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Devaluation and Trade Balance in Nigeria: A Test of Marshall-Lerner Condition

Olugbon Bamidele Sulaimon
Department of Economics, University of Nigeria

Omotosho Omotunde
Department of Economics University of Nigeria

Babalola Bolaji Haorayah
Department of Business Administration, Osun State University, Nigeria

Abstract
This paper concentrates on devaluation and trade balance in Nigeria, specifically testing whether or not the Marshall-Lerner condition holds for Nigeria. The research empirically investigates the impact of devaluation of exchange rate on Nigerian trade balance. The Johansen cointegration and the error correction methodologies were employed to investigate the longrun and shortrun effects of the devaluation/depreciation of exchange rate on the balance of trade. The results indicate that all the variables are integrated of the order 1(1). An estimation of the cointegrating equation showed that there is a longrun negative relationship between the trade balance and real exchange rate in Nigeria. This means that an increase in the REXR (appreciation in the local currency) results in a deterioration in the trade balance, when all things are held constant. Likewise, a decrease in the REXR (depreciation in the local currency) results longrun improvement in the trade balance, when everything else is held constant. This provides evidence that the Marshal Lerner condition holds. Hence, factors leading to exchange rate depreciation of the naira needs to be monitored closely. High interest rate differentials in favour of Nigeria will induce large capital inflows, which is good for investments

Introduction

Every nation depends on international trade and payments, and the balance of payment reflects the performance of an economy in relation to the rest of the world. Devaluation has become inevitable in view of the recurring deficit in the balance of payment and as alternative policy option available to improve balance of trade (Danmola, Akonji, Wakili, & Sakiru, 2013). Currency devaluation is a stabilization policy measure, which some countries undertake to harness the competitive situation of the economy, by reducing imports and fostering exports of goods and services with the aim of impacting positively on the balance of trade. At theoretical level, it worsens trade balance situation initially, but with time, it starts to show positive impact until long-run equilibrium is achieved (Sibe, Nembo& Tafah, 2012).

The year 1986 was a transformational year in the exchange rate policy of Nigeria and it was characterized by the introduction of the Structural Adjustment Program (1986) that was put in place to address the structural imbalance in the economy in order to attain a structural transformation in the economy (Omojimite & Akpokodje, 2010). By 1994, the federal government fixed the exchange rate at $22 to a US dollar which implies a shift from the flexible regime of 1986. The foreign exchange market was liberalized in 1995 and it saw the introduction of Autonomous Foreign Exchange Market (AFEM) for sale of foreign exchange dedicated to this market by government as well as purchase of foreign exchange by the Central Bank of Nigeria (CBN) from the oil companies. An Inter-Bank foreign Exchange Market (IFEM) was introduced on October 25, 1999. The operation of the IFEM, however, experienced similar problems and setbacks as the AFEM. The CBN thus, re-introduced the Dutch Auction System (DAS) to replace the IFEM (Omojimite & Akpokodje, 2010).

The decade of 1970s witnessed an increase in research emphasis in the assessment of the impact of currency depreciation on the trade balance of nations and a large body of literature aimed at examining the success of competitive devaluation policy as a cure to trade imbalances (Harberger, 1950; Meade, 1951; Alexander, 1952, 1959 & Mundell, 1968). The more recent ones include (Bahmani-Oskooee & Asle, 1995; Upadhyaya & Dhakal (1997); Kale (2001); Bahmani-Oskooee, (1985) among others.

Nigerian economy has experienced substantial structural changes since the country gained independence in 1960. The country has been battling with series of economic problems, most of which defied conventional solutions. Some of the problems are to correct external imbalance, domestic inflation, unemployment and anomalous import content of the productive as well as the consumption activities given the low export content of the nation. Evidence shows that there was a rapid trade imbalance (deficit) in the federal government current account.

The economy's high import dependence on raw materials and finished goods worsened the situation which marked the beginning of economic crisis in Nigeria. As a result of this, the government set up the National

Economic Council (NEC) in 1983. The expert report on the state of the nation was that there was the necessity to restructure the economic base and system in Nigerian economy (Riti, 2012). Despite the series of devaluations of nominal exchange rate in the fixed exchange rate regime and continuous depreciation of nominal exchange rate in the floating exchange rate regime, the external sector performance of Nigeria is still poor.

This is a manifestation of the fact that the real depreciation has not been obtained or maintained by the nominal depreciations. However, Alfred Marshall and Abba Lerner submitted that a rise in exchange rate can bring about favourable balance of trade only if elasticity of demand for exports by the rest of the world and at the same time, demand for imports by domestic residents is strong enough(e >1). Therefore, this study is of particular significance because the existence of Marshal-Lerner (M-L) relationship suggests that currency devaluation can be effective tool in improving the trade balance that is rooted in disequilibrium

This prompts the recent attempt to devalue Nigerian currency by the Central Bank of Nigeria (CBN) as prescribed by international monetary fund (IMF) during Sanusi Lamido led administration which has renewed the interest of the current researcher to further re-examine the impact of currency devaluation on country's balance of trade. In Nigeria, extensive exchange controls were applied in 1982 and this period also characterized with current account deficit of 15 percent of GDP.

With the introduction of Structural Adjustment Program (SAP) in 1986, country followed floating exchange rate system and realized the improvement in current account balance and with two years of surplus, 1996 and 1997 again in 1998 the country faced the deficit of 13 percent of GDP. After 1998, the economy enjoyed current account surplus (Omojimite & Akpokodje, 2010).In particular historical content of the Nigeria external balance, the available evidence over M-L is mixed which may send conflicting signal to policy makers. Most of the previous studies on Marshall-Lerner Condition (MLC) on Nigeria (i.e. Adeniyi & Omisakin,2010; Damilola, Rasaq, Abba & Oladipo, 2013; Aliyu, 2009; Shehu, 2007) did not formally test the validity of MLC in Nigeria, thereby giving conflicting conclusions as regards to whether devaluation can improve balance of trade or not.

Similarly, in the work of lotto (2011), though, the validity of M L C was tested and however, it was noted that some important variables were ignored (i.e. exchange rate, money supply, dummy variables to capture exchange rate regime)which might have affected his outcome. The study therefore bridge these gaps, and also examine the relationship between devaluation and trade balance in Nigeria by taking all the important relevant macroeconomic variables into consideration and the VAR model will be employed which allow for joint estimation of relationship between devaluation of exchange rate and trade balance.

