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Original Article

Exchange Rate Effect on Import Volume in Nigeria (1981 – 2019)

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Abstract *- In our study, we examined the effect of the exchange rate on demand for imports in Nigeria. The study is conducted over the period 1981 – 2019 and is done using the autoregressive distributed lag (ARDL) approach. The data for the study was obtained from the World Bank, Central Bank of Nigeria, and United Nations Conference on Trade and Development. The data were subjected to unit root test, Bounds test for cointegration, and error correction mechanism. The unit root test revealed that the variables were integrated in mixed order, while the Bounds test for cointegration and error correction mechanism supported the existence of a long-run equilibrium relationship between import demand and the explanatory variables. It was further discovered that the exchange rate had a negative and insignificant effect on import demand in the short run but a negative and significant effect in the long run. The real income exerted a negative and insignificant effect on the demand for imports in the short run, while in the long run, import demand is influenced by real income in a positive and significant manner. Though the import price index exerted a negative and insignificant short-run effect on the demand for imports, its effects became significant in the long run. The paper recommended that domestic production of most of the imported goods should be stimulated so as to ameliorate the dangers associated with over importation of even basic items.*

Keywords *- Exchange rate, Import price index, Consumption, Real income, Nigeria, ARDL.*

I. INTRODUCTION

The rate of external trade in a country is an indication of the degree of openness of a nation to external businesses. In this way, importation and exportation are stimulated across borders. As noted by McKinnon [1] and Chenery and Shout [2], these foreign trade transactions are crucial for a nation's economic development and thus prompted the development of the two-gap model by the aforementioned scholars. Imports being a component of international trade transactions, can boost economic progress when it is carried out on productive commodities [3]. It follows that excessive importation of non-productive commodities can generate an undesired effect on the domestic economy as long as such commodities can be locally produced. However, inasmuch as the gap between government expected revenue and expected expenditure in an annual budget are financed through borrowing, the gap between domestic production and domestic consumption can be bridged through importation.

Meanwhile, importation is likely to be constrained by various factors, such as the availability of the required external reserves to facilitate import transactions. Other factors that have been considered in the literature include household and public sector consumption expenditure, exchange rate, and import price index. These factors can either stimulate or dampen the import demand of a nation depending on the direction of their effect. It has been noted that excessive importation is likely to exert *pressure on the external reserves of the country,* thereby creating a negative impact on the economy. However, the positive impact of imports has been that it "increases the varieties of goods available to domestic consumers, generate positive competitive pressures on the domestic economy, promote standardization, and could be used to bridge the gap in domestic supplies of essential commodities to poor households" [4].

In the 1980s and recently in 2014, Nigeria witnessed a tremendous decline in export prices, which caused the evolution of various economic reform in the likes of the import substitution industrialization (ISI) strategy, export promotion program (export free zones), Structural Adjustment Programme (SAP) to mention but a few [3]. These reforms, which were geared towards stimulating domestic production, promoting exportation, discouraging importation of locally produced goods, and propelling economic growth, had hitherto been matched with increasing import demand in the country over the years.

In the pre-SAP era of 1981 to 1985, total imports averaged ₦9.35 billion. With the introduction of SAP, imports declined to ₦5.98 billion in 1986 but rose up to ₦30.86 billion in 1989, averaging ₦23.39 billion between 1987 to 1989. The period 1990 – 1999 was characterized by the significant rise in total imports demand in the country. Total Import was put at ₦165.63 as at 1993 with a record high of ₦862.52 billion as at 1999. Meanwhile, total imports from 1990 to 1999 averaged ₦447.02 billion, which is very high when compared to just an average of ₦13.66 billion from 1981 to 1989.

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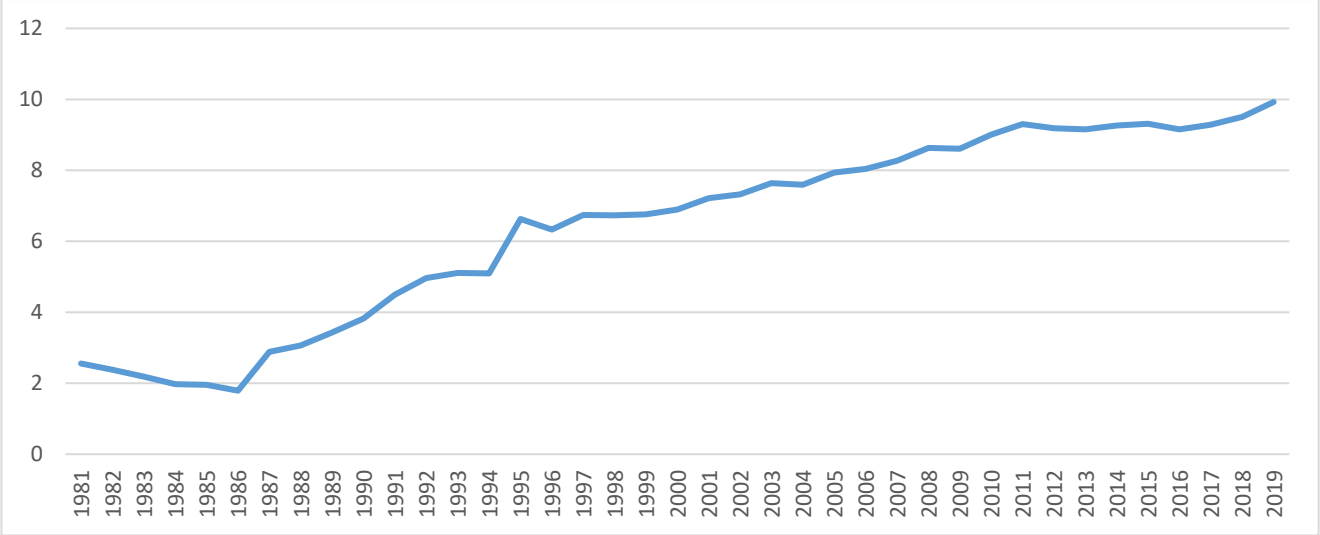

Fig 1.1 Trend for the Log of Total Imports

Within 2000 and 2009, the Nigerian economy was characterized by a tremendous upsurge in import demand even more than that experienced in the 1980s and 1990s. Total imports within the period averaged ₦3362.03 billion with a maximum value of ₦8,163.97 billion as of 2010. Meanwhile, imports averaged ₦11,777.35 billion between 2011 and 2019, with the highest total Import within the period being put at ₦20,448.92 billion as of 2019 [20]. One thing to note is that Nigeria's imports have maintained a continuous rise over the review period.

