Macroeconomic Implications of Exchange Rate Depreciation: The Nigerian Experience

Ekundayo P. Mesagan
University of Lagos, Nigeria
profdayoms@yahoo.com

Olorunfemi Y. Alimi
University of Lagos, Nigeria
haleemphemy480@gmail.com

Ismaila A. Yusuf
University of Lagos, Nigeria
ismailyusufakanni@yahoo.ca

This study examines the macroeconomic implications of exchange rate depreciation in Nigeria. It employs the Autoregressive Distributed Lag Bounds Testing Cointegration approach for data covering the period of 1970 to 2015. Empirical results confirm that the Naira depreciation positively and significantly impact all the indicators of macroeconomic performance except for output per capita, which is found to be insignificant. This implies that Naira depreciation stimulates trade balance; promotes price instability and increases the interest rate. Thus, currency depreciation does not benefit the country's economy. Moreover, the study confirms that long-run relationship exists between exchange rate depreciation and macroeconomic performance in Nigeria. Thus, there is the need for trade and export diversification to sustain gains from exchange rate movements and mitigate its negative effects on the economy.

Key Words: currency depreciation, output, inflation rate, interest rate, trade balance
JEL Classification: B22, E31, E43, F31, O40
https://doi.org/10.26493/1854-6935.16.235-258

Introduction

Exchange rate variations bring changes to trade balance and thus cause both price and output level of an economy to witness significant changes (Kandil 2004; Kollmann 2005; Mamun, Chowdhury, and Basher 2013; Cheung and Sengupta 2013). Nigeria's foreign sector is seriously affected by the depreciation of the naira against other major currencies of the world. Such has serious implication for Nigeria's macroeconomic performance. According to Ike (1984), Nigeria first witnessed depreciation in its

currency by 10% in 1973 in response to the US currency depreciation the same year by the same amount. This made the country's foreign exchange reserves to grow by 773.5% in 1974. Consequently, the effect of currency depreciation in the foregoing year was meagre in enhancing the foreign exchange asset position of the Nation as foreign exchange reserves fell by about 2.5%. In 1974, it was observed that many other factors, like the increased oil export caused by the 1973 Arab–Israeli war and the increased oil price negotiated by the Organisation of Petroleum Exporting Countries (OPEC), contributed to the growth of Nigeria's foreign exchange reserves. More so, in November 2014, Nigeria depreciated its currency again by 28 per cent, from N155 to a dollar to N197, on the advice of the International Monetary Fund (IMF).

Exchange rate variations affect the economy via its exports channel in two ways – its depreciation and its volatility or risk (Fang, Lai, and Miller 2005). Both effects, have received considerable attention since fixed exchange rates system collapsed in the early 1970s. Depreciation has the tendency to lower the foreign currency price of exports, and perhaps boosts exports volume as well as export revenue in the home country. Export revenue can fall under certain conditions, like for instance; a very high inelastic foreign import demand translates to falling export revenue. According to Fang, Lai, and Miller (2005), it becomes ambiguous if export production incorporates high import content. This is because the domestic price of exports always rises with currency depreciation (Matsuyama, Kiyotaki, and Matsui 1993). Exchange from a hard or foreign currency to a local currency can result in either pass-through foreign exchange loss or gain. Realization of gains or losses depends on the appreciation or the depreciation of the local currency against respective hard currencies comparative to the date of the transaction that gave rise to earning of the hard currencies (Cherop and Changwony 2014).

Flexible, but stable exchange rates are critical to national and global economic well-being (Beckington and Amon 2011). Systematic exchange arrangements have the tendency to support and facilitate trade in goods and services and at the same time boost investments across national boundaries in a balanced and sustainable manner (Fang, Lai, and Miller 2005; Beckington and Amon 2011; Mengistu and Lee 2014). The essential logic behind these precepts is flawless, but accomplishing and maintaining such flexibility, stability, and order are hampered when national governments ignore these practical axioms for self-serving, short-sighted, and mercantilist reasons (Beckington and Amon 2011). In the short-term,

a country's enforced undervaluation of its currency can be expected to boost its jobs, output, exports, and foreign reserves, while reducing imports and syphoning foreign direct investment along with research and development from other countries (Beckington and Amon 2011). Such 'beggar-thy-neighbour' gains, however, are contrary to the basic international goal of achieving efficient markets for the general welfare. They further run the risk of prompting other countries to misalign their own currencies in self-defence. At that point, the situation can deteriorate very quickly into destructively pervasive economic stagnation and worsen economic performance (Beckington and Amon 2011).

Theoretically, currency depreciation enhances economic performance as it allows domestic output level to rise promoting spending for home products (Mamun, Chowdhury, and Basher 2013). This is because it increases the competitiveness of exported goods in the international markets (Mengistu and Lee 2013; Nyeadi, Atiga, and Atogenzoya 2014). Conversely, it causes a higher level of import price, thereby engendering inflationary pressures especially in countries, like Nigeria, that is import dependent. Empirically, there is the ambiguity of evidence as to the type of effect exchange rate depreciation has on trade. Studies by Junz and Rhomberg (1973) and Wilson and Takacs (1979) suggested that devaluation enhances exports for developed economies that operate fixed exchange rates system, while Bahmani-Oskooee and Kara (2003) observed similar results for countries operating flexible exchange rates. However, Athukorala (1991), Athukorala and Menon (1994), Abeysinghe and Yeok (1998), Wilson and Tat (2001), and Fang, Lai, and Miller (2005) reported that depreciation does not improve export and trade performance of some Asian countries. Specifically, Fang, Lai, and Miller (2005) noted that exchange rate depreciation and exchange rate volatility generate a negative net effect on export growth and consequently adversely affects economic performance in the process.

Currency depreciation does not only weaken local firms' ability to transfer appropriate technology from foreign countries but also stalls industrial diversification in that it hurts agricultural export development. Currency depreciation has also been found to undermine the banks and hinders domestic ownership of private assets and economic performance (Fang, Lai, and Miller 2005; Fidelis 2014). The Marshal-Lerner condition states that depreciation brings a positive effect on trade when the sum of demand elasticities for exports and imports exceeds unity (Mengistu and Lee 2013). This means that depreciation improves trade balance if

the depreciating nation's demand elasticity for imports plus the foreign demand elasticity for the country's exports exceed one. If this is not the case, then, currency depreciation could lead to economic contraction (Mamun, Chowdhury, and Basher 2013).

Since Nigeria currently faces depreciation of her currency which has seen a dollar been exchanged for over N360 officially, it becomes crucial to conduct a study of this sort. Moreover, since Nigeria is an import dependent country and it only depends on primary exports, which is demand inelastic in the international market, a study of this nature becomes inevitable. To this end, this study attempts to proffer answers to several questions such as: what sort of impact does Nigeria's currency depreciation have on the country's GDP? Does currency depreciation have any significant effect on improving Nigeria's trade balance? How does currency depreciation affect domestic price level? Does currency depreciation have anything to do with the domestic interest rate in the country?

The present study is at variance with previous studies as it focuses on the channel through which exchange rate depreciation affects the macro economy of Nigeria. Consequently, the main thrust of the study is to examine the macroeconomic effect of exchange rate depreciation in Nigeria between 1970 and 2015.

