Ogwuma M. M. & Nwaeze N. C. (2019). The place of market interest rates variability on commercial banks' profitability: an empirical investigation of banks in Nigeria (1996 - 2016). *The Macrotheme Review* 8(1), 31-42

Ojeaga P.,&Odejimi O. (2014). The impact ofinterest rateon bank deposits: Evidence fromthe Nigerian banking sector. *Mediterranean Journal of Social Sciences*" MCSER Publishing, Rome-Italy, vol. 5no. 16, pp. 232-238.

Olaniyi, E. (2019). How much is too much? The threshold effects of interest rate on growth and investment in Nigeria. *Journal of Management and Administration, 1(4)* 69-82.

Osuji O. (2021) Impact of interest rate deregulation on investment growth in Nigeria. *International Journal of Economics and Financial Issues, 10(2), 170-180.*

Onwumere J.U.J., Okore O.A., & Ibe I.G. (2012). The impact of interest rate liberalization on savings and investment: evidence from Nigeria. *Research Journal of Finance and Accounting*, vol. 3 no. 10, pp. 130-136.

Orji A.O. (2012). Banksavings and bankcredits in Nigeria: Determinants and impact oneconomic growth. *International Journal of Economics and Financial Issues*,vol. 2 no. 3, pp. 357–3.

Repullo R. (2020). The reversal interest rate: A critical review," CEPR Discussion Paper 15367.

Sarlak O. (2014). Effective factors on the absorption of bank deposits to increase the relative share of Isfahan Sepah Bank. *International Journal of Academic Research in Economics and Management Sciences*, vol. 3 no. 4, pp 35-56.

Suranovic S. M. (2005). International Finance: Theory and Policy.

Taiwo O., &Adesola O. A. (2013). Exchange rate volatility and bank performance in Nigeria.*International Journal of Asian Economic and Financial Review*, vol 3 no. 2, pp. 178-185.

Tsuru K. (2000). Finance and growth: some theoretical considerations and a review of the empirical literature. Economics Department Working Paper 228, Organization for Economic Co-operation and Development (OECD), Paris.World Development Indicator (WDI), (2016).

Umoru D. & Hussaini R. (2022). Exchange rate devaluation, interest rate volatility, and investment growth: ECOWAS evidence.*Sriwijaya International Journal of Dynamic Economics and Business*.6(2), 211-226https://doi.org/10.29259/sijdeb.v6i2.211-226

Umoru D. & Shaibu A. I. (2022). Wages, currency devaluation, and real consumption in Africa. *Amity Business School, Amity University Madhya Pradesh Vol. X, No. 1, January – June*.15(3): 20 – 29.

van den E., Willem J., Konietschke P., Samarina A., & Stanga I. (2020). Macroeconomic reversal rate: Evidence from a nonlinear IS-curve. DNB Working Paper 684.

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