The study provides answers to the following research questions; what is the relationship between devaluation of the naira and trade balance in Nigeria? Does the Marshall-Lerner Condition holds for Nigeria?

2.0 Brief Empirical Literature Review

In Nigeria, the pioneering work of Olayide (1968) analyzes the import demand model: an econometric analysis of Nigeria's Imports Trade. The study focused only on some selected commodities of Nigeria's imports between 1948 and 1964. Evidence from multiple regression models indicates that terms of trade, real income measured in terms of GDP and the index of trade restriction had fairly good estimates to improve trade balance of Nigeria.

In the same vein, Ajayi (1975) examined the econometric analysis of imports demand function for Nigeria. The result from OLS econometric technique shows that real income, relative prices, and foreign exchange were the major determinants of total Imports in Nigeria during the period of 1960 – 1970.Akinlo (1996) investigates the effect of depreciation on the Nigerian economy between 1986 and 1991. He pointed out that when the massive depreciation of the naira during the adjustment is taken into consideration, the actual profit for all categories of industries fell precipitately. When compared with 1985 adjusted values, all categories of industry showed a significant decrease. He concluded that negative relationships existed between the profit levels of the manufacturing industries generally and the movement in the exchange rate.

The higher the rate of exchange rate depreciation, the lower the rate of profit, and vice versa. He went further to tell us that the result tends to demonstrate that the exchange rate constituted a major component of the manufacturing industries production process in particular and the economy at large in general. Egwaikhide (1999) in his dynamic specification model of import determinants in Nigeria from 1953-1989 discovers that short run changes in the availability of foreign exchange earnings, relative prices, and real output (income), significantly explain the growth in total imports. In all, the author concludes that the effect of foreign exchange availability is particularly remarkable.

Furthermore, results from major components of import regression show that imports of raw materials responded significantly to foreign exchange earnings, relative prices and industrial output through an error correction mechanism. The imports of capital goods, another imports component, is highly sensitive to the dynamics of relative price. The last component of import demand, that is the consumer goods imports, is basically determined by the foreign exchange availability thereby improve trade balance

Baldwin, Skudelny and Taglioni (2005)found out that,generally, the transmission mechanism through

which exchange rate volatility affects non oilexports in Nigeria could be both from the supply and demand channels. The supply sideeffects are related to the fact that exchange rate volatility could affect input prices. Thisinduces some producers to lower output and in the face of volatile exchange rate, makes theexports less competitive.

Exchange rate volatility could also affect consumer confidence inimporting countries and thus lowers demand. It also adversely affects investment indirectlyby increasing producers' cost. MeanwhileShehu (2007) examines the determinants of import and export demand functions. The object is to empirically measure the relative strengths and weaknesses of the determinants import and export, and to examine, using the Marshall-Lerner hypothesis, the condition under which balance of payments adjustment works in the Nigerian economy.

The analytical framework employed is an econometric methodology, which encompasses wide range of tests for stationary, co-integration and specification of an error correction model. Using data obtained from the Nigerian economy covering the period of 1970 to 2004, result of over-parameterized error correction model show significant causational relationships in the two models. The Marshall-Lerner condition is said to hold in Nigeria. The absolute sum of coefficient of exchange is greater that one from the two models. Aliyu (2009) quantitatively assessed the impact of exchange rate volatility on non oil export flows in Nigeria. Empirical results showed presence of unit root at level, however, the null hypothesis of non-stationarity was rejected at first difference. Co-integration results revealed that a stable long run equilibrium relationship exists between non oil exports and the fundamental variables. Using quarterly observations for twenty years, vector co-integration estimate revealed that the naira exchange rate volatility decreased non oil exports by 3.65% while the same estimate for the US dollar volatility increased export of non oil in Nigeria by 5.2% in the year 2003.Abimbola, Adeniyi and Omisakin (2010)examined the long-run and short-run impacts of exchange rate and price changes on trade flows in Nigeria using exports and imports functions. The bounds testing (ARDL) approach to co-integration is applied on a quarterly data from 1980Q1 to 2007Q4. The results indicate that in both the short-run and long-run Nigeria's trade flows are chiefly influenced by income- both domestic and foreign-, relative prices, nominal effective exchange rates andthe stock of external reserves.

The results also reveal that in the long-run, devaluation is more effective than relative prices in altering imports demand at both baseline and augmented models. The reverse is, however, the case for exports demand. Furthermore, the sum of the estimated price elasticities of export and import demand in Nigeria exceeds unity indicating that the Marshall-Lerner (ML) condition holds thus implying that a devalued naira might hold considerable promise as the panacea to rising trade deficits.

In a similar vein**,** Ogbonna (2011)examined the empirical relationship between the real exchange rate and aggregate trade balance of Nigeria. This conjecture is founded on the Bickerdike-Robinson-Metzler (BRM) and Marshall- Lerner (ML) conditions. Empirically, the evidence for Nigeria has been inconsistent in either rejecting or supporting BRM or ML conditions. It uses the a regression model formulation which includes income and real exchange rate, so that absorption approach to balance of payments is also investigated.

The econometric procedures used to assess the impact of exchange rate variations on the aggregate trade balance are: Unit root tests (ADF and PP), Johansen and Juselius approach to estimation of multivariate co-integration system and ordinary least squares (OLS). The results suggest no co integration for the trade balance model. The results further show that depreciation/devaluation improves trade balance and that Marshall-Learn (ML) condition holds for Nigeria. This is an indication that in Nigeria, exchange rate management may be regarded as a relevant tool for balance of trade adjustment.

In contrary, Loto (2011) examines the effect of devaluation/depreciation of the Nigerian naira on the country's trade balance for the period 1986 to 2008. The study adapted the elasticity approach of the Marshall-Lerner condition to the balance of payment adjustment mechanism. The ordinary least squares (OLS) method was used to estimate the import and export demand functions. The empirical results shows that devaluation/depreciation does not improve the trade balance; since the sum of demand elasticities for imports and exports is less than unity, the Marshall-Lerner condition does not hold.