The rest of the paper proceeds as follows: section two is on theoretical issues and review of past studies, section three presents analytical framework while section four focuses on data description and pre-estimation analyses. The fifth section presents the results and discussion of findings and section six conclude the paper.

Literature Review

THEORETICAL REVIEW

Interest Rate Parity (IRP) and Purchasing Power Parity (PPP)

The IRP states that the difference between interest rates in two countries is the difference between the future rate and the current rate of their currencies (Adrangi, Raffiee, and Shank 2007; Cherop and Changwony 2014; Lo and Morley 2015). The theory states that real interest rates should be equalized across countries under fully liberalized financial markets without government interventions and capital controls (Chang and Su 2015). If this parity is broken, then there is the existence of an arbitrage resulting in a risk-free return (Edison 1987). According to this theory, if an investor makes his own forecasts by using rational expectations and, at the same time, the international capital markets and the product markets are in-

tegrated well enough, then real interest rates must be equal across countries (Chang and Su 2015). PPP in its own sense is a theory of long term equilibrium exchange rates based on relative price levels of two countries (Cherop and Changwony 2014). According to He, Ranjbar, and Chang (2013), PPP remains a cornerstone of many theoretical models in international finance. The PPP states that the exchange rates between two currencies are in equilibrium when the purchasing power is the same in both countries. This implies that the exchange rate between any two countries should equal the ratio of the two currencies' price level of a fixed basket of goods and services. The basic idea behind the PPP hypothesis is that because any international goods market arbitrage should be traded away over time, we should expect the real exchange rate to return to a constant equilibrium value in the long run (He, Ranjbar, and Chang 2013). The concept is founded on the law of one price which states that in the absence of transaction costs, identical goods will have the same price in different markets (Cherop and Changwony 2014).

Exchange Rate Channel of Monetary Transmission

In recent empirical studies on monetary policy transmission, attention has been directed towards exchange rate channels of monetary transmission. This becomes very crucial as the exchange rate channel has a significant role to play in aggregate output fluctuations in an economy. The exchange rate channel plays an important role in how monetary policy affects the domestic performance of an economy (Taylor 1993; 1995; Mishkin 1996). The channel works through the interest rate effects. This is so because when real domestic interest rates decrease, domestic currency deposits (for instance, Naira) become less attractive to foreign investors relative to deposits that are foreign denominated (like US dollar), leading to a decline in the value of the domestic currency deposits relative to other foreign currency deposits (Mishkin 1996). This means a depreciation of the domestic currency relative to other foreign currencies and the implication of this on aggregate output is that it makes domestic goods produced in the country cheaper compared to foreign goods thereby making exports of domestic goods increase sharply relative to imports. Consequently, net exports rise, and aggregate domestic outputs rise as well.

EMPIRICAL REVIEW

There are series of studies on exchange rate, trade and output performance for developing countries, as well as, exchange rate and export per-

formance. Result wise, some studies agreed that exchange rate depreciation stimulate output growth and trade balance while others found negative results. For instance, Devarajan, Lewis, and Robinson (1993) observed that exchange rate depreciation enhanced economic performance. Cherop and Changwony (2014) opined that domestic currency depreciation stimulates economic activity through the initial increase in the price of foreign goods relative to the price at home. Hence, by increasing the international competitiveness of domestic industries, exchange rate depreciation diverts spending from foreign goods to domestic goods. Similar conclusions were arrived at in Guitian (1976), Dornbusch (1988), Beckington and Amon (2011), as well as, Mengistu and Lee (2014). For Frankel (1998), the success of currency depreciation in facilitating trade balance mainly depends on switching demand in the proper direction and on the capacity of the home economy to meet the additional demand by supplying more goods.

For cross-country studies, Fang, Lai, and Miller (2005) researched into export promotion through exchange rate policy in Indonesia, Thailand, Japan, Taiwan, Singapore, Philippines, Korea and Malaysia. It was affirmed that exchange rate movements affect exports through its depreciation and its variability (risk). Depreciation, as suggested, raises exports, but exchange rate risk could offset that positive effect. The net effect between both effects was investigated for the selected countries and result showed that depreciation enhanced export. Exchange rate risk contributed to export growth in Malaysia and the Philippines, leading to positive net effects. It also produced a negative effect for six of the countries, resulting in a negative net effect in Indonesia, Japan, Singapore, Taiwan and a zero-net effect in Korea and Thailand. Ali and Anwar (2011) examined the repercussions of induced currency depreciation in developing countries. The results presented were based on a model with firm microeconomic foundations and which takes into cognizance both the supply and demand-side effects of exchange rate variations. The distinctive feature of the model is the role of exchange rate expectations. The study considered three kinds of expectations; adaptive, extrapolative, and regressive expectations. Several sensitivity tests were also performed based on these expectations. Based on simulation, it was reported that the effect of induced currency depreciation largely depends on supply-side effects and that in most cases, currency depreciation results in a fall in output, a price increase and an improvement in the trade balance. The study reported that in the absence of weak supply-side effects of exchange rates, if

the Marshall-Lerner conditions hold, then home currency depreciation will have a favourable effect on output and a negative effect on trade balance.

Furthermore, Nouira, Plane, and Sekkat (2011) researched into exchange rate devaluation and manufactured export. It employed a sample of 52 developing countries, which has adopted proactive exchange rate policies and the results showed that between 1991 and 2005, several countries used undervaluation to foster the price competitiveness of manufactured exports. Mengistu and Lee (2014) investigated the effects of currency depreciation on the trade balance in selected fourteen Asian economies. The findings did not find any evidence for depreciation enhancing trade balance in the selected sample. However, when the study was narrowed down to eight relatively bigger, stable and more industrialised countries, depreciation enhanced trade balance. Hooy, Law, and Chan (2015) examined the impact of the real exchange rate on ASEAN disaggregated exports to China. First, the study found that income elasticity is positive and significant in all export categories and increases with higher technology products. Secondly, they found that the RMB real exchange rate significantly and positively enhanced ASEAN total exports to China. Thirdly, the RMB effect on disaggregated exports by technology level is mixed; for finished goods exports, higher technology exports were more sensitive to RMB depreciation, which is consistent with the income effect, while for parts and components exports, the lower technology exports had greater exposure to RMB depreciation, which is possibly due to the price effect and the recent production relocations of multinational corporations in the ASEAN region to China and Vietnam.

For country specific studies, Cheung and Sengupta (2013) looked at the effect of exchange rate movements on exports of Indian non-financial sector firms between 2000 and 2010. Results revealed that exports shares of Indian firms were negatively but significantly impacted by currency appreciation. The Indian firms with smaller export shares responded strongly to real exchange rate volatility, compared with those exporting goods. Also, firms that export services were more affected by exchange rate fluctuations. Similarly, Divakaran and Gireeshkumar (2014) focused on the Indian economy and found that a weak rupee made India produce more competitively in global markets, thereby stimulating the country's exports and output growth. More so, focusing on the same India, and using 36 currency trade-based effective nominal and real exchange rates and trade balance, Datta (2014) observed that increase of trade balance in

India is an important reason for currency depreciation. Mamun, Chowdhury, and Basher (2013) examined the effect of exchange rate variation on domestic output growth and price level of Bangladesh. Combining exchange rate and other traditional factors like investment, bank credit, narrow and broad money together with the labour force, the study observed that depreciation has an expansionary effect on output and price level. Li, Ma, and Xu (2015) focused on the exchange rate and export in China by proving first-hand firm-level evidence on Chinese exporters' reaction to RMB exchange rate movements. It was reported that exporters with higher productivity price responded more to exchange rate movements. Furthermore, RMB appreciation reduced the probability of entry as well as the probability of continuing in the export market. Paudel and Burke (2015) extended the study to Nepal between 1980 and 2010. Employing a gravity modelling approach, it confirmed that real exchange rate appreciation influenced Nepal's export.

