EXCHANGE RATE MISALIGNMENT AND ECONOMIC GROWTH IN NIGERIA

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Abstract

This study examines the effect of exchange rate behaviour on economic growth in Nigeria covering the period 1986 to 2022. The technique of analysis employed in the study is Vector Error Correction Model (VECM) approach. The study utilized Behavioural Equilibrium Exchange Rate (BEER) and Exchange Rate Misalignment (EXRM) models. The unit root tests of stationary shows stationarity at first difference and Cointegration was established using Johansson cointegration technique. The VECM results revealed that the impact of BEER on the economy depends on its direction especially in the long run. It appreciates for improved terms of trade and net foreign asset position but depreciates due to increased trade openness and broad money supply in the long-run. In the short-run, the EXR misalignment would impede growth. The convergence term has correct sign (negative) and 36% adjustment rate to equilibrium in BEER and 32% in EXRM. The study concludes that it is imperative for the Central Bank of Nigeria to initiate consistent macroeconomic policies and regulatory frameworks focusing on the main drivers of equilibrium EXR to correct currency misalignment and to support their promising economic growth. Thus, increased investment in domestic market is required to encourage local production thereby taking advantage of period undervaluation to achieve increase in export that will bring about rapid economic growth. This ensures sustainable growth in a more diversified economy to improve the terms of trade. The study recommends that appropriate incentives should be provided in both tradable and non-tradable sectors of the Nigerian economy.

Keywords: Real exchange rate, misalignment, economic growth, VECM, Nigeria

Introduction

Macroeconomic stability and sustained growth are essential for job creation, economic development, and poverty reduction in developing economies. The Sustainable Development Goals (SDGs) provide fundamental economic issues that must be adequately address to achieve growth and development. in particular, promoting sustained, inclusive and sustainable economic growth; and build resilient infrastructure, promote inclusive and sustainable industrialization; foster innovation and reduce poverty. Developing economies have gone through economic and financial shocks the most recent of which is as a result of the Covid-19 pandemic that impacted on flow of goods, services and capital. Most African economies are largely depending on advanced industrialized countries for inflow of foreign capital either through foreign direct investment or earnings from exports. This has implications for the management of foreign exchange and macroeconomic stability generally.

Exchange rate remains an essential price that links economies. Real exchange rate requires effective management by monetary authorities to achieve equilibrium exchange rate (EEXR) that prevails in the absence of price rigidities or frictions in the short run. There are different approaches to exchange rate determination one of which is the behavioural equilibrium exchange rate (BEER) that expresses the equilibrium real exchange rate as a function of other macroeconomic fundamentals like inflation, growth or balance of payment equilibrium. The real exchange rate misalignment (RERM) signifies deviations of the observed or actual real exchange rate from its equilibrium values (Momodou & Sheriff, 2020). It is the rate that is not equal to equilibrium exchange rate that is misaligned. Exchange rate plays vital role in macroeconomic and microeconomic components. The macroeconomic component relates to financial stability where exchange rate is used as credible and explicit anchor for domestic price stability. Getarch (2022) observed that a strong link between real exchange rate behaviour and economic performance abound in Latin American, Asian and African countries. Similarly, Domac & Shabsign (2014) argued that while stable real exchange rates led to the expansion of East Asian economies, their sustained misalignment stifled economic growth in African countries. The EXRM affect economic growth in different folds. For instance, it could influence domestic and foreign investment especially portfolio investments, thereby influencing the capital accumulation process. Also, misaligned real exchange rate could affect the tradable sector and the competitiveness of the sector in relation to the rest of the world (Razin & Collins, 1997). Hence, EXRM distorts the economic activities which in turn impinge negatively on various sectors of the economy given that misalignment in form of

overvaluation of domestic currency serves as a tax on prices of traded goods.

In a quest to achieve appropriate value for nominal exchange rate, the monetary authority in Nigeria over the years designed and implemented policies targeted at achieving a realistic, well aligned and growth propelling exchange rate for the currency (naira). The Central Bank of Nigeria (CBN) in a quest to achieve exchange stability moved from fixed rate in 1986 to floating rate. Most recently, CBN intervened through Investors' & Exporters (I&E) windows and secondary market intervention sales (SMIS). The SMIS includes inter-bank spot sales, spot and forward retail & wholesale intervention and priority sectors intervention. While I&E FX Window was introduced to boost liquidity in the foreign exchange market and ensure timely execution and settlement for eligible transactions.