With the continuous rise in importation in the Nigerian economy, it is worth noting the direction of movement of the prevailing exchange rate (measured in the US Dollar). In the early 1980s, before the introduction of the Structural Adjustment Programme (SAP), Nigeria naira had value more than the US Dollar. For instance, the exchange rate as of 1981 was ₦0.62/$1. From 1981 to 1985, the exchange rate average ₦0.73/$1. With the introduction of SAP, Nigeria started experiencing a decline in the value of the naira. The exchange rate rose to ₦8.04/$1 in 1990, averaging ₦5.14/$1 between 1986 to 1990. Further, the rate rose to as high as ₦92.34/$1 in 1999, averaging ₦27.91/$1between 1991 to 1999. The early 2000s were also characterized by a continuous decline in the value of the naira, with the exchange rate being put at ₦148.90/$1in 2009, averaging ₦124.88/$1 within 200 and 2009. Between 2010 to 2019, the exchange rate continues to rise to as high as ₦306.93/$1, averaging ₦214.23/$1 within the same period.

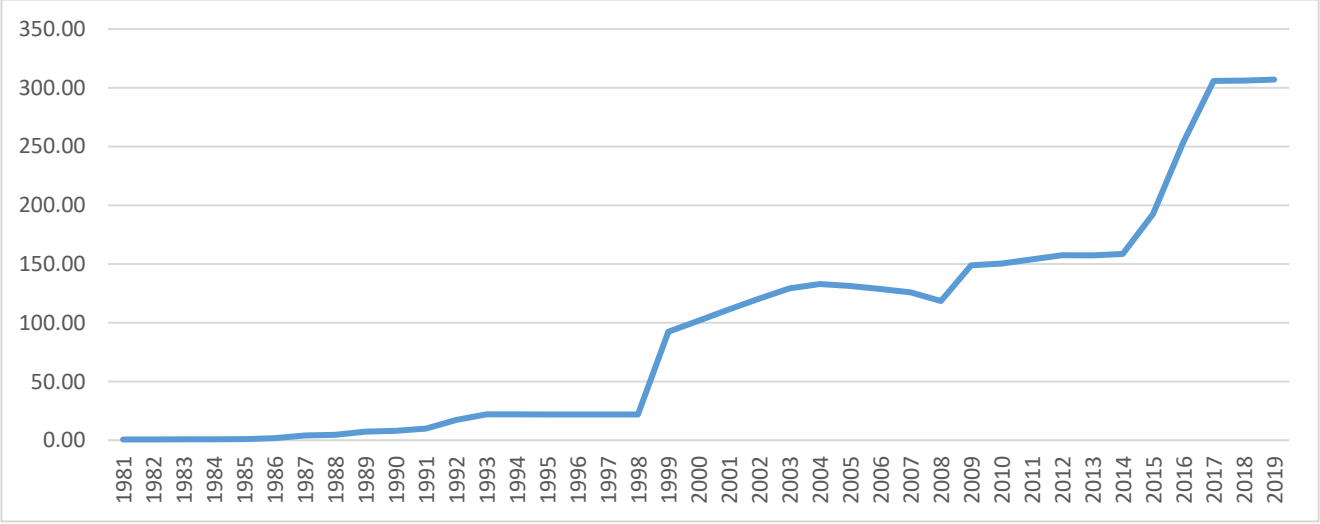

Fig 1.2 Trend of Exchange Rate in Nigeria (1981 – 2019)

It is observed from the foregoing analysis that imports have been rising along with the rising exchange rate, which calls for concern as to whether the exchange rate influences importation in Nigeria. The objective of this study is to ascertain the effect of the exchange rate on import volume in Nigeria for the period 1981 – 2019. We also seek to ascertain the effect of real income on demand for imports in Nigeria, as well as tracing the effect of the import price index and the degree of trade openness on the import demand in Nigeria. In doing this, our methodology

follows the autoregressive distributed lag (ARDL) approach to determine both the short-run dynamics and the long-run equilibrium relationship existing between Import and some explanatory variables selected in the course of this study.

Our paper is structured in five sections, with some of the sections having some key sub-sections that handle some crucial aspects of the paper. Section 2 deals with the literature review where we observe both the theoretical and empirical kinds of literature in the area of the determinants of import volume, both within and outside Nigeria. Section 3 presents the data and methodology utilized in this study, while section 4 presents the findings and discussion. The final section of the paper focuses on the conclusion and recommendations, which is section 5.

II. LITERATURE REVIEW

Since the demand for imports is backed with the desire to satisfy certain needs, the *traditional theory of import demand* and the *imperfect substitute model* gain sway. This traditional demand theory was developed by Khan [5], Hemphill [6], and Moran [7]. Based on the traditional theory of import demand, the main reason why consumer demand for goods is to derive utility [4]. The model suggests *an analysis of import demand relations based on the consumer theory of demand* [8]. Arize and Afifi [9] pointed out that "the traditional formulation of an aggregate import demand equation relates the real quantity of imports demanded by a country to the ratio of import prices to domestic prices (assuming a degree of substitutability between imports and domestic goods) and to domestic real income, at a given period" [9].

Goldstein and Khan [10], in the imperfect substitute model, exerted that imports and exports are not perfect substitutes for a country's domestically produced goods. And as such, "given that total imports of goods and services into Nigeria is relatively a small proportion of total world import demand, it may be realistic to presume that world supply of imports to Nigeria is perfectly elastic" [4]. With Nigeria contributing an insignificant quantity to output to the world market, the assumption of a perfectly elastic import supply curve can hold, and this is an indication that other countries of the world can increase their export supply to Nigeria without necessarily increasing the prices.