For some notable African studies, Nyeadi, Atiga, and Atogenzoya (2014) analysed the impact of exchange rate movement on export growth in Ghana from 1990 to 2012. The study observed that exchange rate has no impact on Ghana's export but that output, national saving, import growth and total investment significantly impact export. Cherop and Changwony (2014) conducted a survey on exchange rate fluctuation and tea export earnings among smallholder tea factories in Kenya using correlation analysis. Results found a positive relationship between exchange rate and per kilogram of green leaf paid. It also observed positive correlation between exchange rate and quantities of tea sold. Extending the study to Nigeria, Loto (2011) adopted the elasticity approach to the balance of payment adjustment. The result showed that depreciation did not improve trade balance and that Marshal-Lerner condition did not hold for Nigeria. Ogbonna (2011) tested the Marshall-Lerner (ML) condition for Nigeria using data between 1970 and 2005. The study found no long run relationship between trade balance and real exchange rate but confirmed that Marshall-Learner (ML) condition holds and that depreciation enhanced trade balance in the country. Ogundipe and Egbetokun (2013) employed data covering 1970 to 2010 and found that exchange rate induced an inelastic and significant impact on the trade balance in the long run while no causality was found in the short run. Umoru and Oseme (2013) explored the J-curve effect in studying trade flows and exchange rate shocks in Nigeria. The study did not find any empirical evidence in favour of the short-run deterioration of the trade balance as implied by

the J-curve hypothesis but found evidence for the cyclical trade effect of exchange rate shocks. Adediran, Yusuf, and Adeyemi (2014) traced exchange rate fluctuation to output growth Nigeria between 1986 and 2013 and found that exchange rate depreciation positively but insignificantly impacted the GDP.

Considering the review so far, previous studies have beamed searchlight on the subject matter in several ways. Studies such as; Guitian (1976), Dornbusch (1988), Devarajan, Lewis, and Robinson (1993), Fang, Lai, and Miller (2005), Ali and Anwar (2011), Beckington and Amon, (2011), Mengistu and Lee (2014), as well as Cherop and Changwony (2014), have focused on the link between exchange rate and output growth. Others, like Cheung and Sengupta (2013), Datta (2014), Paudel and Burke (2015), and Hooy, Law, and Chan (2015), have focused on the nexus between exchange rate and trade balance or export. However, there is a dearth of studies focusing on the implications of exchange rate depreciation on macroeconomic performance. The present study aims to fill this noticeable gap in the literature.

Also, since there has been no consensus in the literature on the exact effect of exchange rate depreciation on variables like export, trade balance, and output growth, this study attempts to further deepen the discussion and take a position. Moreover, the recent happenings in Nigeria, where exchange rate movements have thrown the country into recession, and the fact that studies like; Loto (2011), Ogbonna (2011), Ogundipe and Egbetokun (2013), Umoru and Oseme (2013), and Adediran, Yusuf, and Adeyemi (2014) did not account for exchange rate effect on macroeconomic indicators like the interest rate, provides justification for this study.

Analytical Framework

This empirical investigation looks at currency depreciation and macroeconomic performance in Nigeria over the period 1970–2015. Sequel to the literature review on exchange rate depreciation and following the work of Ali and Anwar (2011), the empirical model is specified thus:

$$\pi_1 = E_t\pi_{t+1} + b_1 y_t + b_2 p_t + b_3(p^f + e_t) + u_{1t}. \quad (1)$$

Equation (1) is derived by making use of the New Keynesian Approach and it represents the supply side of the market. In equation (1), π_t is the inflation rate, $E_t\pi_{t+1}$ is expected inflation rate, y_t is the current period output, p_t is the domestic price level, p^f is foreign price level, e_t is nominal

exchange rate, b_1, b_2 and b_3 are the slope parameters for output, domestic price level, and foreign price level respectively, and u_{1t} is the residual term. As affirmed in Ali and Anwar (2011), equation (1) is an expectations-augmented Philips curve for an open economy where the exchange rate is found to not only affects directly the domestic inflation rate but also its stabilizing properties (Froyen and Guender 2000; Ali and Anwar 2011). In equation (1), it is expected that exchange rate depreciation leads to higher inflation, while an appreciation leads to deflation in the home country.

On the supply-side, depreciating the home currency can cause unfavourable effects in the home economy (in the form of higher inflation and lower output). Alternatively, the model can be expanded by introducing exchange rate on the supply side as we have in Ball (1999), Froyen and Guender (2000), and Ali and Anwar (2010; 2011).

$$y_t = E_t y_{t+1} - a_1(r_t - r_t^f) + a_2(p_t^f + e_t) + u_{2t}. \tag{2}$$

Equation (2) is the IS curve known as expectational or inter-temporal IS equation showing that the demand for output in the current period depends on expected output. In equation (2), y_t is current period output, $E_t y_{t+1}$ is the expected output, $r_t - r_t^f$ is the interest rate differential, a_1 and a_2 are slope parameters for real interest rate and price level respectively, p_t^f is foreign price level, e_t is nominal exchange rate while u_{2t} is the residual term. A similar IS curve, with firmer micro economic foundations than the traditional IS curve, has been employed in Kerr and King (1996), McCallum and Nelson (1999) and Ali and Anwar (2011).

$$i_t = i^f + \overline{e}_{t+1} - e_t + u_{3t}. \tag{3}$$

Equation (3) is the interest parity condition. In equation (3), i_t is the nominal interest rate, i^f is the foreign interest rate, $\overline{e}_{t+1}$ is the expected nominal exchange rate, e_t is nominal exchange rate, and u_{3t} is the residual term. Interest parity states that due to arbitrage by risk neutral agents, the domestic interest rate will be equal to the foreign interest rate plus expected capital gains that are associated with holding wealth in foreign currency denominated assets.

$$r_t = i_t - E_t\pi_{t+1}. \tag{4}$$

Equation (4) is the real interest rate and it is defined as the nominal interest rate minus the expected inflation rate. In equation (4), r_t is the real interest rate, i_t is nominal interest rate, and $E_t\pi_{t+1}$ is expected inflation rate.

ESTIMATION TECHNIQUE

The ARDL bounds test developed by Pesaran, Shin, and Richard (2001) is employed to estimate the links owing to its superior small sample performance. This procedure is built on the *F*-statistic or Wald test in a generalized Dickey-Fuller type of regression normally used to test the significance of lagged levels of those variables that are under consideration in a conditional unrestricted equilibrium error correction model (Pesaran, Shin, and Richard 2001). The ARDL bounds test also helps to analyse the long-run relationships and short run dynamic interactions among variables in the study.