Studies have found that real exchange rate misalignment may lead to slower economic growth (Elbadawi, Kaltani, & Soto, 2012), constrain export diversification (Sekkat 2016), reduce export volumes (Hinkle & Montiel, 2016), foster currency crises (Chinn, Gauthier & Tessier, 2014) and political instability and conflict (Montiel, 2017). Though studies have investigated the nexus between exchange rate misalignment and growth in Nigeria (Nnyanzi, Oryema & Nicholas, 2022; Abraham, 2017; Agu, 2015), The recent gap between official rate and parallel market rate has become a major concern and policy issue that requires more evidence for monetary authority to ensure stability in exchange rate management in particular and external sector in general. Therefore, the study seeks to examine the impact of exchange misalignment on economic growth in Nigeria covering the period 1986-2022. To achieve this, the paper is structured into 5 sections. Section 1 is introduction. Section 2 is literature review. Section 3 is methodology. Section 4 is empirical analysis and discussion of findings. Section 5 is conclusion and recommendations.

Conceptual Clarification

Foreign exchange is defined as foreign currency or any other financial instrument acceptable as means of payment for international transactions (Williamson, 2014). Real exchange rate misalignment (RERM) refers to the deviation of the actual real exchange rate from its equilibrium time path. Rodrik (2008) noted RERM occurs when real exchange rate deviates from the underlying real exchange rate that would have prevailed in the absence of price rigidities and frictions. It is deviation of the actual RERM from its equilibrium. Studies have found that RER misalignment may impact developing economies negatively in several ways. The equilibrium real exchange rate is compatible with simultaneous achievement of internal and external balance in the medium term. Economic growth is an indication of

society's welfare. It reflects the changes in its ability to attain any socially agreed upon set of goals, whether consumption, capital formation and improvement in general well-being of individuals in the society (Abraham, 2017). In other words, growth can be defined as sustained increase in macroeconomic aggregates particularly real gross domestic product.

Empirical Review

A number of studies have examined the relationship between exchange rate misalignment and economic growth across regions using diverse approaches. Ambaw, Madhavi, Arief & Nicholas (2022) investigates the examined the impact of real effective exchange rate (REER) misalignment on business cycles in Asia and the Pacific by employing a panel vector autoregressive model and quarterly data for 22 sample economies covering the period 1990-2018. The results showed that REER overvaluation may lead to a reduction in CPI inflation and short-term interest rate. Asia and the Pacific are highly heterogeneous in the output gaps of some economies, particularly Southeast Asia are more susceptible to REER misalignment shocks. Similarly, Getaneh (2022) examined the main drivers of REER misalignment and its effect on economic growth of East African least developed countries (LDCs) using Pooled Mean Group (PMG) and dynamic OLS estimators for panel and ARDL Bound testing and data covering the period 1980–2019. The panel results revealed that the REER of LDCs were significantly misaligned for the study period. The ARDL bound testing results support the panel estimation results. In the short-run, the REER misalignment would impede growth of Ethiopia while it promotes growth of Kenya. Nnyanzi, Oryema and Nicholas (2022) estimated the effects of real exchange rate (RER) misalignment and regional integration on performance of service sector in selected countries from East Africa covering the period of 1991–2017. The study employed Pooled Mean Group ARDL and panel Cross-Sectional Autoregressive distributed lag (CS-ARDL) approach for analysis. The results showed that exchange rate volatility is detrimental to the services sector in the long run. Furthermore, Mazorodze (2022) investigated the effect of exchange rate misalignment on growth in fragile states of sub-Saharan Africa using the dynamic ordinary least squares method and system generalized methods of moment (S-GMM) covering the period 2009-2018. The results from S-GMM exchange rate misalignment capture the distortionary effects of inappropriate macroeconomic policies in the main with significant negative effects on growth which increases with state fragility.

Iyke (2019) examined the effect of real exchange rate misalignments on economic growth in sub-Saharan Africa (SSA) by employing 15 countries (7 low income and 8 middle-income countries) covering the

period 1970-2010. A simplified regression model was used for model estimation and standard regression model to determine Balassa-Samuelson Hypothesis (BSH). The results showed negative and significant coefficient of the relative productivity for the two subsamples and stablished BSH. for the SSA countries considered. Also, undervaluation promote while overvaluation reduce growth is weaken as countries migrate from the low-income bracket to the middle-income bracket. Adenikinju (2017) examine the effect of real exchange rate movements (misalignment and volatility) on the growth of non-oil export using cointegration and error correction model. The results showed that misalignment have significant negative impact on manufacturing investment. Similarly, Agu (2015) estimate the time path of the naira equilibrium exchange rate and its misalignments. The result showed that real exchange rate misalignment in Nigeria was irregular but persistent. The naira was found to be overvalued by an average of about 1.4%. The RER misalignment and its volatility affects trade balance, capital account and economic growth.