Empirical studies on the determinants of import demand have been conducted by the researcher over the years. In Kenya, Mwega [11] investigated the issues inducing demand for imports using annual data that spans through 1964 – 1991. The result of the study revealed *an insignificant relationship between short-run relative price, level of real income, and aggregate import demand elasticities*. On the contrary, "total imports demand is significantly related to the previous level of demand for imports, the lagged value of foreign exchange reserves and to revenue from the foreign exchange" [11].

A similar study was conducted in Cote D'Ivoire by Case and Fair [12] using cointegration technique and bounds testing approach to test the long-run relationship between imports, relative import prices, final consumption expenditure, investment expenditure, and export expenditure using yearly data for the period 1970 – 2007. A long-run cointegrating relationship was found among the variables, and "the study recommended that policymakers in the country should closely watch changes in relative price levels to boost economic growth" [12].

Egwakhide [13] investigated "the determinants of imports in Nigeria" using a time series data of 1953-1989. In his study, an import demand function was modeled based on the "Balance of Payments framework and the consumer theory model." The study utilized the cointegration and error correction technique. It was realized that *foreign exchange dynamics affect imports decisions* [13]. The paper recommended a relaxation of restraints on foreign exchange, hence devaluation of the currency.

In Pakistan, Shaista & Hammed [14] estimated the *import demand function* using the ARDL framework. A long-run relationship among "import demand, real economic growth, and the relative price of imports, real effective exchange rate and volatility of real effective exchange rate" was observed to exist in the country. The study further revealed that "aggregate import demand is positively affected by real gross domestic product suggesting that import demand in Pakistan is growth driven" [14]. The short-run dynamics shows that "real economic growth, the relative price of imports, real effective exchange rate and real effective exchange rate volatility Granger cause import demand in the short-run" [14]. Similarly, the traditional demand methodology, as well as the error correction mechanism, was utilized by Douglason [15] to estimate Nigeria's import demand function. Based on the findings, the demand for imports is mostly determined by real income and is less responsive to relative prices.

A study by Odili [16] was geared towards studying "the effect of real exchange rate volatility on Nigerian imports for the period 1971 to 2011". The study employed cointegration analysis as well as a parsimonious error correction model. Findings revealed that the exchange rate has a long-run positive and significant effect on imports. Also, it was discovered that a one-way causality flows from exchange rate to imports. Using the VAR approach, Ogbonna [17] estimated Nigeria's import demand function. The result revealed that the explanatory variables (real exchange rates, world price index, and disposable income) had a significant long-run effect on import demand, but such effects were insignificant in the short run.

Ayodotun and Farayibi [8] employed panel data analysis on data spanning from 1995 to 2012 to model *the determinants of imports demand in sub-Saharan Africa*. The study utilized the fixed effects and random effect model for the model estimation. It was discovered that domestic income, foreign exchange reserves, and trade

liberalization exerts significant short-run and long-run impact on the demand for Import within the region. The study pointed out that "*trade policy authorities who aim at reducing imports to correct balance-of-payments imbalances, in the long run, should focus their efforts on policies that will reduce purchasing power at the macroeconomic level and implement policies that will ensure an increased domestic supply*" [8].

Also, Nteegah and Mansi [3] explored the issues inducing import demand in Nigeria for the period 1980 – 2014 using the Ordinary Least Square (OLS) and cointegration as well as error correction mechanism. The result showed that "real income level, domestic price change, and exchange rate all have a negative and significant impact on total import demand in Nigeria." Meanwhile, *trade openness, gross capital formation, and external debt have a positive and significant consequence on total import demand* [3].

In Sudan, Ibrahim and Ahmed [18] estimated t*he determinants of the aggregate import demand function* using time series data for the period 1978 to 2014. The study utilized Augmented Dickey-Fuller and Phillips-Peron unit root test to ascertain the stationarity of the variables, namely: domestic income, relative prices, and exchange rate; and Johansen cointegration procedures to estimate the long-run import demand function. From the result, a long-run cointegration relation among the volume of imports, domestic income, relative prices, and the exchange rate was observed. The implication of the findings is that GDP has a greater effect on the number of imports than the price ratio and exchange rate.

Oluyemi and Isaac [19] utilized monthly data covering the period of January 1996 to June 2015 to examine the effect of exchange rate on imports and exports under a vector autoregression (VAR) framework consisting of three variables – imports, exports, and exchange rate. From the result of the VAR model, they observed that exchange rates exert a positive and insignificant effect on imports. Meanwhile, a negative and insignificant effect of exchange rate on exports at lag 1 was also observed. It was further observed from the *impulse response function* that exchange rates responded positively to shocks in imports but negatively to shocks in exports. The study recommended the encouragement of exports in the non-oil sector through entrepreneurial development.

Recently, Alex and Ebipuamere [4] studied the determinants of imports in Nigeria using *Autoregressive Distributed Lag (ARDL)* approach and *Error Correction Mechanism (ECM)* for the period 1981-2017. From the bounds test, Real GDP, Consumer Price Index, and Nominal Exchange rate were cointegrated to import demand in the long run. Additionally, the study discovered that when the exchange rate depreciates by 1.0%, imports demand increases by 1.47%.

In our study, we will employ the autoregressive distributed lad (ARDL) approach, the Bounds test for cointegration, and the error correction mechanism to trace the effect of exchange rate on import volume in Nigeria. The study will therefore cover the period 1981 to 2019.

III. DATA AND METHODOLOGY

A. Data

Our seven data sets – import volume, import price index, exchange rate, real gross domestic product, government consumption expenditure, household consumption expenditure, and trade openness - covering the period 1981 – 2019 were gotten from secondary sources. Data on the gross domestic product, import volume, exchange rate, and trade openness were gotten from the Central Bank of Nigeria [20] statistical bulletin; import price index was obtained from United Nations Conference on Trade and Development [21] Handbook of Statistics; while government consumption expenditure and household consumption expenditures were obtained from World Bank [22] database on world development indicators.