Moreover, Danmola, Rasaq, Abba, & OLadipo (2013) tested the validity of J-curve Hypothesis in the Nigerian economy; the study employs Co-integration, Vector Auto regression Estimate, Granger Causality and Variance Decomposition to analyze the hypothesis. The study found short run relationship between exchange rate devaluation and trade balance through Granger causality test and therefore confirming the existence of J-curve hypothesis i.e domestic currency devaluation has bi-directional effect on trade balance in the short-run but with little effect in the long-run and hence, the needs to diversify the sources of foreign exchange apart from petroleum sector, so as to benefit from the initial devaluation of the domestic currency, in term of increasing their exports earnings

Ogundipe, Ojeaga and Ogundipe, S. (2013)investigated the impact of currency devaluation on Nigeria trade balance using the Johansen co-integration and variance decomposition analyses from 1970-2010. The empirical results indicate that there exist a long-run stationary relationship between trade balance and its determinant- domestic income, domestic and foreign money supply, domestic interest rate and nominal exchange

rate; as employed in the study. The study concluded with important implications for policy makers because it provides evidence supporting the fact that level of money supply has a major impact on trade balance adjustment and that devaluation of the exchange rate worsens the trade balance of Nigeria in the long run. Meanwhile, the finding from this study is similar to the claim by Damoense and Agbola (2007) that a monetary expansion stimulates domestic demand and increases export demand, and thus worsen trade balance.

3.0 Methodology

Theoretical Framework

In order to provide the needed insight into the relationship between devaluation and trade balance; the study assess the effect of devaluation of exchange rate policies on trade balances in Nigeria, making use of Marshall-Lerner condition. Among the theories that explain the effects of devaluation of currency on the balance of trade (relative –price approach, income approach, monetary approach, absorption approach and elasticity approach), it is only the Marshall-Lerner condition (elasticity approach) that analyses the effects of currency devaluation on the balance of trade from a broad macroeconomic perspective. That is, unlike other theories, it takes into consideration many channels through which an exchange rate change passes to affect the balance of trade.

The condition states that, for a currency devaluation to have a positive impact on trade balance, the sum of price elasticities of exports and imports (in absolute value) should be greater than1 ($^{\eta}$xe+$^{\eta}$xe|>1),where $^{\eta}$xe and $^{\eta}$me are common notation for the elasticity of exports and imports with respect to the exchange rate respectively).As a devaluation of exchange rate means a reduction in the price of exports, quantity demanded for these will increase. At the same time, price of imports will rise and the quantity demanded will diminish.

In line with the methodology employed by Eita (2013), this study uses a vector auto-regression (VAR) model which can model time series simultaneously. Using the vector error correction model (VECM) specification, this method corrects for autocorrelation and endogeneity parametrically (Johansen, 1995). This methodology has advantage over others, such as the Engle-Granger two-step procedure, because it prevents substantial bias that takes place in OLS estimates of co-integration relations. This study explicitly takes the possibility into account by adopting a VAR model, which allows for joint estimation of relationships between trade balance and devaluation of exchange rate induced movement in Nigeria, as well as whether the price elasticity of import and export would be greater than 1. Thus, the model makes a clear distinction between the long-run and short-run effects. Also, it assumes that the information relevant to the prediction of the respective variables is contained solely in the time series data of these variables and the disturbances uncorrected.

More so, variance decomposition as an aspect of VAR is one of the most popular techniques for capturing the impulse responses and transmission of shocks among the variables. Again, the choice of regressors of the bilateral trade balance (the ratio of the values of aggregate export (x) to the aggregate import (m)) is inline with theory. Economic theory suggests that Gross domestic product(GDP), exchange rate, money supply are important determinants of a country's trade balance. This study use model developed by Tihomir (2004) based on the standard "two-country" imperfect substitutes model as specified in Goldstein and Kahn (1985) and Rincon (1998), this study specify the trade balance as a function of real exchange rate, real GDP, real money supply as follows:

$$TB = a_0 + a_1RGDP + a_2RER + a_3RMS + \varepsilon_t \quad \ldots\ldots 3.11$$

3.2 Model Specification

MODEL ONE:THE GENERAL VAR MODEL

In order to examine the nature of relationship between devaluation of naira and balance of trade in Nigeria (objective one). This study employs Sims (1980) VAR approach to multivariate time series as specified below:

Consider a VAR of order:

$$y_t = A_1y_{t-1} + A_2y_{t-2} \ldots + A_py_{t-p} + Bx_t + \varepsilon_t \quad \ldots\ldots (3.12)$$

Equation (3.1) is saying that y_t is a *k* vector of endogenous variables (for this study, vector y_t contains B*TB, RGDP, RER, RMS*) x_t is a *d* vector of exogenous variables (constants, trends and dummies), *A*1 …. *A*p and *B* are matrices of coefficients to be estimated, and ε_t is a vector of innovations or impulses or shocks. According to Sims (1980) this type of modeling estimates the dynamic relationships among variables that are jointly endogenous without the imposition of strong *a priori* restrictions. This is supported by Harris (1995). For this study, the matrix form of the VAR (k) model is specified:

$$\begin{bmatrix} btb_t \\ rgdp_t \\ rer_t \\ rms_t \end{bmatrix} = A(L)\begin{bmatrix} btb_{t-i} \\ rgdp_{t-i} \\ rer_{t-i} \\ rms_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{btb} \\ \varepsilon_{gdp} \\ \varepsilon_{rer} \\ \varepsilon_{rms} \end{bmatrix} \quad \ldots\ldots (3.13)$$

Where B*TB,RGDP,RER,RMS* are Bilateral Trade Balance, Real GDP, Real Exchange Rate and Real Money Supply (the rationale for including all these variables have discussed under the section 3.1), the last term is the structural shocks of the policy variable, and L is the lag operator.

Equation 3.13 can be transformed into its logarithm form as thus;

$$\begin{bmatrix} Lbtb_t \\ Lrgdp_t \\ Lrer_t \\ Lrms_t \end{bmatrix} = A(L) \begin{bmatrix} Lbtb_{t-i} \\ Lrgdp_{t-i} \\ Lrer_{t-i} \\ Lrms_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{btb} \\ \varepsilon_{gdp} \\ \varepsilon_{rer} \\ \varepsilon_{rms} \end{bmatrix} \ldots\ldots (3.14)$$

By converting them into log, the researcher is interested in measuring the rate of change, which wouldbe captured by the coefficients of the regressors. Where: L is natural logarithm, RGDP is real Gross domestic product, RER is the real exchange rate, RMS represents real domestic money supply. Equation 3.14 shall be estimated only if all the included variables are stationery at level form otherwise; we carry out unit-root test on the variables, as well as co-integration test. As suggested by Lutkepohl (2007) (as cited in Ilori, 2013.p.21). If the variables are integrated (stationery after differencing) but not co-integrated, then the VAR model shall be estimated in differenced form as in thus;

$$\Delta y_t = A_1 \Delta y_{t-1} + A_2 \Delta y_{t-2} + \cdots + A_p \Delta y_{t-p} + B\Delta x_t + \ldots\ldots (3.15)$$