Theoretical Framework

The early work on exchange rate determination and movement by Laursen & Metzler (1950) focused on the elasticities of demand for and supply of exports and imports as well as the demand for and supply of foreign currency, and conditions under which devaluation may be effective in improving the balance of trade. Friedman (1953) argued in favour of floating exchange rates on the grounds that speculation may produce stabilising effects in the foreign exchange market. The work of Mundell (1962 & 1963) and Fleming (1962) extended the Keynesian income-expenditure model by introducing capital flows. In more recent theories, floating exchange rates under the assumption of perfectly flexible prices and continuous purchasing power parity was argued in monetary approach. There are traditional or modern theories of the exchange rate. The traditional theories are based on trade financial flows, and purchasing power parity that explains exchange rate movements in the long run (Bhalla, 2018). The theories are the elasticity approach to exchange rate determination, the monetary approach to exchange rate determination, the portfolio balance approach to exchange rate determination, and the purchasing power theory of exchange rate determination. The modern theory of sticky-price monetary theory that focuses on the importance of capital and international capital flows by explaining the short run volatility of the exchange rates and their tendency to overshoot in the long run is adopted as our monetary theory.

Dornbusch (1976) propounded the sticky-price monetary model which assumes that prices cannot adjust instantaneously, but instead respond to

discrepancies in long-run equilibrium fundamentals that explain the phenomenon of exchange rate overshooting and central to international monetary analysis. Dornbusch, (1984) used the term overshooting to mean short-run adjustment of an economic variable in a certain direction following an exogenous shock or policy change that is larger than what is needed to restore the long-run equilibrium which necessitate reversal of the direction at some time in the future. The sticky-price monetary model allows short-term overshooting of the nominal and real exchange rates above their long run equilibrium levels. Since goods prices are sticky in the short run, any initial fall in the real money supply and lead to rise in interest rates to clear the money market. The rise in domestic interest rates then leads to a capital inflow and an appreciation (overvaluation) of the nominal exchange rate (a rise in the value of domestic currency in terms of foreign currency).

The theory postulates that in the medium term domestic prices begin to fall in response to the fall in the money supply. This ease-out pressure in the money market (the real money supply raises) and domestic interest rates start to decline. The exchange rate then depreciates slowly towards long run equilibrium level. Therefore, the exchange rate misalignment in Nigeria can be explained from the perspective of the Dornbusch theory. The model explains the paradox that exchange rates of currencies for countries with relatively higher interest rates as the case in in Nigeria tend to depreciate: the initial interest rate rise that induces a sharp exchange rate appreciation, and slow depreciation as prices adjust, which continues until long-run equilibrium level is satisfied.

Research Methodology

Model Specification

The formation of the model is based on the notion that Naira equilibrium exchange rate (EEXR) is obtained from distribution of observable variables of EXR and its fundamental determinants. The functional form of the model is adapted from Getacnch (2022) and Adenikinju (2017) stated as follows:

$$EXR_t = (OPEN/GDP_t, TOT/GDP_t, FDI/GDP_t, GNER_t, INTR_t) \quad (1)$$

Where, EXR is exchange rate; OPEN is degree of openness proxied by imports plus exports as ratio of GDP; TOT is terms of trade as ratio of GDP; FDI is foreign direct investment as ratio of GDP; GNER is nominal exchange rate; INTR is interest rate; and t is the time variant. Equation 1 can further be expressed in VECM form for estimation of exchange rate behaviour as:

$$\Delta EXR_t = \beta 0 + \sum_{i=1}^{P} \beta_1 \Delta exr_{t-1} + \sum_{i=0}^{P} \beta_2 \Delta lnopen_{t-1} + \sum_{i=0}^{P} \beta_3 \Delta lntot_{t-1} + \sum_{i=0}^{P} \beta_4 \Delta lnfdi_{t-1} + \sum_{i=0}^{P} \beta_5 \Delta lngner_{t-1} + \sum_{i=0}^{P} \beta_6 \Delta intr_{t-1} + \beta_7 ECT_{t-1} + \mu t \quad 2$$

Where Δ denotes the first difference operator, ECT is the estimated residual of the co-integrating regression; ϵ is the stochastic white noise; RER is the dependent variable while β_1-β_5 are the vector of exogenous variables.