B. Model Specification

Our model for this study is a modified form of the import demand function that was estimated by Narayan and Narayan [23]. The model identified Import as a function of income, consumer price index, and exchange rate. Also, Ayodotun & Farayibi [8] recognized key variables like lagged real imports, relative import prices, real income, and current foreign exchange reserves as being the determinants of import demand. Meanwhile, Ibrahim and Ahmed [18] modified the model to encompass Import being a function of income (real GDP), relative prices or price ratio, and exchange rate. In addition, Aljebrin & Ibrahim [24] recognized real gross domestic product, the value of international reserves, real value of gross capital formation, the real value of private consumption expenditure, the real value of public consumption expenditure, and the import price index; as being the determinants of import demand. Going by these positions, our model is specified as follows.

IMPT = f(EXCR, IMPI, GCEX, HCEX, RGDP, TRPN) – (1)

Where:

IMPT = The value of Import

EXCR = Exchange Rate

IMPI = Import Price Index

GCEX = Government Consumption Expenditure

HCEX = Household Consumption Expenditure

RGDP = Real Gross Domestic Product

TRPN = Trade Openness

Transforming Equation 1 into an econometric model with transformation into a double log model forms Equation 2.

$$logIMPT_t = \delta_0 + \delta_1 EXCR_t + \delta_2 IMPI_t + \delta_3 logGCEX_t + \delta_4 logHCEX_t + \delta_5 logRGDP_t + \delta_6 TRPN_t + \mu_t - - - - - - - (2)$$

Where log denotes the natural logarithm, δ are the parameters to be estimated, and μ is the error term.

C. A Priori Expectation

The exchange rate is expected to generate a positive elasticity coefficient to denote the fact that as the exchange rate rises, importation becomes cheaper, leading to an increase in the volume of imports. In this case, $\delta_1 > 0$. Also, the import price index is expected to generate a negative effect on the volume of Import hence $\delta_2 < 0$. Emphasis should be placed on the fact that "a declining exchange rate obviously decreases the purchasing power of income and capital gains derived from any returns as such, while importers prefer a strong dollar, exporters prefer a weak dollar" [25].

Both government consumption expenditures and household consumption are expected to have a positive effect on imports as long as domestic production do not meet up with the local demand. Therefore, $\delta_3 > 0$ and $\delta_4 > 0$. As domestic demand is greater than domestic production, the consumption demand of the government and households will be provided for through the importation of the commodities that are in shortage of supply.

From Equation 2, an increase in real income (real gross domestic product) is expected to culminate in an increase in import demand. This is because as income rises, consumption demand is boosted as some of such consumption is augmented through the importation of the desired commodities. This gives a positive income elasticity $\delta_5 > 0$. However, there are scenarios where an increase in the real gross domestic product will lead to a decline in import demand as a result of increased domestic production. In this case, the income elasticity coefficient will be negative ($\delta_5 < 0$).

Finally, the degree of trade openness can exert a positive effect on imports. An economy that is highly open to trade will experience high trade volume, which can also bring about more importation of commodities at even a cheaper price. Therefore, $\delta_6 > 0$.

D. Estimation Procedures

After descriptive statistics and correlation were conducted, the series are tested for unit root using the Augmented Dickey-Fuller unit root test to ascertain their order of integration. In this way, the presence of mixed order of integration (level and first difference) necessitated the test for cointegration under the autoregressive distributed lag (ARDL) Bounds test for levels relationship. In doing this, we utilized the Akaike Information Criterion (AIC) to ascertain the optimal lag to be selected in the model. With the Bounds test reporting the presence of a long-run equilibrium relationship, we carry out an estimation of the error correction model to ascertain the speed of adjustments of the short-run disequilibrium to a long-run equilibrium relationship. Meanwhile, after estimating the short-run dynamics, we also estimate the long-run equilibrium model. We also carry out the post-diagnostic test to ensure that our estimated model meets the required assumptions of the classical linear regression model. The post-diagnostic test includes Breusch-Godfrey Serial Correlation LM Test, Breusch-Pagan-Godfrey Heteroscedasticity Test, Stability Test, Normality Test for Residuals, and Ramsey RESET Test for specification error.

IV. RESULTS AND DISCUSSION

A. Descriptive Statistics

The descriptive statistics capture the statistical properties of the macroeconomic variables utilized in this study. The descriptive statistics cover the mean, maximum, minimum, and standard deviation and are presented in Table 1.

Table 1. Descriptive statistics of the Variables

	Mean	Maximum	Minimum	Standard Deviation	Observations
LOGIMPT	6.414	9.926	1.789	2.647	39
EXCR	94.144	306.930	0.620	92.822	39
IMPI	227.775	489.570	62.860	142.656	39
logGCEX	6.122	9.181	2.266	2.285	39
logHCEX	9.875	10.676	9.028	0.584	39
logRGDP	10.292	11.176	9.531	0.572	39
TRPN	16.951	56.534	0.098	16.679	39

Source: Output from Eviews 10 Software Package

Over the thirty-nine period of observation, the log of imports (logIMPT) averaged 6.414% with a standard deviation of 2.647%, while its minimum and maximum values were 1.789% and 9.926%, respectively. The exchange rate averaged ₦94.144/$ with a standard deviation of ₦92.822/$. Meanwhile, the minimum exchange rate was ₦0.620/$ while the maximum was ₦306.93/$. The import price index averaged 227.775 with a standard deviation of 142.656 and has a maximum value of 489.570 and a minimum value of 62.860. Also, the log of government consumption expenditure (logGCEX) has a mean value of 6.122% with a standard deviation of 2.285%, and its minimum value was 2.266%, while the maximum value was 9.181%. In the same vein, the log of

household consumption expenditure has a mean value of 9.875% with a standard deviation of 0.584%; and its maximum value is 10.676%, while its minimum value is 9.028%. The fact that the minimum value is not far below the maximum value gives rise to the low deviation in the variable. The log of real gross domestic product (logRGDP) averaged 10.292% with a standard deviation of 0.572%, which is quite low as a result of the fact that the maximum value (11.176%) is not far beyond the minimum value (9.531%); indicating low dispersion. Finally, trade openness averaged 16.951%, with a high standard deviation of 16.679% arising from high dispersion between the maximum (56.534%) and the minimum value (0.0098%).

