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## EXCHANGE RATE FLUCTUATION AND INFLATION NEXUS IN NIGERIA: THE CASE OF RECENT RECESSION

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### ABSTRACT

The erratic performance of the Nigerian economy has generated theoretical and empirical debate in the literature. For instance, while some scholars have posited that inflation and currency depreciation positively influence a country's economy, others believe the contrary. This leads to the interaction of both the exchange and inflation rates to arrive at an innovative conclusion. Hence, this study examines the effects of both indicators and their interactive effect of the country's performance in the regulation era between 1986 to 2019, using the autoregressive distributed lag estimation technique. The empirical findings reveal that the interaction of inflation and exchange rate has a negative impact on the economy in the short run, but it is positive in the long run. Thus, the monetary authority should proactively control the foreign exchange rate movement to curtail the recent surge in inflation and boost the performance of the country's economy.

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### INTRODUCTION

The incessant decline of the naira to other major foreign currencies brings a great deal of turmoil to the economy. This is happening in the face of the ongoing pandemic caused by the novel coronavirus. A recent report by Calderon et al. (2020) affirmed that the reason for Nigeria's poor economic performance in terms of GDP, was attributable to recent border closure, insecurity across the country, especially in the North-East and some parts of North-Central where the major consumable food items can be accessed. More so, the issue of Fulani herdsmen and farmers clash, as well as Boko Haram and other forms of banditries, have been a major concern to the government at all levels, raising domestic food prices in the process. The resultant effect of these is a negative decline of 3.62% in the quarter of 2020 (National Bureau of Statistics, 2020). In the same vein, the Nigerian economy in recent times has witnessed an unprecedented setback as a result of a back-to-back recession that occurred within the space of four years in 2016 and 2020. According to the National Bureau of Statistics (2020), the recession which occurred in Nigeria seems to have had a massive adverse effect on government revenue, tumble-down exchange rate as well as leading to a persistent increase in the prices of consumable food items, which led to the government to borrow from emerging and developed countries. A further report by the National Bureau of Statistics (2020), revealed that GDP in Nigeria declined to -

6.10% in 2020, compared to the previous value of -5.04% in 2019 and -2.18% in 2018. This decline in the gross domestic product (GDP) was principally attributed to the low level of local and foreign economic activities within the year, which resulted from coast-to-coast shutdown efforts aimed at curtailing the Covid-19 pandemic (Olunkwa et al., 2021). Furthermore, the persistent variation in the real exchange rate has been a source of concern to stakeholders in recent times, and this has attracted the interest of scholars to investigate its consequence on the economy. For instance, available data from the National Bureau of Statistics (2020) affirmed that the official exchange rate in Nigeria has been on a downward trend. Before the pronouncement of recession in Nigeria, the naira to US dollars (USD) rate in 2010 was ₦150.30 to US\$1. However, in 2015 and 2016, when the country entered recession, it moved from ₦192.44 to 1 USD to ₦253.49 to 1 USD, putting GDP growth rate at risk as the cost of imported raw materials increased. Similarly, from 2017 to 2020, the exchange rate in Nigeria further depreciated to ₦379.10 from ₦305.79. This has further declined to ₦412.05 in the first quarter of 2021, while it is currently sold at about ₦470 on the parallel market. The resultant effect of such persistent currency depreciation is seen in the decline of industrial output, causing high rates of unemployment and poverty. For instance, studies like Mesagan et al. (2019), as well as Bostan & Firtescu (2018) affirmed that exchange rate variation is

useful in determining a country's export competitiveness because high depreciation could boost export while reducing imports, leading to a favourable trade position. Similarly, macroeconomic changes and business variability occasioned by exchange rate fluctuation could alter the GDP growth rate in an unwanted direction (Anyanwu et al., 2017; Mesagan & Bello, 2018; Isola & Mesagan, 2018).