The proposed tests are based on standard *F*- and *t*-statistics used to test the significance of the lagged levels of the variables in a first difference regression. The test is applicable irrespective of whether the underlying regressors are I(0), I(1) or mutually integrated. It entails the estimation of the unrestricted error correction model (UECM) specified in equation (5) following Pesaran, Shin, and Richard (2001).

$$VY_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 VY_{t-1} + \sum_{i=1}^{p} \alpha_2 VY_{t-i} + \beta_1 Y_{t-1} + \beta_2 Z_{t-1} + \varepsilon_{1t}, \quad (5)$$

where Y_t is the vector of dependent variables, Z_t is the vector of explanatory variables, V is the difference operator, P is the lag structure, α_1 and α_2 are the short run coefficients, β_1 and β_2 are the long run coefficients, while ε_{1t} are the residual terms. The null hypothesis of no long run equilibrium relationship will be tested (i.e. $H_0: \beta_1 = \beta_2 = 0$) against the alternative hypothesis of the existence of long run relationships (i.e. $H: \beta_1 \neq \beta_1 \neq 0$) using the *F*-test as suggested in Pesaran, Shin, and Richard (2001). However, this test has nonstandard distributions depending on the sample size, the inclusion of intercept and trend variable in the equation, as well as the number of regressors.

The estimated ARDL test statistics will be compared with two asymptotic critical values reported in Pesaran, Shin, and Richard (2001) as against the conventional critical values. If the test statistic is above an upper critical value, it implies that the null hypothesis of no long-run relationship is rejected, but if it is below a lower critical value, the null hypothesis will be accepted. If it, however, falls between these two bounds or critical values, the result is declared inconclusive.

Hence, following Pesaran, Shin, and Richard (2001), the models estimated are specified in equations (6) to (9) as follows:

$$\begin{aligned}
\Delta \ln \text{GDP}_t &= \beta_0 + \beta_1 \ln \text{GDP}_{t-1} + \beta_2 \ln \text{HC}_{t-1} + \beta_3 \ln \text{EX}_{t-1} \\
&\quad + \beta_4 \ln \text{TO}_{t-1} + \beta_5 \ln \text{INV}_{t-1} \\
&\quad + \sum_{i=1}^{p} \theta_1 \Delta \ln \text{GDP}_{t-1} + \sum_{i=1}^{p} \theta_2 \Delta \ln \text{HC}_{t-1} + \sum_{i=1}^{p} \theta_3 \Delta \ln \text{EX}_{t-1} \\
&\quad + \sum_{i=1}^{p} \theta_4 \Delta \ln \text{TO}_{t-1} + \sum_{i=1}^{p} \theta_5 \Delta \ln \text{INV}_{t-1} + \varepsilon_{1t}, \qquad (6) \\
\Delta \ln \text{INF}_t &= \phi_0 + \phi_1 \Delta \ln \text{INF}_{t-1} + \phi_2 \Delta \ln \text{EX}_{t-1} + \phi_3 \Delta \ln \text{TO}_{t-1} \\
&\quad + \phi_4 \Delta \ln \text{MS}_{t-1} + \phi_5 \Delta \ln \text{GDP}_{t-1} \\
&\quad + \sum_{i=1}^{p} \delta_1 \Delta \ln \text{INF}_{t-1} + \sum_{i=1}^{p} \delta_2 \Delta \ln \text{EX}_{t-1} + \sum_{i=1}^{p} \delta_3 \Delta \ln \text{TO}_{t-1} \\
&\quad + \sum_{i=1}^{p} \delta_4 \Delta \ln \text{MS}_{t-1} + \sum_{i=1}^{p} \delta_5 + \Delta \ln \text{GDP}_{t-1} + \varepsilon_{2t}, \qquad (7) \\
\Delta \ln \text{INT}_t &= \vartheta_o + \vartheta_1 \ln \text{INT}_{t-1} + \vartheta_2 \ln \text{EX}_{t-1} + \vartheta_3 \ln \text{TO}_{t-1} \\
&\quad + \vartheta_4 \ln \text{INV}_{t-1} + \vartheta_5 \ln \text{MS}_{t-1} \\
&\quad + \sum_{i=1}^{p} \gamma_1 \ln \text{INT}_{t-1} + \sum_{i=1}^{p} \gamma_2 \ln \text{EX}_{t-1} + \sum_{i=1}^{p} \gamma_3 \ln \text{TO}_{t-1} \\
&\quad + \sum_{i=1}^{p} \gamma_4 \ln \text{INV}_{t-1} + \sum_{i=1}^{p} \gamma_5 \ln \text{MS}_{t-1} + \varepsilon_{3t}, \qquad (8) \\
\Delta \ln \text{TB}_t &= \alpha_0 + \alpha_1 \ln \text{TB}_{t-1} + \alpha_2 \ln \text{EX}_{t-1} + \alpha_3 \ln \text{TO}_{t-1} \\
&\quad + \alpha_4 \ln \text{INV}_{t-1} + \alpha_5 \ln \text{GDP}_{t-1} \\
&\quad + \sum_{i=1}^{p} \omega_1 \ln \text{TB}_{t-1} + \sum_{i=1}^{p} \omega_2 \ln \text{EX}_{t-1} + \sum_{i=1}^{p} \omega_3 \ln \text{TO}_{t-1} \\
&\quad + \sum_{i=1}^{p} \omega_4 \ln \text{INV}_{t-1} + \sum_{i=1}^{p} \omega_5 \ln \text{GDP}_{t-1} + \varepsilon_{4t}, \qquad (9)
\end{aligned}$$

where Δ is the first difference operator, β_{1-5}, ϕ_{1-5}, ϑ_{1-5}, and α_{1-5} are long-run multipliers corresponding to long-run relationships, β_0, ϕ_0, ϑ_0, and α_0 are drifts, θ_{1-5}, δ_{1-5}, γ_{1-5}, and ω_{1-5} are the short run dynamic coefficients of the underlying ARDL model in the equation; t is a time or trend variable, and ε_{1-4} are white noise errors. The dependent variables are variables used to proxy macroeconomic performance such as trade balance per capita (TB) captured by net export per capita, economic growth

TABLE 1 List of Variables and Descriptive Statistics

(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP	GDP per capita	US$ (constant 2010)	1698.35	419.07	2548.43	1147.75
TB	Trade bal. per capita	US$ (constant 2010)	155.47	141.75	436.22	–133.33
INF	Inflation rate	CPI (2010 = 100)	18.65	16.24	72.84	3.46
INT	Mon. policy rate	Rate (%)	10.89	5.11	26.00	3.50
EX	Exchange rate	US$ = N	54.58	65.24	193.28	0.546
INV	Investment	GFCF as % of GDP	14.67	7.28	35.22	5.46
HC	Enrolment rate	Secondary (both sexes)	24.62	11.99	43.84	4.41
TO	Trade openness	Trade as % of GDP	47.69	16.44	81.81	19.62
MS	Financial deepening	M2 as % of GDP	22.51	7.17	43.27	10.04

NOTES Column headings are as follows: (1) Variables, (2) descriptive, (3) measurement unit, (4) mean, (5) standard deviation, (6) maximum, (7) minimum.

captured by real gross domestic product per capita (GDP), inflation rate captured by consumer price index (INF) and interest rate measured by monetary policy rate (INT). The explanatory variables include exchange rate (EX), and other controlled variables like investment (INV), proxied with gross fixed capital formation (GFCF), human capital (HC), which is proxied with secondary school enrolment rate, trade openness (TO) proxied with total trade as a ratio of real GDP and money supply captured by the ratio of money supply to real GDP (MS). It is expected that exchange rate depreciation will positively impact trade balance as export is expected to be boosted, positively enhancing output, negatively impacting inflation, due to imported inflation for Nigeria and raising the interest rate to curtail the inflation.