B. Correlation

The degree of correlations between variables indicates the co-movements existing between the variables. The result, as reported in Table 2, indicate that all the variables are positively correlated with each other.

Table 2. Correlation Matrix

	LOGIMPT	EXCR	IMPI	LOGGCEX	LOGHCEX	LOGRGDP	TRPN
LOGIMPT	1						
EXCR	0.852	1					
IMPI	0.075	0.259	1				
LOGGCEX	0.994	0.873	0.067	1			
LOGHCEX	0.923	0.900	0.318	0.930	1		
LOGRGDP	0.932	0.924	0.303	0.940	0.978	1	
TRPN	0.886	0.895	0.381	0.892	0.926	0.952	1

Source: Output from Eviews 10 Software Package

The correlation matrix presented in Table 2 indicates that exchange rate, import price index, government consumption expenditure, household consumption expenditure, real gross domestic product, and trade openness all have a strong positive relationship with imports. This indicates that as these variables increases, imports also increase and vice versa. In general, it is observed that all the explanatory variables have a very strong positive relationship with imports.

C. Unit Root Test

The Augmented Dickey-Fuller unit root test is carried out to ascertain the order of integration of the variables, and the result is presented in Table 3. All estimation follows the constant assumption of a random walk model with drift.

Table 3. ADF Unit Root Test Result

Variables	5% ADF Critical Value @ Level	ADF Test Statistic @ Level	5% ADF Critical Value @ First Difference	ADF Test Statistic @ First Difference	Order of Integration
logIMPT	-3.5366	-1.1225 (0.9114)	-3.5366	-6.9101 (0.0000)**	I(1)
EXCR	-3.5366	-2.0790 (0.5400)	-3.5366	-4.5057 (0.0049)**	I(1)
IMPI	-3.5331	-2.3206 (0.4133)	-3.5366	-5.4493 (0.0004)**	I(1)
logGCEX	-3.5366	-0.4231 (0.9829)	-3.5366	-7.7082 (0.0000)**	I(1)
logHCEX	-3.5331	-3.5418 (0.0491)**	-3.5366	-6.8102 (0.0000)**	I(0)
logRGDP	-3.5403	-1.4860 (0.8159)	-3.5434	-3.7341 (0.0160)**	I(1)
TRPN	-3.5366	-2.5408 (0.3080)	-3.536601	-4.5487 (0.0044)**	I(1)

Source: Output from Eviews 10 Software Package
*Note: ** denotes significance at least at the 5% level.*

From Table 3, it is observed that household consumption expenditure is stationary at level. Thus, we do not need to differentiate it before it becomes stationary. However, imports, import price index, government consumption expenditure, household consumption expenditure, real gross domestic product, and trade openness are all stationary at first difference. The fact that the variables are stationary at mixed order of I(0) and I(1) calls for the adoption of the autoregressive distributed lag (ARDL) model, as presented by Pesaran, Shin & Smith (2001), to ascertain whether the variables are cointegrated. We start the process by ascertaining the model selection criteria to carrying out the Bounds test for cointegration, and then we proceed to estimate the ARDL error correction model.

D. Model Selection Criteria

The optimal lag selection is carried out using the Akaike Information Criteria. The result is presented in Figure 2.

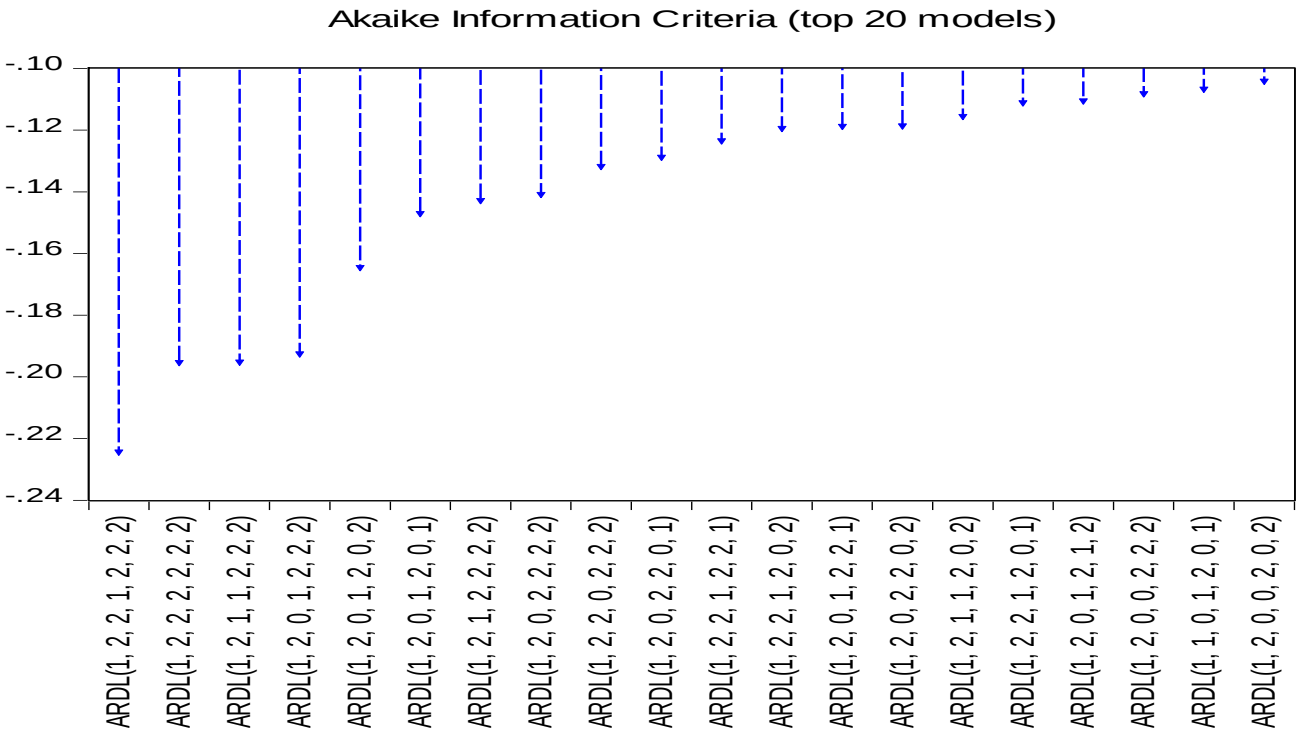

Fig 2. Model Selection Criteria under AIC

Figure I portrays the selected ARDL (1, 2, 2, 1, 2, 2, 2) model out of the top 20 models based on the Akaike Information Criteria (AIC). It specifies that the selected model has the least AIC value when compared to any other models.