But if the variables are integrated as well as co-integrated, then it is appropriate to estimate Vector Error Correction (VEC) model thus;

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \cdots + \Gamma_{p-1} \Delta y_{t-p+1} + \epsilon_t \ldots\ldots (3.16)$$

Where $\Pi = -(I_k - A_1 - A_2 - \cdots - A_p)$ is the error correction term of the model and the short-term parameters of the model are the $\Gamma_j = -(A_{j+1} + \cdots + A_p)$ for $j = 1, \ldots, p-1$. And Δ is the difference operator. VECM specification, this method corrects for autocorrelation and endogeneity parametrically (Johansen, 1988; 1995). This methodology has advantage over others, such as the Engle-Granger two-step procedure, because it prevents substantial bias that takes place in OLS estimates of co-integration relations.

The impulse responses and variance decompositions computed from VAR estimates are used to ascertain the reaction of trade balance to currency devaluation policy changes (regimes) and the dynamic effects of shocks on the endogeneous variables included in the model. The further analysis to variance decomposition is needed as it offers information on the relative importance or predictive content of each of the determinant variables regarding the dependent variable.

Therefore the study also specified the VAR model in equation 3.12 as follows:

$$\Delta BTB_t = \alpha_0 + \left[\alpha_1 \sum_{t=1}^{n} \Delta RGDP_{t-1} + \alpha_2 \sum_{t=1}^{n} \Delta rer_{t-1} + \alpha_3 \sum_{t=1}^{n} \Delta rms_{t-1}\right] + \sum\nolimits_{1t} \cdots\cdots 3.16a$$

$$\Delta rgdp_t = \alpha_0 + \left[\alpha_1 \sum_{t=1}^{n} \Delta btb_{t-1} + \alpha_2 \sum_{t=1}^{n} \Delta rer_{t-1} + \alpha_3 \sum_{t=1}^{n} \Delta rms_{t-1}\right] + \sum\nolimits_{2t} \cdots 3.16b$$

$$\Delta rer_t = \alpha_0 + \left[\alpha_1 \sum_{t=1}^{n} \Delta rgdp_{t-1} + \alpha_2 \sum_{t=1}^{n} \Delta btb_{t-1} + \alpha_3 \sum_{t=1}^{n} \Delta rms_{t-1}\right] + \sum\nolimits_{3t} \cdots\cdots 3.16c.$$

$$\Delta rms_t = \alpha_0 + \left[\alpha_1 \sum_{t=1}^{n} \Delta btb_{t-1} + \alpha_2 \sum_{t=1}^{n} \Delta rgdp_{t-1} + \alpha_3 \sum_{t=1}^{n} \Delta rer_{t-1}\right] + \sum\nolimits_{4t} \cdots\cdots 3.16d$$

The level of variations in trade balance from each of the endogenous regressors determines how significant or not, shocks from such variable are to the Nigerian trade balance. For instance, if shock from the exchange rate movements are important determinant of variations in trade balance Nigeria. However, selecting the appropriate lag order to ensure that residuals are serially uncorrelated, normality of the residuals in the underlying VAR is also a concern, and for these reasons the optimal lag order should be determined. The main lag selection statistics (criterions) are the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and the Hannan-Quinn Information Criterion (HQIC). Here AIC and SBC are the most popularly applied, with usually the SBC favours a lower lag order the AIC is the typical standard for determination of the lag order and is adopted for this model. To determine the lag order criterion statistic, we first of all, calculate the above criterion and determine the log likelihood (LL) estimate the underlying VAR as;

$$LL = \frac{1}{2} T\left[In\left|\sum_{i=1}^{n-1} y_t\right| - KIn(2\pi) - K\right] l \ldots \cdots\cdots (3.17)$$

Where T is the total number of observations, K is the number of variables; $\sum_{i=1}^{n-1} y_t$, Yt is the maximum likelihood estimate of $E(\varepsilon_t \varepsilon_t^1)$ the vector of residuals in equation (3.17) that has the dimension K x 1. The LL can be obtained after fitting a VAR at any lag order level, the procedure is to run a number of VARs with lag order from one to a defined maximum subject to the data frequency and the sample size, in quarterly data for example a lag order of more than 12 (three years) would be too high for a sample of 100 observations, a lag

order of 8 would be more suitable as a maximum lag order.

MODEL TWO: ELASTICITY APPROACH VAR MODEL

Following an extensive review of the literature, this section discusses the empirical model to be estimated for Nigeria. While many studies estimated export and Import demand equations without given consideration to exchange rate. Therefore this study takes note that the exchange rate is the kernel of the Marshall-Lerner condition. So, In order to capture the second objective **(to test whether Mashall-Lerner Condition applies for Nigerian economy).** The empirical models for Nigeria are estimated as follows:

$$EX = \eta + \eta_1 WY + \eta_2 RER + \mu \quad \text{.....(3.18)}$$

$$IM = \beta + \beta_1 DY + \beta_2 RER + \varepsilon \quad \text{.....(3. .19)}$$

Where ***EX, IM, WY, DY,*** **and** ***RER***are exports of goods and services, imports of goods and services, world income or GDP (importer's GDP), domestic income or GDP(exporter's GDP), and real effective exchange rate, and ε and μ are the respective error terms. In Equation (3.18), an increase in world income is associated with an increase in exports. However, according to Bahmani-Oskooee and Kara (2003), an increase in world income can be associated with a decrease in exports. This can be possible if the increase in world income is attributed to an increase in import substitutes in the rest of the world; hence, $\eta 1 > 1 < 0$. An appreciation of the real effective exchange rate is expected to decrease the country's export which means that $\boldsymbol{\eta_2 < 0}$. It is expected that in Equation (3.19), an increase in domestic income will encourage imports and the elasticity will be positive; thus, $\boldsymbol{\beta 1 > 0}$. An increase in domestic relative price to foreign prices as proxied by appreciation of the real exchange rate makes domestic products less competitive and encourages imports. This will yield a positive elasticity and $\boldsymbol{\beta 2 > 0}$