Furthermore, in discussing exchange rate fluctuation, the issue of inflation is paramount since both variables are macroeconomic variables that could have a positive or negative effect on the economy. A high rate of inflation poses a great deal of threat to the GDP growth rate (Obansa et al., 2013; Mesagan & Shobande, 2016; Omojolaibi et al., 2016). In other words, the risk of inflation and the ability to tolerate both high consumption and enhanced investments implies that the country would expect alterations in the relative price system leading to a faulty resource allocation (Almosabbah & Almoree, 2018; Charles et al., 2018; Mesagan et al., 2018). Furthermore, the performance of any economy is largely determined by exchange and inflation rates. For instance, Aliyu (2009) affirmed that currency appreciation boosts imports and reduces export and vice versa. This implies that currency depreciation tends to cause a demand shift from foreign goods to domestic goods as the local goods to become cheaper globally, provided the local capacity to produce is large enough (Ekundayo and Agatha, 2017; Yusuf et al., 2020; Ogbuji et al., 2020; Mesagan et al., 2022). Also, such a position will be greatly enhanced when inflation in the home country is low to enhance local productivity for the production of export goods. Therefore, given the aforementioned, the study sets out to examine the impact of exchange rate variation and inflation rate on the Nigerian economy. It also ascertains the interactive effect of both exchange rate and inflation on the country's economic performance. Furthermore, this study is consequent on the current economic quagmire in the country caused by the present recession. To the best of the researcher's knowledge, there is no previous work has simultaneously linked exchange rate fluctuation, inflation rate, and economic performance together by examining their interactive impacts. This represents a noble contribution to the literature and will be of immense importance to policymakers. Therefore, looking at the opinion of previous studies, we situation the contribution of this paper.

For cross-countries and regional studies, Chen (2012) explored the impact of currency on growth convergence in Chinese provinces between the period 1992 and 2008, using the dynamic GMM estimation. Empirical findings affirmed that exchange rate appreciation positively impact the growth of China's economy. In the same vein, employing the two-stage least square (2SLS) for the period 1976 to 2010, Ahmad et al. (2013) analyzed the link between exchange rate and economic growth in Pakistan. The study confirmed that the exchange rate positively influences growth via export promotion and import substitution. In a similar manner, Vieira et al. (2013) found that exchange rate variability negatively affected growth, while Saravanan (2015) explored the link between inflation and other macroeconomic variables in Malaysia within the period 1960 to 2012 and revealed that inflation positively enhanced economic performance. From 1970 to

2010 in Ethiopia, Denbel et al. (2016) affirmed that monetary phenomenon and inflation negatively and significantly affected economic growth, while Ndoricimpa (2017) also confirmed the negative impact of inflation on growth beyond the threshold level.

Moreover, Maduku & Kaseeram (2018) affirmed a negative long-run nexus for unemployment, exchange rate, and inflation. Likewise, Abu Asab et al. (2018) compared the association between consumer price and uncertainty consumer price index under inflation targeting for some emerging nations employing GARCH in mean models for 2000 to 2017. Empirical findings affirmed that fixed exchange rate insignificantly enhanced regular consumer price index and persistent inflation. Regarding studies conducted in Nigeria, Obansa et al. (2013) found that the naira to dollar movement positively enhanced the country's growth. Also, Anochiwa & Maduka (2015) employed the Johansen co-integration and nonlinear regression for the period 1970 to 2012 and found that inflation adversely affected performance. In addition, Chude & Chude (2015) focused on the period between 2000 and 2009 and observed that inflation and currency movement enhanced Nigeria's growth. Similarly, employing ordinary least square for the period 1980 to 2013, Olu & Idih (2015) affirmed that inflation positively but insignificantly impact economic growth. Similarly, Enejoh & Tsauni (2017) used ARDL to improve on the result of Chude & Chude (2015). Results revealed that both exchange rate and inflation had a positive and significant influence on the economy.