E. ARDL Bounds Test for Cointegration

The Bounds test is carried out to test for the existence of levels relationship. That is, to ascertain if there exists any long-run equilibrium relationship given that the variables are integrated in mixed order. The result is presented in Table 4.

Table 4. Bounds Test Result

Null Hypothesis: No levels relationship				
Test Statistic	Value	Significance	Lower Bounds I(0)	Upper Bounds I(1)
F-statistic	8.9805	10%	1.99	2.94
K	6	5%	2.27	3.28
		1%	2.88	3.99

Source: Output from Eviews 10 Software Package

From the Bounds test result presented in Table 4, it is observed that the F-statistic (8.9805) is greater than both the lower and upper Bounds critical value at the 5% level of significance. Thus, the null hypothesis of no levels relationship is rejected, and we conclude that there is a long-run relationship between imports and the explanatory variables. We, therefore, proceed to estimate the error correction model.

F. ARDL Error Correction Mechanism

The error correction mechanism (ECM) in the error correction model captures the speed of adjustment of the short-run distortions to a long-run equilibrium relationship. The result of the ECM is presented in Table 5.

Table 5. ECM Result

Variable	Coefficient	Standard Error	t-Statistic	Probability
Δ(EXCR)	-0.0031	0.0020	-1.5863	0.1301
Δ(EXCR(-1))	-0.0044	0.0023	-1.9506	0.0669*
Δ(IMPI)	-0.0006	0.0004	-1.4312	0.1695
(LOGGCEX)	-0.0558	0.1616	-0.3454	0.7338
Δ(LOGGCEX(-1))	-0.9967	0.1778	-5.6065	0.0000***

Δ(LOGHCEX)	0.1036	0.2623	0.3948	0.6976
Δ(LOGHCEX(-1))	0.6850	0.2625	2.6092	0.0178**
Δ(LOGRGDP)	-0.1674	0.9458	-0.1770	0.8615
Δ(LOGRGDP(-1))	-3.2312	0.9704	-3.3297	0.0037**
Δ(TRPN)	0.0319	0.0089	3.6060	0.0020**
Δ(TRPN(-1))	0.0242	0.0084	2.8946	0.0097**
ECM(-1)	-0.9415	0.0942	-9.9892	0.0000***
R-squared	0.8615			
Adjusted R-squared	0.8006			
Durbin-Watson statistic	2.0695			

Source: Output from Eviews 10 Software Package

From the ECM result in Table 5, we observe that changes in the exchange rate and its lag value have a negative effect on imports. Though changes in exchange rate do not have a significant effect on imports, its lag value does significantly affect imports. Going by the coefficient of the lag value of the exchange rate (-0.0044), the past period's exchange rate reduces imports by 0.44%. Also, changes in the import price index exert a negative but insignificant effect on imports. Thus, high import prices are likely to reduce import demand, while low import prices will increase the demand for imports.

Also, government consumption expenditure exerts a negative and insignificant impact on imports while its lag value exerts a negative but significant impact on the demand for imports. The implication is that the past period value of government consumption expenditure reduces import demand by 99.67%. Meanwhile, household consumption expenditure and its lag value exert a positive impact on import demand in Nigeria. Though the current changes in household consumption exert an insignificant effect on imports, its lag value exerts a significant impact. Thus, in the past period, household consumption expenditure increases import demand by 68.50%.

The real gross domestic product (income in this case) and its lag value both exert a negative effect on the demand for imports. Therefore, the income elasticity does not exert any significant impact on import demand in the short run. Only the lag value exerts a significant effect, implying that the past period income reduces imports by 323.12%. However, trade openness and its lag value exert a positive and significant effect on import demand. Thus, a unit percentage increase in trade openness will lead to a 3.19% increase in import demand, while the past value of trade openness increases import demand by 2.42%.

The coefficient of the error correction mechanism (-0.9415) carries the right sign (negative) and is statistically significant at the 1% level of significance. The coefficient is an indication that 94.15% of the short-run disequilibrium is corrected annually so as to restore the model back to equilibrium in the long run. It further implies that when the economy experiences distortions/shocks, it will take 0.9415 years (about 11 months) for imports to respond to changes in any of the independent variables. This is an indication that the speed of adjustment in the import demand function is fast to restore equilibrium in the long run. The long-run relationship between Import and the explanatory variables is further validated through the ECM. The R-squared (0.8615) indicates that 86.15% of the total variation in imports is explained by variations in the explanatory variable.

G. ARDL Long Run Estimates

The long-run result in Table 6 indicates that exchange rate, import price index, government consumption expenditure, and real gross domestic product exerts a significant effect on import demand, while both household consumption expenditure and trade openness exerts an insignificant long-run effect on import demand.

Table 6. Long Run Result

Variable	Coefficient	Standard Error	t-Statistic	Probability
EXCR	-0.0068	0.0020	-3.4544	0.0028**
IMPI	-0.0020	0.0009	-2.2386	0.0381**
LOGGCEX	1.1376	0.0997	11.4139	0.0000***
LOGHCEX	-0.3795	0.6187	-0.6135	0.5472
LOGRGDP	1.8641	0.7803	2.3890	0.0281**
TRPN	-0.0138	0.0177	-0.7777	0.4468
C	-14.2097	4.7169	-3.0125	0.0075**

Source: Output from Eviews 10 Software Package

From the result, the exchange rate exerts a negative and significant effect on imports, indicating that a unit percentage increase in the exchange rate will lead to a 0.68% decrease in import demand in the long run. Also, the import price index exerts a negative and significant effect on import demand. Thus, a unit percentage increase in the import price index will cause import demand to decline by 0.20% in the long-run. However, government consumption expenditure and real gross domestic product (income) exert a positive and significant effect on the

demand for imports. Thus, a unit percentage increase in government consumption expenditure and real gross domestic product will cause import demand to increase by 113.76% and 186.41% in the long run.