For this study, the matrix form of the export and import equation (3.18) and (3.19) models are specified as thus:

$$\begin{bmatrix} EX_t \\ WY_t \\ RER_t \end{bmatrix} = A(L) \begin{bmatrix} EX_{t-i} \\ WY_{t-i} \\ RER_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{ex} \\ \varepsilon_{wy} \\ \varepsilon_{rer} \end{bmatrix} \quad \text{.....(3.20)}$$

$$\begin{bmatrix} IM_t \\ DY_t \\ RER_t \end{bmatrix} = A(L) \begin{bmatrix} IM_{t-i} \\ DY_{t-i} \\ RER_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{im} \\ \varepsilon_{dy} \\ \varepsilon_{rer} \end{bmatrix} \quad \text{.....(3.21)}$$

Equation **3.20 and 3.21** are transformed into their logarithms forms as thus:

$$\begin{bmatrix} lnEX_t \\ lnWY_t \\ lnRER_t \end{bmatrix} = A(L) \begin{bmatrix} lnEX_{t-i} \\ lnWY_{t-i} \\ lnRER_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{ex} \\ \varepsilon_{wy} \\ \varepsilon_{rer} \end{bmatrix} \quad \text{.....(3.22)}$$

$$\begin{bmatrix} lnIM_t \\ lnDY_t \\ lnRER_t \end{bmatrix} = A(L) \begin{bmatrix} lnIM_{t-i} \\ lnDY_{t-i} \\ lnRER_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{im} \\ \varepsilon_{dy} \\ \varepsilon_{rer} \end{bmatrix} \quad \text{.....(3.23)}$$

4.0 DATA ANALYSIS AND INTERPRETATION OF RESULTS

4.1 PRE-DIAGNOSTIC TESTS

4.1.1 Unit Root Test Result

Unit-root test is a test of stationarity. A time series is said to be stationary if it has a constant mean, variance and auto-covariance. A non-stationary series, which has unit-root, suffers permanent or prolonged effects from random shocks, and regression estimation with non-stationary series will be spurious. The unit root test for stationarity is applied using the Augmented Dickey Fuller (ADF) test at 5% critical value which is frequently and widely used because of its ability to take into consideration the autocorrelation adjustments, though it has the lapses of arbitrary choice of the proper order of autocorrelation. It is with this in mind that the study further employs the Phillip-Perron (1988) method which is robust to any form of autocorrelation (Song, 1997). The result is presented below as table 4.1.1a with the null hypothesis being that the series has a unit root if the t statistics is less than the critical value (5%), otherwise the study rejects.

Table 4.1.1a: ADF Unit Test (Trend and Intercept)

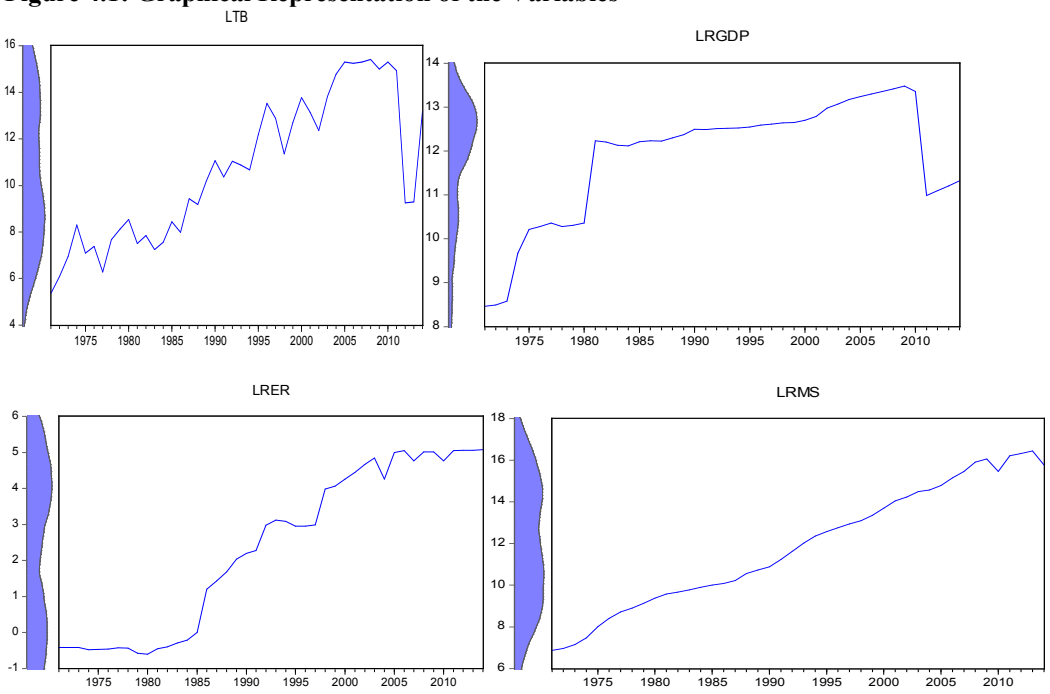
Variables	Test Statistics	Critical Values	Level of Sig	Order of Integration
TB	-6.018699	-2.936942	5%	1(1)
RGDP	-6.105281	-2.935001	5%	1(1)
REXR	-5.452700	-2.935001	5%	1(1)
RMS	-4.776791	-2.936942	5%	1(1)
EXP	-6.015500	-2.936942	5%	1(1)
IMP	-5.934777	-2.936942	5%	1(1)

Table 4.1.1b: PP Unit Test (Trend and Intercept)

Variables	Test Statistics	Critical Values	Level of Sig	Order of Integration
TB	-6.693108	-2.935001	5%	1(1)
RGDP	-6.102468	-2.935001	5%	1(1)
REXR	-5.461481	-2.935001	5%	1(1)
RMS	-4.556095	-2.936942	5%	1(1)
EXP	-5.087400	-2.935001	5%	1(1)
IMP	-4.670138	-2.935001	5%	1(1)

The tables **4.1.1a** and **4.1.1b** above indicates that balance of trade, gross domestic product, real money supply, real exchange rate, import and export variables are non-stationary at level using both Augmented Dickey Fuller and Phillips Peron test for stationary. The variables were stationary at first difference at the three critical values of 1%, 5% and 10% from the Augmented Dickey Fuller (ADF) test and Philip Peron (PP) results (see appendix).With this stationarity condition, therefore the co-integration estimation using both the Trace and Max-Eigen value tests was done to test the sufficient condition for the error correction model. The result of the co-integration is presented below as:

Figure 4.1: Graphical Representation of the Variables



Sources: Author's computation using Eview 7.0

4.2 COINTEGRATION RESULTS

TABLE 4.2.1a: Cointegration results for the Trade Balance

hypothesized No. of CE(s)	Eigenvalue	trace Statistic	0.05Critical Value	Prob.**
None *	0.729748	89.39044	47.85613	0.0000
At most 1 *	0.398194	35.74596	29.79707	0.0092
At most 2	0.261832	14.92532	15.49471	0.0608
At most 3	0.058657	2.478358	3.841466	0.1154

Sources: Author's computation using Eview 7.0 see appendix

Evidence of cointegration suggests that it is now appropriate to proceed to the VECM. The result of the cointegration indicates that Nigeria's trade balance equation as a function of her RGDP, REXR, RMS has 2 cointegrating factor at 5% level of significance with the assumption of linear deterministic trend in the data. This is exhibited by the value of the trace statistics greater than critical values (**89.39044>47.85613, 35.74596>29.79707**)

Table 4.2.1b : Cointegration Test Results For The Export Equation

hypothesized No. of CE(s)	Eigenvalue	trace Statistic	0.05Critical Value	Prob.**
None *	0.495071	42.97787	29.79707	0.0009
At most 1	0.251692	14.96105	15.49471	0.0600
At most 2	0.072223	3.073497	3.841466	0.0796

Sources: Author's computation using Eview 7.0 see appendix

The model of Nigeria export as a function of her GDP and EXR indicates 1 cointegrating equation at 5% level of significance with the assumption of linear deterministic trend in the data. The is shown by the value of the co integrating trace statistic greater than the critical value shown in table 4.1.2b (CV=**42.97787>29.79707**).

Table 4.2.1c : Cointegration Test Results For the Import Equation

hypothesized No. of CE(s)	Eigenvalue	trace Statistic	0.05Critical Value	Prob.**
None *	0.470544	41.55873	29.79707	0.0014
At most 1	0.240709	15.48662	15.49471	0.0501
At most 2	0.097288	3.196426	3.841466	0.0405

Sources: Author's computation using Eview 7.0 see appendix

The above clearly shows from both the Trace and Max-Eigen value that cointegration exist among the variables under consideration and this implies that there is stability in the relationships between two variables out of the three variables under consideration and it becomes imperative to estimate vector error correction model (VECM) of the variables. The model of Nigeria import as a function of her GDP and EXR indicates 1 cointegrating equation at 5% level of significance with the assumption of linear deterministic trend in the data. The is shown by the value of the co integrating trace statistic greater than the critical value shown in table 4.1.2c (CV=**41.55873> 29.79707**).

4.3: LAG SELECTION CRITERIA

LAG	LL	LR	FPE	P	AIC	HQIC	SBIC
0	-236.062	NA	2.6101	NA	12.3109	12.3721	12.4815
1	-51.8572	368.41	0.0004	0.000	3.68498	3.99107	4.53809
2	-29.3012	45.112	0.0003	0.000	3.34878	3.9974	4.88437
3	-12.8908	32.821	0.0003	0.008	3.32773	4.1235	5.54582
4	-1.92195	21.938	0.0005	0.145	3.58574	4.62644	6.48631

Sources: Author's computation using Eview 7.0 see appendix

LL: Log L
FPE: Final Prediction Error
AIC: Akaike Information Criterion
SBIC: Schwarz Bayesian Information Criterion
HQ: Hannan-Quinn Information Criterion

Table 4.3a shows that the LR, FPE, AIC and the HQ information criterion selected two lag orders, while the SBIC selects one lag order. The SBIC seems to be providing the lag length of the VAR that minimizes the information criterion as the lag selected is lower than those selected by others. Liew (2004) found that AIC was more robust in a sample of lower than 60. In this study, the number of observations is 43, thus affirming that AIC has selected an appropriate lag. Based on these reasons, the appropriate lag orders are chosen by using the AIC which selected one lag length. The lag order of one was then used to carry out the Johansen Cointegration under the null hypothesis of no Cointegration (r=0). In specifying the VAR, it is assumed that there is an intercept and trend in the Cointegration equation and that there is no trend in VAR.

4.3b: AUTOCORRELATION TEST USING LM TEST

Lag	chiz	df	prob
1	5.4228	16	0.99322

H_0 : no autocorrelation at lag order

The diagnostic table presented in table 4 shows that the null hypothesis of no serial correlation is not rejected at 1per cent level of significance

4.4 PRESENTATION OF EMPIRICAL RESULTS

The result of the granger causality test showed that some of the variables granger caused eachother while others have a unidirectional causality running from dependent to independent variable and others are without any cause-effect relationship. The implication of this is there could be bias in the estimation and the ordinary least square **(OLS)** gives inconsistence and biased estimates. However, the vector error correction model (**VECM**) econometric technique is applied to minimize the error inherent in estimation (Koutsoyianis, 1977).

4.4.1 LONGRUN DYNAMICS FOR MODEL ONE

In the previous discussion, it revealed that there seems to be a longrun run relationship among the variables included in the VAR model. This section reports the results showing the normalized cointegrating coefficients and the adjustment coefficients. The estimated longrun equation when normalized by the coefficients of the trade balance can be written as follows**:**

LTB = 5.1170 – 0.2715RGDP – 0.1015REXR - 1.0357 RMS …….. (4.1)
[-1.1478] [-0.3544] [-3.6151]**

Where the values in the parenthesis are the t- statistics of the estimated coefficients while ** denotes rejection at 5 percent level of significance**.**

Equation 4.1 represents the estimated longrun relationship between Trade Balance (TB), Real Gross Domestic product(GDP), Real Exchange Rate(REXR) and Real Money Supply(RMS). The variables are in logarithm form and therefore the coefficients are interpreted as elasticities.

The estimated coefficient of RGDP which is -0.2715 is negative and insignificant, showing that there is a negative relationship between RGDP and TB. This means that a 1% increase in the RGDP will lead to -0.2715 reduction in trade balance.

The result further show that the estimated coefficient of REXR which is -0.101 is negative and insignificant, indicate there is negative relationship between REXR and TB. This means that an increase in the REXR index, which shows depreciation in the domestic currency, has a negative impact on the trade balance. This is because an appreciation in the domestic currency makes foreign goods more affordable and increases the demand for manufactured imports while exports are discouraged by the relatively strong domestic currency.