Idris & Suleiman (2019) employed the VECM technique to cover the 1980 to 2017 period. Short-run evidence showed that inflation and interest rate negatively and significantly affected performance. In the same vein, Adaramola & Dada (2020) focused on the 1980 to 2018 period using the ARDL. The study revealed that both exchange rate and inflation negatively and significantly altered the country's growth performance. Having reviewed empirical studies relating to the exchange rate, inflation, and economic growth, it is clear that the inconclusiveness and the conflicting results can be attributed to defects in the previous studies. Also, most of the previous failed to interact with the two macroeconomic variables to further determine their effect on economic growth. However, studies like (Chude & Chude 2015; Enejoh & Tsauni 2017; Adaramola & Dada 2020) all explored the role of exchange rate and inflation on growth but failed to interact with the variables to determine the extent of the effect. Based on that, this present study tends to fill the noticeable in literature as well as extend the frontier of knowledge by investigating the effect of exchange rate and inflation on economic growth, which to the best of the researcher's knowledge, no previous studies have interacted them.

## METHODOLOGY

The theoretical underpinning for this study is the augmented Solow growth theory propounded by Mankiw et al. (1992). The introduction of the theory remained to address the defects in the Solow growth theory of 1956 by decomposing capital into human and physical capital (Solow, 1956). The study further argued that the investment in human and physical capital provides effective growth in output. This present study is strained from the structural macroeconomic model

employed by Edwards & Sebastein (2000). In addition, we then extended the model further by incorporating other variables as employed in Akpan & Atan (2011) to capture the objectives of the study as follows:

$$\ln Y\tau_t = \beta_0 + \beta_1 \ln MS_t + \beta_2 \ln EX_t + \beta_3 \ln EX_{t-1} + \beta_4 \ln INF_t + \beta_5 \ln Y\tau_{t-1} + \varepsilon_t \quad (1)$$

Where  $Y\tau$  Growth rate of GDP, MS is the growth rate of money supply, EX is the nominal exchange rate, INF is the rate of inflation,  $EX_{t-1}$  is the lag of nominal exchange rate,  $Y\tau_{t-1}$  is the lag of the growth rate of GDP,  $\ln$  is natural logarithms,  $t$  is time subscript, while  $\beta_1\beta_2\beta_3\beta_4\beta_5$  are parameters and  $\beta_0$  is the intercept. Equation (1) is then modified to form equations (2) – (6) based on the objectives.

Model 1, analyses the role of the exchange rate on economic performance.

$$AGDPR = f(EXCH, INV, RINT, AEGS) \quad (2)$$

Where economic performance is proxied with annual GDP growth rate, EXCH is the official exchange rate, INV is investment proxied with gross fixed capital formation, AEGS represents the annual growth rate of exports of goods and services and RINT is the real interest rate.

The above equation (2) is further specified in ARDL form as:

$$\Delta AGDPR_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta AGDPR_{t-1} + \sum_{i=0}^p \alpha_2 \Delta EXCH_{t-1} + \sum_{i=0}^p \alpha_3 \Delta INV_{t-1} + \sum_{i=0}^p \alpha_4 \Delta RINT_{t-1} + \sum_{i=0}^p \alpha_5 \Delta AEGS_{t-1} + \alpha_6 \ln AGDPR_{t-1} + \alpha_7 \ln EXCH_{t-1} + \alpha_8 \ln INV_{t-1} + \alpha_9 \ln RINT_{t-1} + \alpha_{10} \ln AEGS_{t-1} + \varepsilon_t \quad (3)$$

Model 2, examines the effect of inflation on economic performance.