G. Post-diagnostic Test

The post-diagnostic test conducted here includes serial correlation test, heteroscedasticity test, normality test, stability test, and the Ramsey RESET test. The result of the serial correlation and heteroscedasticity test are presented in Table 7; normality test and stability test are presented in Figure 3 and Figure 4, respectively; while the Ramsey RESET test is presented in Table 8.

Table 7. Result of the Post Diagnostic Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	4.122018	Prob. F(2,16)	0.1360
Obs*R-squared	12.58162	Prob. Chi-Square(2)	0.1019
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.496342	Prob. F(18,18)	0.2004
Obs*R-squared	22.17832	Prob. Chi-Square(18)	0.2242
Scaled explained SS	4.520608	Prob. Chi-Square(18)	0.9994

Source: Output from Eviews 10 Software Package

From the result in Table 7, the F-statistic (4.1220) for the Breusch-Godfrey Serial Correlation LM test is not statistically significant at the 5% level. Therefore, the null hypothesis of no autocorrelation is not rejected. Similarly, the F-statistic (1.4963) for the Breusch-Pagan-Godfrey heteroscedasticity test is not statistically significant at the 5% level. It follows that the model does not suffer from heteroscedasticity, which is further evidenced by the p-value of 0.2004. Hence, our model has a constant variance (homoscedastic).

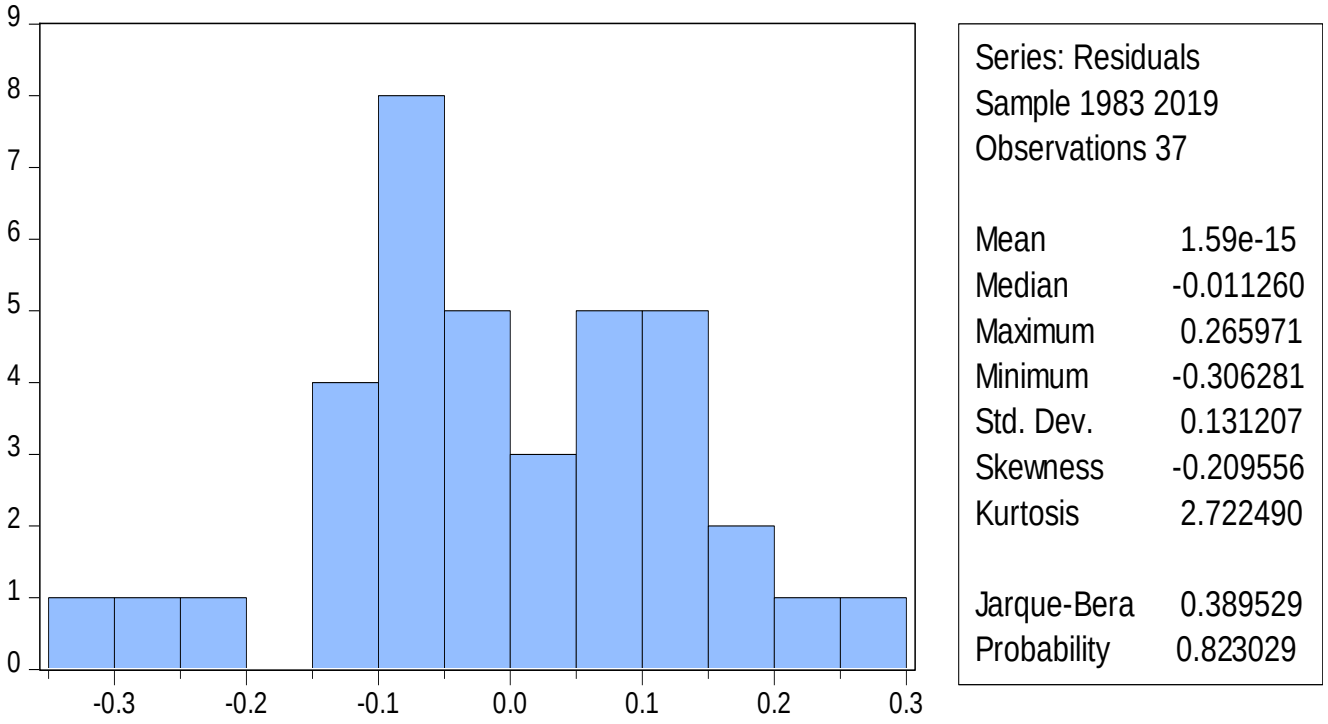

Fig 3. Histogram Normality Test for Residuals

From figure 3, the Jarque-Bera coefficient (0.3895) is not statistically significant given that its p-value (0.8230) is greater than the 5% level of significance. Thus, the null hypothesis that the error terms are normally distributed is accepted.