The exchange rate misalignment (EXRM) model is specified as follows:

GDP = (M2/GDP, EXRM, GCF/GDP, GC/GDP, FDI/GDP) 3

Equation 3 can further be expressed in VECM format for estimation as follows:

$$\Delta GDP_t = \alpha 0 + \sum_{i=1}^{P} \alpha_1 \Delta GDP_{t-1} + \sum_{i=0}^{P} \alpha 2 \Delta lnM2/GDP_{t-1} + \sum_{i=0}^{P} \alpha_3 \Delta lnEXRM_{t-1} + \sum_{i=0}^{P} \alpha_4 \Delta lnGCF/GDP_{t-1} + \sum_{i=0}^{P} \alpha \Delta lnGC/GDP_{t-1} + \sum_{i=0}^{P} \alpha \Delta inFDI/GDP_{t-1} + \alpha_7 ECT_{t-1} + \mu t \quad 4$$

Where, GDP is gross domestic product; M2/GDP is money supply as % of GDP; EXRM is real exchange rate misalignment; GCF is gross fixed capital

formation; GC/GDP is government consumption as % of GDP; FDI/GDP is foreign direct investment as a % of GDP; ECT is error correction term, and e is stochastic disturbance term; and t is time variant.

Data Source and Description

The study used time series data covering the period 1986-2022 and sourced from Central Bank of Nigeria (Various issues), World Bank database and IMF International Financial Statistics (IMF-IFS). The exchange rate, gross domestic product, gross fixed capital formation, and money supply were obtained from IMF-IFS. The TOT, government expenditure and foreign direct investment were obtained from World Bank WDI. All variables are taking as ratio of GDP except the ones in rates.

Technique of Data Analysis

The statistical properties of the series we examined include unit root tests of stationarity and cointegration test of long run relationship among variables. Testing for stationarity in economic time series is important since stationarity is assumed in data analysis that sometimes leads to spurious estimation with non-stationarity in series. The stationarity of series at first difference justifies the used of vector error correction model (VECM). The Cointegration tests established long run relationship among series.

Empirical Analysis

Stationarity Tests

The time series unit root tests is presented in table 1 using ADF. The ADF tests conducted at 5% significance level shows that all the variables were found to be non-stationary at levels. However, after taking the first difference the series became stationary. This reveals that the variables are stationary at first difference, that is, they are I(1).

Table 1: Augmented Dickey Fuller (ADF) test.

Variable	*1%*	*5%*	*10%*	*T-statistic*	*P-value*	*Order*
GDP	*-2.739213*	*-1.651645*	*-1.410577*	*3.245922*	*0.0000*	*I(1)*
EEXR	*-3.815581*	*-2.741143*	*-2.509165*	*-3.472790*	*0.022*	*I(1)*
EXRM	*-3.521429*	*-2.814348*	*-2.512630*	*-5.875519*	*0.0000*	*I(1)*
GNER	*-3.415585*	*-2.441142*	*-3.515506*	*-5.115772*	*0.0000*	*I(1)*
TOT	*-3.539482*	*-2.851512*	*-2.549659*	*-5.254215*	*0.0000*	*I(1)*
FDI	*-3.516598*	*-2.846114*	*-2.626986*	*-8.327991*	*0.0000*	*I(1)*
M2/GDP	*-3.222134*	*-2.732627*	*-2.526153*	*-4.942720*	*0.0003*	*I(1)*
FDI/GDP	*-3.473556*	*-2.842145*	*-2.596006*	*-8.298582*	*0.0000*	*I(1)*
GCF	*-2.923896*	*-1.875019*	*-1.734389*	*3.385796*	*0.0000*	*I(1)*

GC/GDP	*-4.006125*	*-3.743663*	*-3.104201*	*-5.486472*	*0.0000*	*I(1)*

Source: Author's computation from E-views 10.0

Lag selection test for behavioural equilibrium exchange rate model

The optimal lag length selection used a number of information criteria's including Akaike information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quinn information criterion (HQ) (equation 1). Two lags as optimal by all the information criteria were established in equation 2.

Table 2: Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9778.672	NA	4.41e+49	131.3379	131.4588	131.3870
1	-8225.282	2960.825	6.30e+40	110.9702	111.8170	111.3142
2	-7892.435	607.6125*	1.17e+39*	106.9857*	108.5582*	107.6246*
3	-7882.781	16.84653	1.68e+39	107.3393	109.6377	108.2731
4	-7860.596	36.92535	2.05e+39	107.5248	110.5489	108.7534

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

The table above shows the result of lag order selection criteria, the result shows that two of the lag orders selected by the criterion are lag two. The study makes use of akaike information criterion.