$$AGDPR = f(INF, INV, RINT, EXVO) \quad (4)$$

Where economic performance is proxied with annual GDP growth rate, INF represents the inflation rate, INV is investment proxied with gross fixed capital formation, AEGS represents the annual growth rate of exports of goods and

services and RINT is the real interest rate. Equation (4) is further specified in ARDL form as:

$$\Delta AGDPR_t = \alpha_0 + \sum_{i=1}^p \alpha^1 \Delta AGDPR_{t-1} + \sum_{i=0}^p \alpha^2 \Delta EXCH_{t-1} + \sum_{i=0}^p \alpha^3 \Delta INV_{t-1} + \sum_{i=0}^p \alpha^4 \Delta RINT_{t-1} + \sum_{i=0}^p \alpha^5 \Delta AEGS_{t-1} + \alpha_6 \ln AGDPR_{t-1} + \alpha_7 \ln EXCH_{t-1} + \alpha_8 \ln INV_{t-1} + \alpha_9 \ln RINT_{t-1} + \alpha_{10} \ln AEGS_{t-1} + \varepsilon_t \quad (5)$$

To obtain the interactive effect of both macroeconomic variables on economic performance, we interact exchange rate and inflation, resulting in the model (3):

$$\Delta AGDPR_t = \alpha_0 + \sum_{i=1}^p \alpha^1 \Delta AGDPR_{t-1} + \sum_{i=0}^p \alpha^2 \Delta EXCH * INF_{t-1} + \sum_{i=0}^p \alpha^3 \Delta INV_{t-1} + \sum_{i=0}^p \alpha^4 \Delta RINT_{t-1} + \sum_{i=0}^p \alpha^5 \Delta AEGS_{t-1} + \alpha_6 \ln AGDPR_{t-1} + \alpha_7 \ln EXCH * INF_{t-1} + \alpha_8 \ln INV_{t-1} + \alpha_9 \ln RINT_{t-1} + \alpha_{10} \ln AEGS_{t-1} + \varepsilon_t \quad (6)$$

The ARDL estimation technique is employed in the study to estimate the data and ascertain cointegration among the regressors. The justification is that it is useful irrespective of the stationarity levels of the indicators. It is also consistent in producing unbiased short-run and long-run estimates. The data employed are sourced from World Development Indicators (WDI) and the Statistical Bulletin of the National Bureau of Statistics (2020) across the 1986 to 2019 period in the deregulation era in Nigeria.

**RESULTS AND DISCUSSION**

This section of the study deals with the analysis and interpretation of empirical results. The analysis commences with the stationarity test as well as a bound co-integration test and autoregressive distributive lag result, coupled with the diagnostic tests for the robustness of the results.

Philip-Perron (PP) stationarity test confirms that real interest rate, annual export growth and economic performance are stationary at the level for 1% and 5% significance level, while inflation, investment and exchange rate are not stationary at the level, implying that there is unit root. However, the first difference testing affirms that all the estimated variables are stationary for a 1% level of significance. The implication is that those combined series are mean reverting and converge in the long-run.

Table 1. Philip-Perron Stationarity Test Statistic.

Variables	Level				First Difference			
	PP Test Statistic	1%	5%	Status	PP Test Statistic	1%	5%	Status
AGDPR	-3.7945***	-3.6463	-2.9540	I(0)	-13.9661***	-3.6537	-2.9571	I(1)
EXCH	-0.9394	-3.6463	-2.9540	I(0)	-3.9174***	-3.6537	-2.9571	I(1)
INF	-2.8055	-3.6463	-2.9540	I(0)	-6.8759***	-3.6537	-2.9571	I(1)
INV	-1.9559	-3.6463	-2.9540	I(0)	-6.4645***	-3.6537	-2.9571	I(1)
RINT	-3.4764**	-3.6463	-2.9540	I(0)	-15.8573***	-3.6537	-2.9571	I(1)
AEGS	-8.4117***	-3.6463	-2.9540	I(0)	-22.2490***	-3.6537	-2.9571	I(1)

Note: \*\*\*, \*\*implies 1% and 5% significance levels.

Table 2. ARDL Bounds Test.