Data Description and Pre-Estimation Tests

This study used annual time series data spanning from 1970 to 2015. The data were extracted from the World Development Indicator (see http://wdi.worldbank.org) and the Central Bank of Nigeria *Annual Statistical Bulletin* (see https://www.cbn.gov.ng/documents/statbulletin.asp). Table 1 presents the descriptive statistics of the indicators. The average growth rate of the macroeconomic performance variables revealed US$1,698.35, US$155.47, 18.65% and 10.89% for GDP per capita, trade balance per capita, inflation rate and interest rate respectively. The mean value of exchange rate and secondary school enrolment stood at N54.58

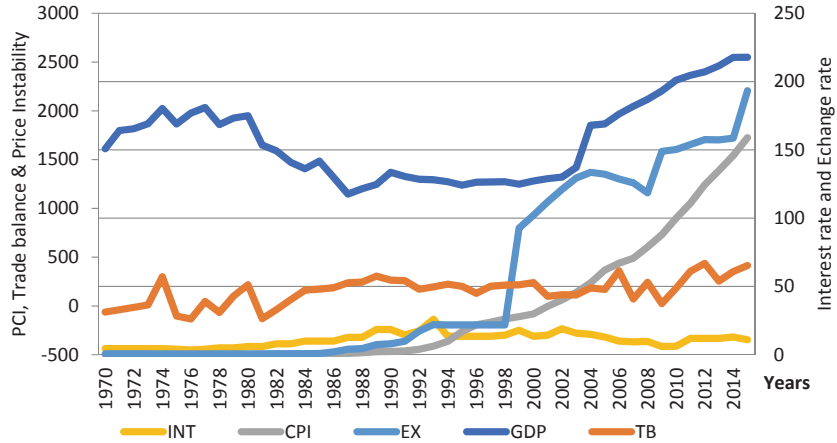

FIGURE 1 Exchange Rate and Macroeconomic Performance

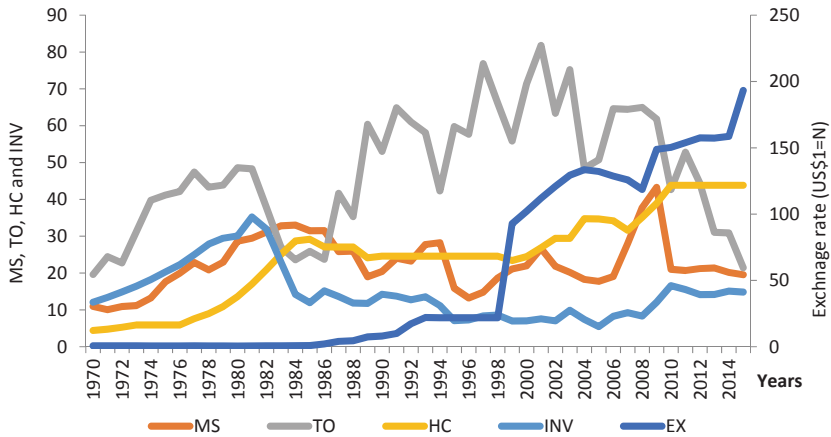

FIGURE 2 Exchange Rate, Money Supply, Trade Openness, Human Capital, and Investment

to a US dollar and 24.62% respectively within the considered periods. For other explanatory indicators, the average values of investment, total trade and money supply to the size of the Nigerian economy were 14.67%, 47.69% and 22.51% correspondingly.

The graphical illustrations of our variables are depicted in figures 1 and 2. Figure 1 shows the trend analysis of exchange rate and macroeconomic performance such as per capita income, trade balance, price instability and interest rate. Trend movement of the exchange rate and other explanatory variables like financial deepening, trade openness, human cap-

TABLE 2 Correlation Matrix

	GDP	TB	INF	INT	EX	MS	TO	HC	INV
GDP	1								
TB	0.115	1							
INF	−0.403	−0.002	1						
INT	−0.482	0.532	0.331	1					
EX	0.555	0.465	−0.291	0.243	1				
INV	−0.038	0.014	0.003	0.064	0.080	1			
HC	−0.304	0.166	0.116	0.494	0.258	0.092	1		
TO	0.278	0.669	−0.090	0.476	0.796	0.356	0.201	1	
MS	0.267	−0.431	−0.099	−0.567	−0.423	0.193	−0.378	−0.421	1

TABLE 3 ADF Unit Root Tests for the Variables at Levels and First Differences

Variables	Levels		First difference		Results
	No trend	Trend	No trend	Trend	
GDP	0.2521	−0.2053	−5.9050**	−6.5328**	I(1)
TB	−3.6708**	−5.1622**	–	–	I(0)
INF	−3.2838*	−3.2934	−6.8328**	−6.8010**	I(1)
INT	−2.3267	−2.3738	−7.2042**	−7.2501**	I(1)
EX	0.9479	−1.5310	−5.7889**	−6.1582**	I(1)
INV	−4.6314**	−5.7012**	–	–	I(0)
HC	−1.0342	−2.2190	−4.2636**	−4.2158**	I(1)
TO	−2.4497	−2.0148	−7.9537**	−8.3016**	I(1)
MS	−3.3666*	−3.5246**	–	–	I(0)

NOTES ** and * denotes significance level at 1% and 5% respectively.

ital and investment are shown in figure 2. The trend reviews of the figures do not show clear direction (whether positive or negative) of all the macroeconomic indicators with the exchange rate. The inconclusiveness of the direction of our variables necessitates the need for an empirical analysis.

Table 2 shows the results of the correlation coefficients indicating that the problem of multicollinearity has been checked for our autoregressive distributed lag (ARDL) outputs. The first pre-estimation test conducted was to establish the order of integration of all indicators as they are critical to the estimation because estimating a time series model with non-

TABLE 4 Result of ARDL Bounds Test for Cointegration Relationship

Dependent variables	Functions	*F*-statistics
GDP Model ARDL (4,1,3,4,4)	F_{GDP}(GDP|HC, EX, TO, INV)	4.0483**
Price instability Model ARDL (4,4,3,4,3)	F_{INF}(INF|EX, TO, MS, GDP)	6.6905***
Interest rate Model ARDL (1,4,0,4,2)	F_{INT}(INT|EX, TO, INV, MS)	4.4786**
Trade balance Model ARDL (2,0,1,0,1)	F_{TB}(TB|EX, TO, INV, GDP)	8.5002***

	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Critical bound values	3.74	5.06	2.86	4.01	2.45	3.52

NOTES ***, **, and * denote rejection of null hypothesis at 1%, 5% and 10% significance levels respectively.

stationary regressors could lead to spurious regression. This study used the Augmented Dickey Fuller (ADF) test by Dickey and Fuller (1979) to ascertain the stationarity level of all variables. The unit root result suggests that all the variables are of order one except trade balance, investment and money supply which are found to be integrated of order zero. The results of the unit root tests are presented in table 3.