In contrast, a decline in the REXR index reflects depreciation in the currency, and could boost exports and make imports relatively expensive. Exports are boosted as depreciation raises the level of competitiveness of Nigerian goods. The net effect of a depreciating currency, which results in higher exports and lower imports, is an improvement in the trade balance. Analysis of magnitude of the coefficient shows a 1 percent rise or appreciation in the REXR of the naira leads to approximately 0.27 percent deterioration in the trade balance, put differently, a 1 percent decrease in REXR of the naira (depreciation) could improve the trade balance by 0.27 percent.

The improvement of the trade balance following exchange rate depreciation provides sufficient empirical evidence that the Marshall- Lerner condition holds, implying that depreciation in the domestic currency is effective in improving the trade balance. This conclusion will, however, be confirmed by the results of the impulse response functions.

The major focus of the study considers whether exchange rate devaluation has worsened or improved Nigeria trade balance hitherto; we shall be considering the exchange rate variable to determine the direction of relations between exchange rate and trade balance. The coefficient of exchange rate (LNNEXR) was found to induce an inelastic variation and significant at 5% level; it implies that the devaluation of Naira would cause Nigeria's trade balance to deteriorate in the long-run; this finding is similar to earlier studies conducted by Damoense M.Y and Agbola F.W, (2007); Upadhaya and Dhakal, (1996);Ogundipe, Ojeaga and Ogundipe, S. (2013)

The size and sign of the estimated coefficient for REXR is relatively comparable to other studies done on Nigeria and other developing economies. Ogbonna (2011) estimated a relatively comparable coefficient of -0.080718with regard to the estimating the long run effects of exchange rate devaluation on the trade balance of Nigeria. In his study on the impact of the REXR on Pakistian's trade balance, Shahbaz, Jalil and Islam (2010) finds that a 1 percent rise (decrease) in the effective exchange rate could worsen (improve) trade balance by 0.91 percent.

The estimated coefficient of money supply is negative and significant with 1.03, reflecting that, holding other factors constant, a 1 percent rise in Nigeria's money supply results in a greater deterioration of about 1.03 percent in the trade balance.

4.5 SHORTRUN DYNAMICS FOR MODEL I

Having investigated the longrun determinants of the trade balance, the next step is to incorporate the short run effects into the longrun. This is done by analyzing the results of the estimated VECM, which also provides the analysis of the adjustments of the cointegrated variables towards their equilibrium. In estimating the VECM, the number of cointegrating vectors and optimal lags found in the Johnson cointegrating steps are used.

Table 4.5.1a: VECM results trade balance Equation

Error correction	LTB	LRGDP	REXR	RMS
CointEq1	-0.617016	-0.194523	-0.006252	-0.153265
	(0.29979)	(0.13884)	(0.08006)	(0.02265)
	[-2.05819]	[1.40108]	[-0.07810]	[6.76634]

Sources: Author's computation using Eview 7.0 see appendix

What is important to note in the estimated VECM are the signs and magnitudes of the error correction terms which measure the speed of adjustment to longrun equilibrium. The four estimated error correction terms all have the correct negative signs(stable adjustment coefficients that move back to equilibrium) and the values of the term lies within the relevant range of 0 and -1 as required. This shows that a shock in the four variables included in the VAR model will result in the values of these variables eventually to return to equilibrium. This confirms the results of the cointegration test that all four variables have a long run relationship. The results, however, show that only the error correction terms of the LTB and LRMS equations are well defined as the estimated terms are negative and statistically significant on a 95 per cent level with t-values of -2.058 and –6.7663 respectively. The error correction terms of LRGDP and LREXR are not significant on a 95 percent level. This signifies that there will be a short run adjustment towards the longrun equilibrium trade balance values.

4.6 ESTIMATION AND INTERPRETATION OF RESULTS FOR MODEL TWO

4.6.1a: VECM RESULTS FOR THE EXPORT EQUATION

Cointegrating Equation	Cointegrating Equation 1		
LEXP(-1)	1.000000		
LWY(-1)	-1.010250 [-3.73462]		
LRER(-1)	-0.895188 [-5.81436]		
Error correction model	Δ(LEXP)	Δ(LWY)	Δ(LRER)
Cointegrating equation 1	-0.502724 [-2.85675]	0.138554 [1.08031]	-0.081995 [-1.24739]

t-statistics in [ ]

Sources: Author's computation using Eview 7.0 see appendix

Table 4.6.1a shows that an appreciation of the real exchange rate causes a reduction in exports. If real exchange rate appreciates by one percent, export will decrease by 0.89 percent. A one percent increase in world income causes export to decrease by 1.01percent. Increase in world income is associated with an increase in export vice versa. The coefficient of the error correction model is negative statistically significant which indicates that the dynamics adjust to long-run equilibrium. The proxy used to represent world income is its growth rate. The findings as per the export function shows a negative and a significant impact of the world income growth rate on the export performance. The income elasticity of export stood at 1.010. The implication of the result is that if the growth rate of world income is increased by 1% then, export performance will decrease by 0.0619%. This outcome does not conform to thea priori expectation.

4.6.1b: VECM RESULTS FOR THE IMPORT MODEL

Cointegrating Equation	Cointegrating Equation 1		
LIMP(-1)	1.000000		
LDY(-1)	-1.711841 [-3.82188]		
LRER(-1)	-0.681905 [-2.65796]		
Error correction model	Δ(LIMP)	Δ(LDY)	Δ(LRER)
Cointegrating equation 1	-0.191972 [-1.90927]	0.149634 [1.91739]	-0.069116 [-1.72541]

t-statistics in [ ]

Table 4.6.1b indicates that an increase in both real exchange rate and domestic income is associated with a risein imports. An appreciation of the real exchange rate by one percent causes import to decrease by 0.681905percent. If domestic income increases by one percent, import will decrease by 1.711841percent. The coefficient of the error correction term is negative and statistically insignificant. This indicates that there is no adjustment to equilibrium.

Duasa (2007) argues that the negative sign of domestic income supports the keynesian view that an increase in domestic income leads to a rise in the demand for foreign produced goods and adversely effects the trade balance. In addition, an increase in foreign income could lead to a rise in foreigner's demand for Nigeria

produced goods, and thus improve the domestic trade balance. The larger estimated longrun coefficient of domestic income relative to that of foreign income is accordance with the structure of the domestic manufacturing sector. The sector is a net importer. Therefore, domestic income explains a large portion of the trade balance for manufactured goods relative to the impact of foreign income.