H <sub>0</sub> : There is no long-run relationship.				
Levels	Lower Bound I(0)	Upper Bound I(1)	F-statistic	
5%	2.62	3.79	K = 5	
1%	3.41	4.68	2.4661	

Authors' computation.

Table 2 reveals that there is no existence of a long-run equilibrium association among the regressors. It means that we can accept the null hypothesis of no co-integration, since

the upper bound values exceed the F-statistic. In this case, the study proceeds to estimate the short-run and long-run results by employing the autoregressive distributive lag model.

Table 3. Autoregressive Distributive Lagged (ARDL) estimation.

Variables	Model I	Model II	Model III
<i>Short-Run Co-efficient</i>			
D(AGDPR (-1))	-0.4572	-0.2481**	-0.3813
D(EXCH)	-0.0663**		
D(INV)	-0.3541	-0.5868**	-0.7021***
D(INV (-1))	0.2827	0.5051	0.4331
D(INV (-2))	-0.4431	-0.9658	-0.7212
D(RINT)	0.1893**	-0.1893	0.1963**
D(AEGS)	-0.0238	-0.0165	0.0053
D(INF)		-0.2961**	
D(EXCHINF)			-0.0023**
D(EXCHINF (-1))			0.0011
CointEq(-1)	-0.4567**	-0.7057**	-0.4000**
<i>Long-Run Co-efficient</i>			
EXCH	0.0187***		
INF		-0.1960	
EXCHINF			0.0014**
INV	0.1436**	0.0269	0.1525
RINT	0.4144	0.0068	0.4184
AEGS	-0.1522	-0.0234	0.0376
C	-3.0627	4.1510	-8.3412

Dependent Variable: Annual Gross Domestic Product Rate (AGDPR).

Note \*\*\*, \*\*, 1% and 5% Levels of Significance.

Table 3 presents the results for the three models as stated in the methodology section. In Model I, the exchange rate has a negative but significant influence on economic performance in the short run, but in the long run, it asserts a positive and significant influence on economic performance. The economic intuition is that increases in the exchange rate, which is depreciation, cause Nigeria's economic performance to improve significantly in the short run. However, an exchange rate depreciation lowers the country's performance over the long run. The short-run result can be linked to the fact that currency depreciation makes domestic goods cheaper in the foreign markets, leading to improvement in the economy in the short-run. Albeit, since the price of imported inputs rises with currency depreciation, firms' production costs rise, long-run productivity falls, and the Nigerian economy shrinks in the long run. This result aligns with the result of Meo et al. (2018) on a similar impact on tourism demand in Pakistan. It is also in consonance with Mesagan et al. (2021) on its result for the Nigerian manufacturing sector but at variance with its result for the agriculture sector. Again, it

is in tune with Mesagan et al. (2022) for the Nigerian financial and capital markets. Lastly, the result is in line with other studies by Obansa et al. (2013) and Mesagan & Shobande (2016).

Similarly, Model II affirms that inflation in the short run has a negative but significant impact on economic performance, while it is insignificant and negative in the long run. The result further asserts that as the inflation rate increases in both periods, economic performance tends to decline by 29.6% and 19.6%, respectively. The practical implication is that inflation lowers both short- and long-term economic performance in Nigeria. The significant short-run impact indicates that the immediate impact of inflation on the Nigerian economy is more substantial compared to the long run. This is so because studies by Mesagan & Eregha (2019) and Alenoghena et al. (2014) affirmed that prices increase more intensely during the short period of adjustment. Hence, the result supports the findings of their studies but is at variance with Burdekin et al. (2004), which posited that inflation increases economic growth. Lastly, the inflation result is in line with Anochiwa & Maduka (2015), which

posits that a high rate of inflation is harmful to Nigeria's economic growth.