The result from the integration test confirmed the appropriateness of the chosen estimation technique (ARDL). Moreover, the results of the ARDL bounds tests for cointegration are presented in Table 4. The Akaike Info Criterion (AIC) was used to select the orders of the ARDL models.

The result revealed that the computed *F*-statistics are greater than the upper bound critical values indicating that the null hypotheses of no cointegration are rejected at 5% significance level. This implies that there is satisfactory evidence in support of a unique and stable long-run relationship between currency depreciation and macroeconomic performance in Nigeria.

Empirical Results and Discussion

Tables 5 and 6 present both the long-run estimates and the diagnostic and stability tests respectively. Models 1–4 revealed the ARDL models for output growth, price instability, interest rate and trade balance correspondingly. Table 5 shows that naira depreciation has a positive and significant impact on all the indicators of macroeconomic performance considered within the periods except for output per capita which was found insignificant at 5% significance level. In magnitude terms, a 10% change in depreciation of Naira would positively increase output per capita, inflation

TABLE 5 Results of the Estimated ARDL Long-Run Coefficients

Independent variables	Dependent variables			
	(1)	(2)	(3)	(4)
Constant	12.335 (2.904)***	−1.529 (3.630)	−3.267 (1.947)	6.354 (1.670)***
HC	0.081 (0.208)			
EX	0.061 (0.087)	0.108 (0.004)**	0.200 (0.058)***	1.437 (0.312)***
TO	−0.101 (0.045)**	0.084 (0.283)*	0.707 (0.279)**	−0.381 (0.143)**
INV	−0.054 (0.061)		0.932 (0.395)**	0.233 (0.153)
MS		0.300 (0.239)	−0.076 (0.287)	
GDP		−0.020 (0.398)		−0.741 (0.223)***

NOTES Column headings are as follows: (1) output growth, (2) price instability, (3) interest rate, (4) trade balance. ***, **, and * denote rejection of null hypothesis at 1%, 5% and 10% significance levels respectively.

rate, interest rate and trade balance per capita by 0.61%, 1.08%, 2.0% and 14.37% respectively. It suggests that Naira depreciation stimulates economic activity and trade balance but adversely affects the cost of doing business and create price instability. The result is in tandem with the findings of Ogbonna (2011); Umoru and Oseme (2013) and Adediran, Yusuf, and Adeyemi (2014) that currency depreciation improves trade balance and output growth. However, the improvement has its economic costs in terms of high cost of business and inflation. Thus, the study found that naira depreciation enhances economic performance.

The result also found that openness to trade has a significant and adverse effect on trade balance and the overall output growth of the Nigerian economy. A 10% increase in trade openness deteriorates per capita output and trade balance by 1.01% and 3.81% respectively. Likewise, openness to trade has a positive and significant impact on inflation rate and interest rate. It implies that inflation rate and interest rate increase by 0.8% and 7.1% respectively as a result of 10% increase in openness of trade. The result further showed the coefficients of investment have a positive impact on interest rate and trade balance while it negatively affects output. A 10% increase in investment leads to a decrease in output by 0.54%. Also, an increase in investment by 10% leads to an increase in interest rate and trade balance by 9.3% and 2.33% respectively. The result also indicates that the coefficient of money supply has no significant impact on inflation rate and interest rate. Conversely, the coefficient of income per capita has a negative but insignificant impact on the inflation rate.

TABLE 6 ARDL Short-run Coefficients: Model 1

Variables	Coefficient	Std. error	*t*-statistics	Probability
Δ(GDP(−1))	0.103691	0.171844	0.603400	0.5527
Δ(GDP(−2))	−0.138708	0.171330	−0.809598	0.4272
Δ(GDP(−3))	0.285443	0.164249	1.737872	0.0969
Δ(HC)	0.238296	0.176991	1.346376	0.1925
Δ(EX)	−0.086272	0.040394	−2.135766	0.0446
Δ(EX(−1))	−0.030093	0.049479	−0.608186	0.5496
Δ(EX(−2))	−0.048727	0.040808	−1.194074	0.2458
Δ(TO)	−0.065438	0.056581	−1.156537	0.2604
Δ(TO(−1))	0.041455	0.062322	0.665169	0.5132
Δ(TO(−2))	−0.093743	0.064255	−1.458911	0.1594
Δ(TO(−3))	0.137556	0.063402	2.169584	0.0417
Δ(INV)	−0.053294	0.082225	−0.648154	0.5239
Δ(INV(−1))	0.183514	0.087796	2.090242	0.0489
Δ(INV2))	−0.188776	0.088033	−2.144369	0.0439
Δ(INV(−3))	0.203321	0.066493	3.057752	0.0060
ECT(−1)	−0.216512	0.100963	−2.144469	0.0432

The dynamic short-run estimates report both positive and negative relationship between the lags of Naira depreciation and macroeconomic performance, as presented in tables 6–9. The coefficients of the error correction term (ECT) for the models were found to be negative and significant at 5% significance level ranging within the magnitude of 11.2% and 48.5%. It implies that approximately, 11.2% to 48.5% disequilibrium in the previous year's shocks on macroeconomic performance converge to long-run equilibrium in the current year. Thus, this supports the existence of long-run relationship between exchange rate and macroeconomic performance in Nigeria.

The diagnostic and stability tests are presented in table 10. The estimated models passed all diagnostic tests indicating that the error terms have same variance, are normally distributed and uncorrelated. The functional form test confirms that the models are well specified except output growth and interest rate models that failed the serial correlation and functional form tests respectively. The results of cumulative sum and cumulative sum of square fall within the critical bounds at 5% significance level indicating that the parameters are stable over the sample periods.

TABLE 7 ARDL Short-run Coefficients: Model 2

Variables	Coefficient	Std. error	*t*-statistics	Probability
Δ(CPI(−1))	0.691703	0.134822	5.130471	0.0001
Δ(CPI(−2))	−0.334044	0.155172	−2.152728	0.0444
Δ(CPI(−3))	0.296855	0.152035	1.952538	0.0658
Δ(EX)	0.015639	0.052347	0.298749	0.7684
Δ(EX(−1))	−0.131723	0.060822	−2.165715	0.0433
Δ(EX(−2))	0.120070	0.066886	1.795148	0.0886
Δ(EX(−3))	−0.144823	0.055389	−2.614639	0.0170
Δ(TO)	−0.022886	0.060006	−0.381400	0.7071
Δ (TO(−1))	0.061598	0.070359	0.875482	0.3922
Δ(TO(−2))	−0.121883	0.068936	−1.768052	0.0931
Δ(MS)	−0.127220	0.075814	−1.678055	0.1097
Δ(MS(−1))	0.165312	0.088561	1.866651	0.0775
Δ(MS(−2))	−0.006453	0.085367	−0.075590	0.9405
Δ(MS(−3))	−0.110480	0.067213	−1.643730	0.1167
Δ(GDP)	−0.758488	0.215093	−3.526319	0.0023
Δ(GDP(−1))	0.527733	0.264206	1.997429	0.0603
Δ(GDP(−2))	−0.885079	0.225297	−3.928498	0.0009
ECT(−1)	−0.252040	0.044018	−5.725830	0.0000