Johansen Co-integration test (behavioural equilibrium exchange rate model)

The co-integration analysis provides information on long-run equilibrium relationship. The result provides evidence to support existence

of long run co-integrating relationship for both trace (Table 3a) and maximum eigenvalue (Table 3b) statistic as there exists two cointegration relations in both trace and maximum eigenvalue statistic in equation 3.

Table 3a: Johansen Co-integration Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.748264	90.41769	69.81889	0.0005
At most 1*	0.535370	52.27774	41.85613	0.0031
At most 2	0.357372	21.74930	29.79707	0.3127
At most 3	0.188676	7.599261	15.49471	0.5092
At most 4	0.027990	0.908450	3.841465	0.3405

Table 3b: Johansen Co-integration - Maximum Eigenvalue Test

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.748264	44.13995	33.87687	0.0021
At most 1*	0.535370	29.52844	23.58434	0.0043
At most 2	0.357372	14.15004	21.13162	0.3528
At most 3	0.188676	6.690811	14.26460	0.5263
At most 4	0.027990	0.908450	3.841465	0.3405

Long run Behavioural Equilibrium exchange rate (BEER) model

Table 4 provides results for long run estimates. The nominal exchange rate and foreign direct investment are positive and significant. The terms of trade and interest rate are negative and significant. However, degree of openness is positive but not statistically significant this finding is supported by Mazorodze (2022) and Iyke (2019).

Table 4: **Long run estimation model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPEN	-2.022180	1.950722	-1.036632	0.3077
GNER	0.049858	0.271043	5.436310	0.0000
C	0.762603	0.131808	0.172839	0.8639
TOT	-1.173542	4.265265	-3.634523	0.0001
FDI	1.618908	3.969429	2.451918	0.0198
INTR	-0.673995	0.254495	-2.648358	0.0125

R-squared	0.878058		Mean dependent var	96.62777
Adjusted R-squared	0.796192		S.D. dependent var	92.78417
S.E. of regression	10.90283		Sum squared resid	3803.898
Long-run variance	169.2811			

Short run behavioural equilibrium exchange rate (BEER) model

In Table 5 the error-correction term is correctly signed and significant. This shows that, in the short run, deviation from this relationship could occur due to shocks to any of the variables as a result of the differences in the dynamics governing short run real exchange rate and long run real exchange rate. The result shows that the speed of adjustment of the real effective exchange rate to the long run equilibrium path is 36%. The depreciation of the real exchange rate is positively associated with increasing inflow of foreign direct investment and negatively related to terms of trade. The (nominal exchange rate is positive and significant. The degree of openness is negative and significant.

Table 5: Vector Error Correction Estimates of the short run

Vector Error Correction Estimates						
Date: 07/07/23 Time: 18:35						
Sample (adjusted): 1986 2022						
Included observations: 38 after adjustments						
Standard errors in ( ) & t-statistics in						
Error Correction:	**D(EEXR)**	**D(OPEN)**	**D(TOT)**	**D(FDI)**	**D(GNER)**	**D(INTR)**
CointEq1	-0.36272	-0.01408	-1.42E+11	-4685820	-0.32971	0.064717
	(0.124338)	(0.02189)	(3.5E+10)	(4366354)	(0.15861)	(0.14922)
	[-2.91721]	[-0.64326]	[-4.09842]	[-1.07317]	[-2.07870]	[0.43371]
D(EEXR(-1)	1.250666	0.046620	4.73E+10	6803773.	0.851621	-0.16658
	(0.36735)	(0.03515)	(5.6E+10)	(7012996)	(0.25475)	(0.23966)
	[3.40457]	[1.32621]	[0.84833]	[0.97017]	[3.34293]	[-0.69506]
D(OPEN(-2)	-0.89327	-0.39144	-7.51E+10	-3535581	-1.62324	-1.67938
	(0.25612)	(0.24461)	(3.9E+11)	(4.9E+07)	(1.77264)	(1.66764)