In Model III, the interaction between exchange rate and inflation exerts a short-run negative and significant impact on economic performance, while in the long run, its impact is positive and significant. The interaction of the two macroeconomic variables shows that the exchange rate augments the inflation rate to negatively affect the economy in the short run. However, over the long term, the interaction between inflation and exchange rate enhances the performance of the economy. The practical implication is that as the naira depreciates over the long-run, domestic prices rise due to imported inflation resulting from a rise in the importation, as suggested in studies by Mesagan & Adenuga (2019) and Eregha & Mesagan (2019) in their works on Nigeria's inclusive growth. However, with full adjustment by Nigerians, the long-run impact of the interaction term improves the economy since it is expected to improve the local productivity for exports. Regarding other major control variables, the real interest rate

positively but significantly enhances economic performance. Also, in models I and II, the export of goods and services reduces economic performance, but this changed crucially with the introduction of the interaction term in model III. The implication is that given the right environment, as the currency depreciates, more foreign exchange flows into the economy, triggering the inflation rate. However, when the exchange rate depreciates as the inflation rate rises, investors take advantage of the high prices to expand the local production capacity, and export expands too. Interestingly, this impact is insignificant because local manufacturers are still faced with an increase in their input prices from abroad occasioned by currency depreciation. Finally, the cointegrating equations in Table 3 are negative and significant at 45%, 70%, and 40%, respectively, for models I-III. This implies that a long-run relationship exists among the regressors and there is a convergence from the short-run to the long-run. The speed of adjustment of all the models is also fast, indicating that the models are well specified.

Table 4. Test for Heteroskedasticity using Breusch-Pagan-Godfrey (BPG).

BPG Stat.	1.602553	Probability	0.1856
Observed R2	19.08862	Chi-Square Prob(15).	0.2097
Scaled sum of square	6.476006	Chi-Square Prob(15).	0.9706

Source: Authors' computation

Table 5. LM Serial Correlation Test using Breusch-Godfrey (BG).

BG Stat.	0.2371	Probability	0.7922
Observed R2	1.0913	Chi-Square prob.	0.5794

Source: Authors' computation.

In Table 4, we display the heteroskedasticity result as a post-estimation test. As shown in Table 4, the corresponding p-values for F-statistics and chi-square are 0.1856 and 0.2097, respectively, which are greater than the 5% level of significance. On these bases, we reject the alternative hypothesis and accept the null hypothesis of no heteroscedasticity, implying that the residual variables are homoscedastic. The test for serial correlation presented in Table 5 shows that both probability values for the F-statistic and observed R<sup>2</sup> are insignificant at 79.2% and 57.9%, respectively. This means that the null hypothesis of no autocorrelation is accepted.

## CONCLUSIONS

This present study assessed the effects of exchange rate fluctuation and inflation on Nigeria's economic performance between 1986 to 2019. The justification for the period is to effectively examine the performance of the Nigerian economy after the Structural Adjustment Program in 1986, which marked the regulation era in the financial sector. The autoregressive distributive lag bound testing co-integration was employed, and the result affirms no co-integration between exchange rate, inflation, and economic performance in Nigeria. However, the empirical findings showed that the exchange rate in the short run impacted economic performance negatively, while its influence, in the long run, is positive. Likewise, inflation exerted a negative influence on the economy in both the short- and long-run. Furthermore, the interaction of both variables affirmed that

the exchange rate augments inflation to lower economic performance in the short run, while their interactive effect, in the long run, is beneficial to the country's economy. With these findings, our only limitation comes from the fact that we restricted the study to the Nigerian economy. Since Nigeria remains the largest economy in Africa, it is worthwhile to receive our attention. We believe that scholars can build on this limitation in conducting future research in this area. Hence, the recommendation is that the Central Bank should proactively control the foreign exchange market by ensuring that banks and the bureau de change sell foreign currencies at the stipulated. The apex bank should also control the influx of foreign currencies that permeate the economy through remittances and other means to keep down inflation pressure. This can also help the Central Bank to make its single-digit inflation target a reality.

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