Conclusion

The Nigerian economy depends so much on the proceeds of crude oil exports, which is foreign currency denominated. Hence, it has serious implications on the Nigerian economy pertaining to budget preparation. It also makes the economy susceptible to external shocks. The recent fall in the international crude oil price plunged the country into recession and put pressure on its external reserve. This prompted a study of this nature between 1970 and 2015. The study adopted the ARDL bound testing approach to establish the macroeconomic implications of exchange rate depreciation on income, inflation rate, interest rate and trade balance. It was confirmed that naira depreciation has a positive and significant impact on all the indicators of macroeconomic performance except for output per capita, which was found to be insignificant. This suggests that Naira depreciation stimulates economic activity and trade balance but also cause price instability and high-interest rate.

TABLE 8 ARDL Short-Run Coefficients: Model 3

Variables	Coefficient	Std. error	*t*-statistics	Probability
Δ(EX)	0.449025	0.109941	4.084253	0.0004
Δ(EX(−1))	0.072957	0.147115	0.495923	0.6241
Δ(EX(−2))	−0.272227	0.155551	−1.750076	0.0919
Δ(EX(−3))	0.321780	0.113559	2.833594	0.0088
Δ(TO)	0.342377	0.129655	2.640682	0.0138
Δ(INV)	−0.353070	0.176507	−2.000321	0.0560
Δ(INV(−1))	0.009363	0.253250	0.036972	0.9708
Δ(INV(−2))	−0.050365	0.248222	−0.202902	0.8408
Δ(INV(−3))	−0.303311	0.191648	−1.582647	0.1256
Δ(MS)	0.137267	0.177800	0.772032	0.4471
Δ(MS(−1))	−0.431731	0.160977	−2.681945	0.0125
ECT(−1)	−0.484618	0.111190	−4.358479	0.0002

TABLE 9 ARDL Short-Run Coefficients: Model 4

Variables	Coefficient	Std. error	*t*-statistics	Probability
Δ(TB(−1))	0.290198	0.142747	2.032955	0.0497
Δ(EX)	0.160992	0.043268	3.720828	0.0007
Δ(TO)	0.598303	1.736739	0.344498	0.7325
Δ(INV)	0.260575	0.172362	1.511791	0.1396
Δ(GDP)	1.175869	0.619252	1.898855	0.0659
ECT(−1)	−0.112026	0.019275	−5.812040	0.0000

The study is in line with Junz and Rhomberg (1973), Wilson and Takacs (1979), and Bahmani-Oskooee and Kara (2003), which suggested that currency depreciation enhances trade balance of countries operating fixed exchange rate. It is also in tune with Ali and Anwar (2011), which found that exchange rate fluctuation results in a price increase and an improvement in the trade balance. The study confirms the existence of a long-run relationship between exchange rate depreciation and macroeconomic performance in Nigeria. We therefore conclude that exchange rate depreciation has severe implications on macroeconomic performance in Nigeria. To this end, it is pertinent to diversify trade by embarking on export promotion strategies that can sustain gains of exchange rate movements and mitigate its negative consequences on the economy.

TABLE 10 Model Diagnostic and Stability Tests

Test statistics	Dependent variables			
	(1)	(2)	(3)	(4)
Serial correlation	5.1299 (0.017)	5.789 (0.009)	4.214 (0.270)	1.841 (0.175)
Funct. form	1.2351 (0.231)	2.063 (0.054)	0.948 (0.352)	0.814 (0.433)
Normality	1.420 (0.492)	1.100 (0.577)	1.199 (0.349)	0.499 (0.779)
Heteroskerdasticity	0.503 (0.935)	1.328 (0.317)	0.473 (0.934)	1.373 (0.289)
CUSUM	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable	Stable
ECT(−1)	−0.217 (0.101)***	−0.252 (0.044)***	−0.485 (0.111)***	−0.112 (0.019)***

NOTES Column headings are as follows: (1) output growth, (2) price instability, (3) interest rate, (4) trade balance. The values in brackets are the probability values for the diagnostic and stability tests; *** and ** denote rejection of null hypothesis at 5% and 10% significance levels respectively.

References

Abeysinghe, T., and T. L. Yeok. (1998). 'Exchange Rate Appreciation and Export Competitiveness: The Case of Singapore.' *Applied Economics* 30:51–5.

Adediran, J. O., S. A. Yusuf, and O. A. Adeyemi. (2014). 'The Impact of Exchange Rate Fluctuation on the Nigerian Economic Growth: An Empirical Investigation.' *International Journal of Academic Research in Business and Social Sciences* 4 (8): 224–33.

Adrangi, B., K. Raffiee, and T. M. Shank. (2007). 'An Ex-Post Investigation of Interest Rate Parity in Asian Emerging Markets.' *International Business and Economics Research Journal* 6 (2): 29–48.

Ali, S. Z., and S. Anwar. (2010). 'Exogenous Shocks and Exchange Rate Management in Developing Countries: A Theoretical Analysis.' *International Journal of Business and Globalisation* 4 (4): 338–58.

———. (2011). 'Supply-Side Effects of Exchange Rates, Exchange Rate Expectations and Induced Currency Depreciation.' *Economic Modelling* 28:1650–72.

Athukorala, P. (1991). 'Exchange Rate Pass-Through: The Case of Korean Exports of Manufactures.' *Economic Letters* 35:79–84.

Athukorala, P., and J. Menon. (1994). 'Pricing to Market Behaviour and Exchange Rate Pass-Though in Japanese Exports.' *The Economic Journal* 104:271–81.

Bahmani-Oskooee, M., and O. Kara. (2003). 'Relative Responsiveness of Trade Flows to a Change in Prices and Exchange Rate.' *International Review of Applied Economics* 17:293–308.

Ball, L. (1999). 'Efficient Rules for Monetary Policy.' *International Finance* 2:63–83.

Beckington, J. S., and M. R. Amon (2011). 'Competitive Currency Depreciation: The Need for a More Effective International Legal Regime.' *Journal of International Business and Law* 10 (2): 208–68.

Chang, M., and C. Su. (2015). 'Does Real Interest Rate Parity Really Hold? New Evidence from G7 Countries.' *Economic Modelling* 47:299–306.

Cherop, C. K., and J. R. Changwony. (2014). 'A Survey of Exchange Rate Fluctuation on Tea Export Earnings among Smallholder Tea Factories in Kenya.' *Research Journal of Finance and Accounting* 5 (8): 1–22.

Cheung, Y., and R. Sengupta. (2013). 'The Impact of Exchange Rate Movements on Exports: An Analysis of Indian Non-Financial Sector Firms.' *Journal of International Money and Finance* 39:231–45.

Datta, K. (2014). 'Relationship between Currency Depreciation and Trade Balance in India: An Econometric Study.' *Journal of Finance and Economics* 2 (3): 83–9.