	[-3.48906]	[-1.60028]	[-0.19362]	[-0.07245]	[-0.91572]	[-1.00704]
D(TOT(-2)	-0.70139	5.46E-14	-0.01595	9.54E-06	-1.19E-12	-4.07E-13
	(0.34578)	(1.1E-13)	(0.16945)	(2.1E-05)	(7.7E-13)	(7.3E-13)
	[-2.02904]	[0.51048]	[-0.09414]	[0.44720]	[-1.53493]	[-0.55873]
D(FDI(-2)	-1.18E-08	-4.43E-10	1424.483	-0.137075	-1.30E-08	2.70E-09
	(1.3E-08)	(1.2E-09)	(1898.08)	(0.23885)	(8.7E-09)	(8.2E-09)
	[-0.94283]	[-0.36980]	[0.75049]	[-0.57391]	[-1.49804]	[0.33059]
D(GNER(-1)	-1.97182	-0.08842	-1.14E+11	-17894674	-1.32973	0.171912
	(0.61388)	(0.05874)	(9.3E+10)	(1.2E+07)	(0.42572)	(0.40050)
	[-3.21207]	[-1.50523]	[-1.22130]	[-1.52692]	[-3.12349]	[0.42924]
D(INTR(-1)	0.617162	0.010111	4.69E+10	-124967.1	0.443432	-0.34675
	(0.30066)	(0.03451)	(5.5E+10)	(6885246)	(0.25011)	(0.23530)
	[2.01821]	[0.29297]	[0.85627]	[-0.01815]	[1.77294]	[-1.47367]
C	6.223888	0.148624	1.61E+11	1.29E+08	4.539904	0.233205
	(3.42655)	(0.32790)	(5.2E+11)	(6.5E+07)	(2.37627)	(2.23552)
	[1.81637]	[0.45326]	[0.31002]	[1.97282]	[1.91052]	[0.10432]

R-squared	0.533730	0.268480	0.594832	0.396778	0.628465	0.439215
Adj. R-squared	0.510206	-0.16378	0.355414	0.040328	0.408922	0.107842
Sum sq. resids	5335.440	48.85878	1.23E+26	1.94E+18	2565.948	2270.982
S.E. equation	15.57305	1.490253	2.36E+12	2.97E+08	10.79972	10.16004
F-statistic	1.937149	0.621106	2.484496	1.113139	2.862606	1.325442
Log likelihood	-141.057	-56.5793	-1067.89	-744.5865	-127.88	-125.682
Akaike AIC	8.614263	3.921070	60.10477	42.14370	7.882219	7.760104
Schwarz SC	9.230075	4.536883	60.72058	42.75951	8.498032	8.375917
Mean dependent	8.505459	0.003863	-5.49E+11	41501364	4.942362	0.348460
S.D. dependent	18.08141	1.381415	2.94E+12	3.03E+08	14.04722	10.75659

Evaluating the degree of real exchange rate misalignment from its equilibrium path

This section presents estimates of lag selection, Cointegration and estimated model of real exchange rate misalignment - growth nexus. The real exchange rate misalignment from its equilibrium path in assumes to be corrected by the error correction term (ECT) given the speed of adjustment.

Table 6 provides result of lag order selection criteria. The result shows two of the lag orders selected by the criterion are lag one while the remaining three selected lag order selection criterion selected three. The study used Akaike information criterion. Hence information criteria made use of in the study is three lag order.

Table 6: Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2607.569	NA	2.92e+57	149.3468	149.6134	149.4388
1	-2397.679	335.8238	1.46e+53	139.4102	141.2767*	140.0545*
2	-2373.801	30.01884	3.53e+53	140.1029	143.5691	141.2994
3	-2339.049	31.77307*	6.65e+53*	130.1742*	145.2402	141.9230
4	-2266.426	41.49884	3.31e+53	138.0815	144.7473	140.3825

Johansen cointegration test

The co-integration analysis for the second model (*Equation 4*) is presented in *Table 7a and 7B*. The Johansen cointegration tests established the existence of a long-run relationship. Specifically, the Trace tests (Table 7a) show four while the Maximum Eigenvalue (Table 7b) indicates three cointegrating equations at 5% level of significance.

Table 7a: Johansen Cointegration Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.847806	150.1022	95.75366	0.0000
At most 1 *	0.598804	82.32865	69.81889	0.0036
At most 2 *	0.410919	49.44963	47.85613	0.0351
At most 3 *	0.299414	30.39872	29.79707	0.0426
At most 4	0.267466	14.58853	18.49471	0.1238
At most 5	0.162492	7.383679	11.841465	0.2115

Table 7b: Johansen Cointegration (Maximum Eigen Value) Test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.847806	67.77354	40.07757	0.0000
At most 1*	0.598804	49.87902	33.87687	0.0004
At most 2*	0.410919	31.05091	25.58434	0.0031
At most 3	0.299414	12.81019	21.13162	0.4698
At most 4	0.267466	11.20485	14.26460	0.1442
At most 5	0.162492	6.383679	3.841465	0.0115

Estimates of real exchange rate misalignment and economic growth model

The estimates of EXR misalignment and growth model (equation 4) is presented in *Table 8*. The variables M2/GDP and GCF/GDP are positive and significant. However, FDI/GDP and EXRM are negative and significant. The EXR misalignment impacts negatively on economic growth with multiplier effects on other macroeconomic variables in the long run. The findings conform with Iyke (2019) and Omotosho (2015).