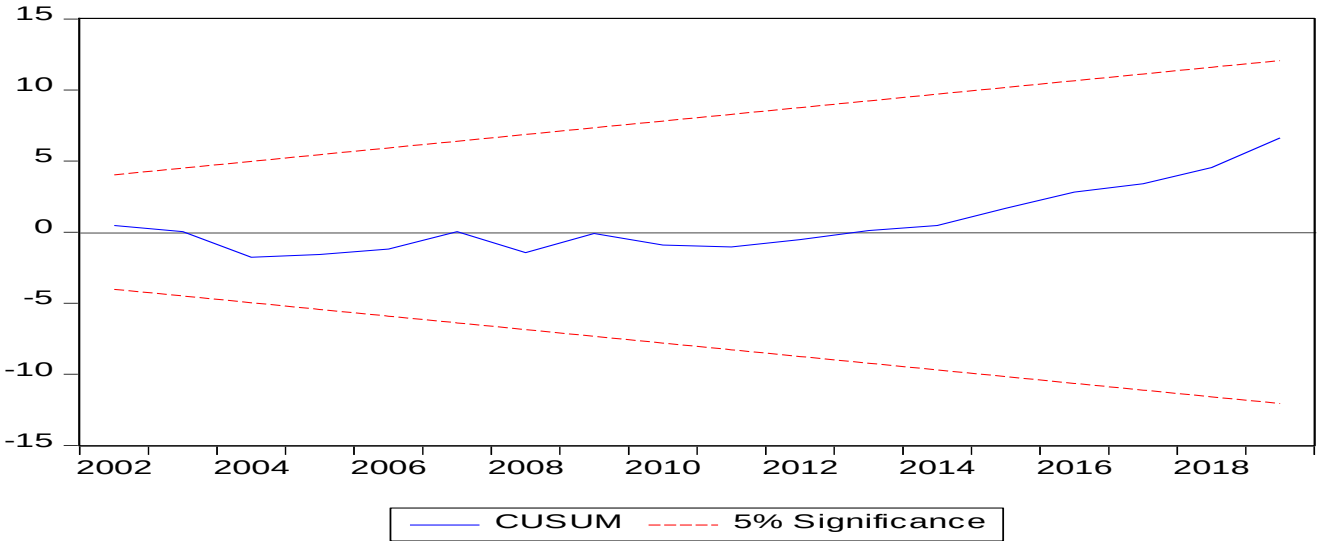

Fig. 4 Cumulative Sum (CUSUM) Test for Stability

The CUSUM line is observed to lie within the 5% critical bound. As required, the CUSUM line is expected to lie within this 5% critical bound so as to validate the stability of the short-run dynamics and the long-run equilibrium parameter of the import function. Since this condition has been met, we can therefore infer that the estimates of the short-run dynamics and long-run equilibrium of the import function is stable over the period of analysis.

Table 8. Ramsey RESET Test Result

	Value	degree of freedom	Probability
t-statistic	1.417336	17	0.1745
F-statistic	2.008840	(1, 17)	0.1745

F-test summary:

	Sum of Squares	degree of freedom	Mean Squares
Test SSR	0.065495	1	0.065495
Restricted SSR	0.619750	18	0.034431
Unrestricted SSR	0.554256	17	0.032603

Source: Output from Eviews 10 Software Package

The Ramsey RESET test results in Table 8 indicate that the F-statistic (2.0088) is not statistically significant at the 5% level, as shown by the p-value of 0.1745. Therefore, the null hypothesis of no specification error is accepted. Hence, our model was correctly specified.

V. CONCLUSION AND POLICY RECOMMENDATIONS

In our paper, we studied the effect of the exchange rate on import volume in Nigeria for the period 1981 – 2019. We carried out a unit root test, cointegration test, and error correction mechanism in achieving our set objectives. It was discovered from the Augmented Dickey-Fuller unit root test that our variables were in a mixed order of integration (both at the level and first difference). In this regard, we utilized the ARDL Bounds test for cointegration to ascertain whether the variables are integrated into the long-run. Our result from both the Bounds test and error correction mechanism supported the existence of a long-run equilibrium relationship. The error correction mechanism showed that 94.15% of the short-run distortions in imports are corrected annually by the explanatory variables. This itself shows that the speed of adjustment is quite fast. Our R-squared indicated that the explanatory variables were able to explain about 86.16% of the total variations in the volume of imports in Nigeria.

From the short-run dynamics, it was discovered that though the exchange rate has no significant effect on import volume, its one-period lag had a significant effect with it reducing import volume by 0.44%. Also, the import price index had the desired a priori sign (negative), but it

had no significant impact on the import volume in the Nigerian economy.

It was further discovered that though government consumption expenditure had a negative and insignificant effect on import volume, its one-period lag had a negative and significant effect on import demand by reducing import demand by about 99.67%. The a priori expectation did not conform with the idea that as the government tends to consume more, they will likely import more inasmuch as domestic production could not meet the demand. Also, household consumption expenditure exerted a positive but insignificant effect on import demand. Meanwhile, its one-period lag exerted a positive and significant effect and increases import demand by 68.50% in the short run.

The level of real income in the economy is also being seen to exert a negative and insignificant impact on import demand though its one-period lag exerted a significant effect accounting for about 323.12% decrease in import demand. The implication is that if the rise in income is due to an increase in domestic production of commodities that were earlier imported, such a boost in domestic production will bring down the demand for imports drastically. Meanwhile, trade openness and its one-period lag both affected import demand positively and in a significant way. So, while the lag of trade openness increases import demand by 2.42%, a unit percentage increase in trade openness will increase import demand by 3.19%.

In the long run, the exchange rate still maintains a negative though a significant effect on the demand for imports. It follows that a unit percentage increase in the exchange rate will lead to a 0.68% decrease in the long term demand for imports and vice versa. Also, the import price index now generates a negative and significant effect on the demand for imports. Thus, a unit percentage increase in the import price index will lead to a 0.20% long-run decline in import demand. Further, government consumption expenditure now has a positive and significant effect on import demand, while household consumption exerts a negative and insignificant long-run effect on the demand for imports. Therefore, a unit percentage increase in government consumption expenditure will lead to a 113.76% increase in import demand in the long run and vice versa.

Income now yields a positive and significant long-run effect on import demand, while trade openness exerts a negative and insignificant long-run effect. Thus, a unit percentage increase in real income will lead to a 186.41% increase in import demand in the long-run and vice versa. This, therefore, supports the argument that as income rises, consumption will be stimulated. With domestic production not being able to contend with the surge in consumption, importation is inevitable. The paper recommends the need for boosting domestic production so as to contend high level of Import that may have a detrimental effect on our external reserves. With production being stimulated, most of the commodities that are imported will be produced locally and even for export. In this way, our domestic currency will appreciate, and the exchange rate problems facing the country will be drastically reduced.

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