Devarajan, S., J. D. Lewis, and S. Robinson. (1993). 'External Shocks, Purchasing Power Parity, and the Equilibrium Exchange Rate.' *The World Bank Economic Review* 7:45–63.

Dickey, D. A., and W. A. Fuller. 1979. 'Distribution of the Estimators for Autoregressive Time Series with a Unit Root.' *Journal of the American Statistical Association* 74(366a): 427–431.

Divakaran, D. N., and S. Gireeshkumar. 2014. 'Currency Depreciation: Causes and its Impact on Indian Economy.' *International Journal of Commerce, Business and Management* 3 (1): 2319-28.

Dornbusch, R. 1988. 'Real Exchange Rates and Macroeconomics: A Selective Survey.' Working Paper 2775, National Bureau of Economic Research, Cambridge, MA.

Edison, H. J. 1987. 'Purchasing Power Parity in the Long Run: A Test of the Dollar/Pound Exchange Rate (1890–1978).' *Journal of Money, Credit and Banking* 19 (3), 376–387.

Fang, W., Y. Lai, and S. M. Miller. (2005). 'Export Promotion through Exchange Rate Policy: Exchange Rate Depreciation or Stabilization?' Working paper, University of Connecticut, Storrs, CT.

Fidelis, A. (2014). 'People's Perception of the Impact of Currency Devaluation on the Performance of Poverty Alleviation Programmes in Nigeria.' *Developing Countries Study* 4 (10): 7–16.

Frankel, J. A., and S. J. Wei. 1998. 'Regionalization of World Trade and Currencies: Economics and Politics.' In *The Regionalization of the World Economy,* edited by J. A. Frankel, 189–226. Chicago: University of Chicago Press.

Froyen, R. T., and A. V. Guender. (2000). 'Alternative Monetary Policy

Rules for Small Open Economies.' *Review of International Economics* 8:721–40.

Guitian, M. (1976). 'The Effects of Changes in the Exchange Rate on Output, Prices, and the Balance of Payments.' *Journal of International Economics* 6:65–74.

He, H., O. Ranjbar, and T. Chang. (2013). 'Purchasing Power Parity in Transition Countries: Old Wine with New Bottle.' *Japan and the World Economy* 28:24–32.

Hooy, C., S. Law, and T. Chan. (2015). 'The Impact of the Renminbi Real Exchange Rate on ASEAN Disaggregated Exports to China.' *Economic Modelling* 47:253–9.

Ike, D. N. (1984). 'Some Economic Considerations for Nigerian Currency Devaluation.' *The Indian Journal of Economics* 65(1): 69–73.

Junz, H., and R. R. Rhomberg. (1973). 'Price Competitiveness in Export Trade among Industrial Countries.' *American Economic Review, Papers and Proceedings* 63:412–8.

Kandil, M. (2004). 'Exchange Rate Fluctuations and Economic Activity in Developing Countries: Theory and Evidence.' *Journal of Economic Development* 29 (1): 85–108.

Kerr, W., and R. King. (1996). 'Limits on Interest Rate Rules in the IS-LM Model.' *Federal Reserve Bank of Richmond Economic Quarterly* 82:47–75.

Kollmann, R. (2005). 'Macroeconomic Effects of Nominal Exchange Rate Regimes: New Insights into the Role of Price Dynamics.' *Journal of International Money and Finance* 24:275–92.

Li, H., H. Ma, and Y. Xu. (2015). 'How Do Exchange Rate Movements Affect Chinese Exports? A Firm-Level Investigation.' *Journal of International Economics* 97 (1): 148–61.

Lo, M. C., and J. Morley. (2015). 'Bayesian Analysis of Nonlinear Exchange Rate Dynamics and the Purchasing Power Parity Persistence Puzzle.' *Journal of International Money and Finance* 51:285–302.

Loto, M. A. (2011). 'Does Devaluation Improve the Trade Balance of Nigeria? A Test of the Marshall-Lerner Condition.' *Journal of Economics and International Finance* 3 (11): 624–33.

Mamun, A., A. H. Chowdhury, and S. Basher. (2013). 'Effects of Exchange Rate Variation on Price Level and Output Growth in Bangladesh.' *Mediterranean Journal of Social Sciences* 4 (6): 205–12.

Matsuyama, K., N. Kiyotaki, and A. Matsui. (1993). 'Toward a Theory of International Currency.' *The Review of Economic Studies* 60:283–307.

McCallum, B. T., and E. Nelson. (1999). 'An Optimizing IS-LM Specification for Monetary Policy and Business Cycle Analysis.' *Journal of Money, Credit and Banking* 31:296–316.

Mengistu, A. A., and J. Lee. (2013). 'Examining the Effects of Currency Depreciation on Trade Balance in Selected Asian Economies.' *International Journal of Global Business* 7 (1): 59–76.

Mishkin, F. S. (1996). 'The Channels of Monetary Transmission: Lessons for Monetary.' NBER Working Paper 5454, National Bureau of Economic Research, Cambridge, MA.

Nouira, R., P. Plane, and K. Sekkat. (2011). 'Exchange Rate Undervaluation and Manufactured Exports: A Deliberate Strategy?' *Journal of Comparative Economics* 39 (4): 584–601.

Nyeadi, J. D., O. Atiga, and C. A. Atogenzoya. (2014). 'The Impact of Exchange Rate Movement on Export: Empirical Evidence from Ghana.' *International Journal of Academic Research in Accounting, Finance and Management Sciences* 4 (3): 41–48.

Ogbonna, B. C. (2011). 'The Impact of Exchange Rate Variations on Trade Balance: Evidence from Nigeria.' *Journal of Research in National Development* 9 (2): 393–403.

Ogundipe, A. A., and S. Egbetokun. 2013. 'Exchange Rate Pass-through to Consumer Prices in Nigeria.' *European Scientific Journal* 9 (25): 110–123.

Paudel, R. C., and P. J. Burke. (2015). 'Exchange Rate Policy and Export Performance in a Landlocked Developing Country: The Case of Nepal.' *Journal of Asian Economics* 38:55–63.

Pesaran, M. H., Y. Shin, and J. S. Richard. (2001). 'Bounds Testing Approaches to the Analysis of Level Relationships.' *Journal of Applied Econometrics* 16 (3): 289–326.

Taylor, J. B. (1993). *Macroeconomic Policy in a World Economy: From Econometric Design to a Practical Operation.* New York: Norton.

———. (1995). 'The Monetary Transmission Mechanism: An Empirical Framework.' *Journal of Economic Perspectives* 9:11–26.

Umoru, D., and A. S. Oseme. (2013). 'Trade Flows and Exchange Rate Shocks in Nigeria: An Empirical Result.' *Asian Economic and Financial Review* 3 (7): 948–77.

Wilson, J. F., and W. E. Takacs. (1979). 'Differential Responses to Price and Exchange Rate Influences in the Foreign Trade of Selected Industrial Countries.' *Review of Economics and Statistics* 61:267–79.

Wilson, P., and K. C. Tat. (2001). 'Exchange Rates and the Trade Balance: The Case of Singapore (1970 to 1996).' *Journal of Asian Economics* 12:47–63.