Table 8: Long run model estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2_GDP	0.091230	0.494819	5.423868	0.0000
RERM	-1.300010	0.500010	-2.645402	0.0331
GCF	0.976705	0.041536	4.137930	0.0002
GC_GDP	-1.523563	0.991347	-0.650677	0.5198
FDI_GDP	-0.497312	1.222872	-2.470720	0.0188
C	-0.834213	0.032362	-4.833734	0.0000
R-squared	0.647669		Mean dependent var	3.101393
Adjusted R-squared	0.594316		S.D. dependent var	4.209841
S.E. of regression	8.485912		Akaike info criterion	62.51601
Sum squared resid	2.376327		Schwarz criterion	62.77195
Log likelihood	-1213.062		Hannan-Quinn criter.	62.60784
F-statistic	180.2066		Durbin-Watson stat	1.058317

Prob(F-statistic)	0.000000			

Short Run Vector Error Correction Model

The short run estimates is presented in *Table 9*. The fiscal policy as proxied by (GC/GDP) monetary policy as proxied by (M2/GDP) and trade policy (trade balances/degree of openness) as proxied by (FDI/GDP) are significant variables. The coefficient of the error correction term of the EXRM equation is negative and statistically significant showing the speed of adjustment to long run equilibrium is 0.324. The EXRM equation error correction coefficient indicates that about 32% of disequilibrium error in the previous quarter misalignment from equilibrium path is corrected within the subsequent quarter.

Table 9: **Vector Error Correction Model**

Error Correction:	**D(GDP)**	**D(M2_GDP)**	**D(RERM)**	**D(GCF)**	**D(GC_GDP)**	**D(FDI_GDP)**
CointEq1	**-0.014597**	5.30E-15	0.324506	-0.002409	1.11E-15	2.98E-16
	(0.00244)	(4.1E-15)	(0.01375)	(0.00137)	(2.0E-15)	(2.5E-15)
	[-5.98238]	[1.29496]	[8.33163]	[-1.76038]	[0.56519]	[0.11842]
D(GDP(-2))	**-0.465596**	5.98E-13	2.82E-12	0.016951	1.61E-13	-1.37E-13
	(0.23088)	(3.9E-13)	(1.6E-11)	(0.12962)	(1.9E-13)	(2.4E-13)
	[-2.01662]	[1.54090]	[0.17686]	[0.13077]	[0.86717]	[-0.57441]
D(M2_GDP(-2))	**-6.876011**	0.345221	3.199152	3.37E+11	0.105140	0.052080
	(2.20411)	(0.37723)	(15.4896)	(1.3E+11)	(0.18106)	(0.23194)
	[-3.11963]	[0.91514]	[0.20654]	[2.67284]	[0.58068]	[0.22454]
D(RERM(-1))	**-1.04001**	-0.006621	-0.402935	-1.68E+09	-0.001192	0.003696
	(0.25600)	(0.00709)	(0.29117)	(2.4E+09)	(0.00340)	(0.00436)
	[- 4.06253]	[-0.93376]	[-1.38387]	[-0.71071]	[-0.35015]	[0.84769]
D(GCF(-1))	**1.317617**	9.69E-14	6.80E-12	1.269436	3.06E-13	1.30E-13
	(0.39756)	(6.7E-13)	(2.7E-11)	(0.22320)	(3.2E-13)	(4.1E-13)
	[3.31424]	[0.14513]	[0.24800]	[5.68742]	[0.95552]	[0.31657]
D(GC_GDP(-1))	**0.665564**	-0.306918	-1.551827	-7.84E+10	-0.312344	0.237594
	(0.24537)	(0.61181)	(25.1214)	(2.0E+11)	(0.29366)	(0.37616)
	[2.71241]	[-0.50166]	[-0.06177]	[-0.38315]	[-1.06364]	[0.63163]
D(FDI_GDP(-1))	**-8.327003**	0.145610	61.36227	-2.84E+11	0.045120	-0.544369
	(2.59983)	(0.42573)	(17.4810)	(1.4E+11)	(0.20434)	(0.26176)
	[-3.20290]	[0.34202]	[3.51024]	[-1.99606]	[0.22081]	[-2.07968]