The second objective of this study is to test the validity of Marshal-Lerner condition in Nigeria. The Marshall Lerner condition stipulate that, for devaluation of a country's currency to improve the balance of trade, the sum of the price elasticities of the import and that of the export demand

Functions must be greater than one. The kernel of estimating import and export elasticities is the Marshall-Lerner condition. From the empirical results, the absolute sum of the price elasticities of the import and export demand functions is greater than one, which is (0.895+0.681=1.576).

This means that the Marshall-Lerner condition is met for Nigeria. Devaluation of exchange rate has a significant impact on exports and imports in Nigeria. The result is consistent with theoretical expectations and comparable with those obtained in the empirical literature such as Eita (2013) in his paper, estimation of the Marshall-Lerner condition for Namibia;Stern, Jonathan and Bruce (1976) estimate the aggregate US import and export price elasticities and found out that Marshall Lerner condition was met. Chiloane, M.L. (2012) modeling the relationship between the exchange rate and trade balance in South Africa also concluded that the validity of marshal Lerner condition was tested and confirmed in south African economy

The emphasis of this research is to provide estimates of price elasticity of import and export to policy makers so that they may make more informed public policy decision. Specifically, the estimation can be used to test the ML-Condition, if they are satisfied; the estimate can be used by Nigeria to improve its bilateral trade balance by devaluing its currency vis-à-vis the partner country. The elasticities are then used to calculate the size of depreciation needed to improve the trade balance. The general consensus in the international finance is that movements in the exchange rate have direct impacts on the trade balance in the longrun.

The research empirically investigates the impact of devaluation of exchange rate on Nigerian trade balance. After the literature review in the area, the theories have been carefully looked into and therefore discover that absorption approach, which is the other component of the Keynesian approach, emphasizes national income and expenditure as determinants of trade flows. In achieving the objectives of this thesis, the elasticity approach was adopted and therefore, part of the objectives has been the testing for the validity of the Marshall-Lerner condition in Nigeria balance of trade.

The Johansen cointegration and the error correction methodologies were employed to investigate the longrun and shortrun effects of the devaluation/depreciation of exchange rate on the balance of trade. The results indicate that all the variables are integrated of the order 1(1). An estimation of the cointegrating equation showed that there is a longrun negative relationship between the trade balance and real exchange rate in Nigeria. This means that an increase in the REXR (appreciation in the local currency) results in a deterioration in the trade balance, when all things are held constant. Likewise, a decrease in the REXR (depreciation in the local currency) results longrun improvement in the trade balance, when everything else is held constant. This provides evidence that the Marshal Lerner condition holds. Similarly, a longrun negative relationship was found between real domestic income and export. This shows that a rise in real domestic income leads to an improvement in the external sector trade balance. In contrast, a negative relationship has been found between balance of trade and foreign income. All the results found are in accordance with economic theory. The VECM results further show that about 62 per cent of the disequilibrium in the trade balance is corrected each quarter. The insights for policy making regarding validity of the *ML* condition are whether the appreciation/revaluation of domestic currency is athreat to the current account and if depreciation/devaluation as a means of restoring the current account balance can be effective. For Nigeria, the aggregate trade balance regression results indicate that the *ML* condition exists, which suggests that exchange rate management may beregarded as a relevant tool for external sector adjustments.

Empirical results from VECM model estimations; indicate that devaluation of the Naira pulls import demand and pushes export demand. The variables were found to be significant at 5% level. In the import demand function, the income variable is very significant. Its elasticity stood at -1.71. The exchange rate variable also has the expected sign -0.681 (that is, negative), and is also significant. Result of the export demand function also shows a positive and a significant impact of the world income growth rate on the export performance. Its elasticity stood at -1.01. The exchange rate variable is negative and significant. Its elasticity stood at -0.89. The study was able to test effectively, the Marshall – Lerner condition. It was proved that in the Nigerian economy, between 1971 and 2014,the Marshall-Lerner condition was met.

The implication of this is that, devaluing the Nigerian naira, will improve the trade balance of Nigeria. In the analysis so far, it has been established that the absolute sum of the price elasticities of the import and export demand functions is greater than one, when estimated at point that is **0.895+0.681=1.576>1.**

The impulse response functions show that in the shortrun, the trade balance is immediately adversely affected by individual shocks of all the three determinants. The negative impact continues even in the longrun,

except that the trade balance starts to improve in the second quarter following a shock in the income of Nigeria's main trading partners. On average, trade balance reacts more significantly to shocks in the RGDP than in real exchange rate and money supply. The immediate deterioration in the trade balance and slow pace of improvement following a shock in the REXR, reflects evidence of the existence of the J-curve theory. The longrun impact confirms that the Marshall Lerner condition holds. Similarly, the variance decomposition results reveal that fluctuations in the REXR explain a large portion of the forecast error variance of the trade balance over time when compared to the two determinants.

CONCLUSION

The study examined the effect of currency devaluation on the trade balance of Nigeria for the period 1971 – 2014. For the economy to benefit from the initial devaluation of the domestic currency in the long-run, efforts should made to diversified the economy from be mere monoculture economy and develop other sectors of the economy that can contribute to the national economy. The issue of instability in world oil market couple with the crisis in the oil producing area in the country seriously affects the volume of revenue accrued to the country.

More so, the devaluation of currency ordinarily would increase the volume of exports but quite unfortunately, the country only relied on oil sector but the price of the product and the quantity to be produced were determined by Organization of petroleum exporting countries (OPEC). This necessitates the need for to open-up other sectors of the economy and improve the export bases of the country, so as to benefit from the initial devaluation of the domestic currency.

The results indicate that an increase in world income causes exports to increase. Real exchange rate appreciation makes domestic goods less competitive and hurts exports. The results also indicate that increase in domestic income and appreciation of the real exchange rate cause an increase in imports. The summation of import and export elasticities is greater than one which provides evidence that theMarshall-Lerner condition holds for Nigeria. Changes in the exchange rate have significant impact on both imports and exports.

Therefore, the data supports the Marshall-Lerner-Robinson condition. Relevant literature has concluded that less developed countries, and African nations (Nigeria in particular) are too heavily dependent on imports to improve the trade balance with currency depreciation.

The negative sign of the import price elasticity indicates that the overall expenditure on imports increases the currency depreciates, even though imports would become relatively more expensive. This occurs when the overall volume of imports decreases, yet not enough to compensate for rising prices, where there is an inelastic demand. Even as the economy grows, high income elasticity for imports suggests that the trade account will worsen without compensation from growth of exports.

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