C	1.044874	-4.0037	-79.02777	1.46E+12	-0.765774	0.029515
	(0.21004)	(2.90520)	(119.290)	(9.7E+11)	(1.39444)	(1.78623)
	[4.96613]	[-1.37811]	[-0.66248]	[1.50500]	[-0.54916]	[0.01652]
R-squared	**0.741830**	0.599216	0.642510	0.956079	0.570296	0.560655
Adj. R-squared	**0.683480**	0.091557	0.189690	0.900445	0.026005	0.004152
Sum sq. resids	2.76E+25	77.82306	131209.6	8.69E+24	17.92886	29.41905
S.E. equation	1.36E+12	2.277763	93.52705	7.61E+11	1.093278	1.400453
F-statistic	19.89338	1.180350	1.418907	17.18526	1.047777	1.007460
Log likelihood	-1012.582	-63.64692	-193.6739	-992.3775	-37.95646	-46.623
Akaike AIC	59.00471	4.779824	12.20994	57.85014	3.311798	3.807028
Schwarz SC	59.89348	5.668594	13.09871	58.73891	4.200568	4.695799
Mean dependent	4.16E+12	0.317759	4.390321	1.05E+12	0.108479	0.013680
S.D. dependent	4.61E+12	2.389789	103.8990	2.41E+12	1.107777	1.403370
Determinant resid covariance (dof adj.)	2.47E+52					
Determinant resid covariance	1.53E+50					
Log likelihood	-2320.155					
Akaike information criterion	139.7803					
Schwarz criterion	145.3795					
Number of coefficients	126					

Interaction model linking overvaluation/undervaluation and economic growth

The effect of overvaluation and undervaluation on growth is provided below. The growth-overvaluation nexus, the dummy variable (OV) takes the value 1 for positive numbers in the misalignment series and 0 otherwise. The undervaluation estimation is provided in equation 3. The results indicate that in the short run changes in M2_GDP is negative and significantly influence growth. The error correction term is (-0.096) which suggest that the error correction process indicates that the economy adjust back to long run equilibrium whenever there is short- run distortion at the rate of 9.6%.

$\Delta(\text{GDP})t$ = -0.41$\Delta(\text{GDP})t$ – 0.53 Δ(M2_GDP)t + 0.22$\Delta(\text{RERM} * UN)t$ − 0.096(ECM)t

R^2 = 0.79, Adj. R^2 = 0.50,3

The growth-overvaluation estimates are provided in equation 4. The error correction term is (-0.064) indicates that any deviations from the equilibrium path directly will convergence to the equilibrium path at the rates of 0.064 or 6.4%. There is a negative and significant relationship between growth and RER misalignment. This result implies that growth

would decline in response to increases in the RER misalignment (overvaluation). Hence, undervalued REER is beneficial in the long-run growth but not so in overvalued REER. The exchange rate misalignment (overvaluation)-growth relationship is possible through its effect on triggering inflationary pressures which has long term effect on competitiveness and growth.

$\Delta(\text{GDP})t = 0.58\Delta(\text{GDP})t + 0.47\Delta(\text{M2\_GDP})t - 0.19\Delta(\text{RERM} * \text{OV})t - 0.070(\text{ECM})t$

$R^2 = 0.60$, Adj. $R^2 = 0.51$ 4

Conclusion and Recommendations

This study examines impact of real effective exchange rate on economic growth in Nigeria. time series data covering the period 1980-2022 were used for the study. The technique of analysis employed in the study is vector error correction model approach. The behavioural equilibrium exchange rate (BEER) approach was adopted in order to incorporate the fundamentals variables that influence short run and long run behavioural pattern of exchange rate. The RER model was estimated. The unit root tests of stationary shows stationarity at first difference and Cointegration was established using Johansson cointegration technique. The results showed that nominal exchange rate, terms of trade, foreign direct investment and interest rate are significant determinants of growth. The interaction models show that exchange rate misalignment (overvaluation) impacts negatively on economic growth while exchange rate misalignment (undervaluation) impact positively on economic growth. The study suggests that increased investment in domestic market is required to encourage local production thereby taking advantage of period undervaluation to achieve increase in export that will bring about rapid economic growth. Ensure sustainable growth in a more diversified economy to improve the terms of trade. Appropriate incentives should be provided in both tradable and non-tradable sectors of the economy.

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