



## THE EFFECTS OF EXCHANGE RATE VARIABILITY ON TRADE FLOWS IN NIGERIA: A COINTEGRATION ANALYSIS

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### ABSTRACT

#### Article History

Received: 13 March 2017

Revised: 26 September 2017

Accepted: 14 November 2017

Published: 18 December 2017

#### Keywords

Exchange rate variability  
Real exchange rate  
Exchange rate volatility  
Real foreign and domestic income  
Cointegration  
Guided deregulation  
lagged imports and exports  
A managed floating exchange rate system.  
Stable economic growth,  
Augmented Dickey-Fuller (ADF) tests  
Trade flows

#### JEL Classification:

F10, F31, C22, C32.

This study is designed to investigate the effects of exchange rate changes (volatility or variability) and other macroeconomic variables such as real exchange rates, real foreign and domestic income, terms of trade and lagged exports and imports on trade flows in Nigeria. The study examined the long-run macroeconomic factors of exports and imports in Nigeria using Johansen cointegration tests and analysis for the period 1971 to 2011 studied. The time series properties of the data were first analyzed using the Augmented Dickey – Fuller (ADF) tests to execute unit root tests for the relevant trade indicators. The study found a long-run cointegration relationship between trade flows and their determinants. It further discovered that exports and imports exhibit varied sensitivity to exchange rate risks (i.e volatility or variability). Thus, a stable exchange rate is recommended for expansion of trade and stable growth of the national economy as persistence in exchange rate volatility would snowball into a depression if not arrested on time via application of a managed floating exchange rate regime by the central bank of Nigeria. More-so, there are other viable policy options that should be adopted by the government to stop this sliding trend like restructuring the domestic economy from consumption to production using agricultural and industrial sectors diversification. In particular, the policy of a guided deregulation of foreign exchange market is strongly recommended instead of allowing the market forces to determine the value of the domestic currency vis-à-vis other key currencies of the world. This is because foreign currency is scare and sources of its inflow is few as at present.

## 1. INTRODUCTION

Before the oil boom of the early 1970s, Nigeria was predominantly an agrarian country being sustained by the agricultural sector. Nigeria was less dependent on importation of finished goods since domestically produced substitutes were available at a reasonable price. The real exchange rate of the naira to a dollar was 0.52798 (CBN, 2005) and the naira experienced a favourable balance of payment.

The oil boom of the 1970s led to large earnings in foreign exchange. Naturally, oil revenue is very volatile due to wild oscillations in oil's spot and future US \$ price per barrel and to unpredictable changes in OPEC assigned oil quotas, of which Nigeria has been a member since 1958 following the commercial discovery of oil in Oloibiri, in Rivers State, Nigeria, in 1956. The absence of suitable fiscal rules and a proper financial management framework for oil-related risks, in Nigeria's variable oil and fiscal revenues in the 1980s and 1990s have led to boom-and-burst-

type of fiscal policies that have generated large and unpredictable movements in government deposits and current account balances (Odili, 2007). This led to the devaluation of the naira following the adoption of the structural adjustment programme (SAP) in 1986. The implication of a devalued naira is that Nigeria's foreign trade structure did not satisfy the Marshall- Lerner condition for a favourable balance of payment adjustment (Umoru and Eboime, 2013).

The Nigeria's foreign trade structure is characterized by export of crude oil whose prices are inelastic and therefore not responsive to policy instruments especially in the short-run. This scenario has led to constant depreciation of domestic currency making the purchasing power of the naira to be low compared to the dollar. One of the leading hypotheses about the forces that determine exchange rate is the purchasing power parity (PPP) hypothesis. It states that "the rate of exchange between two currencies depends on their relative purchasing power in the countries, in which they circulate, making allowance for cost of transaction and the effects of import duties or purchase taxes". The differences in the purchasing power of the foreign and domestic currency create pressure on the naira which is the weak currency, and due to the fact that Nigeria is largely an import- dependent country, there is always high demand for the dollar. This situation leads to unequal exchange rate constant depreciation of the naira and deficit in trade balance (Goldberg and Knetter, 1997; Odili, 2015).

Unequal exchange rate creates uncertainty in the trade relationship and this leads to persistent exchange rate volatility in international trade flows in Nigeria. Exchange rate volatility is a statistical measure of the tendency of the exchange rate to rise or fall sharply within a short period. It is important to understand effect of foreign exchange market behaviour. Volatility in exchange rate, whether nominal or real exchange rates, creates uncertainty in macroeconomic policy formulation, investment decisions and international trade flows among nations (Cote, 1994).

The study of exchange rate volatility and its effects on trade flows since the breakdown of the Bretton Woods fixed exchange rate system in the early 1970s continues to be actively investigated empirically and remains one of the most dominant literature in the field of international finance (Crosby, 2000).

Although there is a growing body of literature on the impact of exchange rate volatility on trade flows, empirical evidence has been ambiguous both within developed and developing countries like Nigeria and across countries (Cote, 1994; McKenzie, 1999; Jeong, 2000; Clark *et al.*, 2004; Chit, 2008). Many empirical findings support the hypothesis that an increase in exchange rate volatility leads to a decrease in trade flows because in most international transactions, goods are denominated in terms of the currency of either the exporting or importing country (Goldberg and Khan, 1985). Therefore, unanticipated variations in the exchange rate should adversely affect trade flows through their effects on profits. There are also evidences on the relationship between exchange rate volatility and trade flows, which suggests that exchange rate volatility has a positive impact on trade flows. Given such contradictions, the debate on the impact of exchange rate volatility on trade flows remains inconclusive.

It should also be noted that volatility in nominal and real exchange rate under flexible exchange rate system, is much larger than volatility in the fundamental -fixed exchange rate system (Crosby, 2000; Baum and Mustafa, 2008; Craighead, 2009). Proponents of fixed exchange rate system often argue that flexible exchange rate regime decreases volume of international trade in two separate ways. First, it exposes importers and exporters to greater exchange rate risks due to fluctuations and therefore less willing to engage in international trade. Second, they claim that unanticipated exchange rate volatility induces governments to erect either generalized or sectoral trade barriers. Such barriers will be erected in order to offset the destabilizing effects of changes in exchange rates that do not reflect changes in income, prices and other fundamental determinants of comparative advantage and trade (Abba and Zhang, 2012). However, proponents of flexible exchange rate regime disagree with the above assertion and argue that exchange rate risk can be hedged systematically and allows international trade flows without being affected.

From a policy point of view, evidence of exchange rate uncertainty adversely affect trade flows especially in developing countries like Nigeria due lack of hedging instruments which may compel governments to intervene in foreign currency markets. This is done in order to stabilize exchange rates as severe fluctuations in currencies can potentially affect the design of appropriate trade policies and thus undermine the achievement of specific economic goals such as export promotion and economic growth (Arize *et al.*, 2000; Smith, 2004; Choudhry, 2005; Bahmani-Oskooee and Hegerty, 2009).

In response to the adverse effects of exchange rate volatility, most governments through their central banks have assumed an active role in the foreign exchange market through interventions in order to limit the undesirable effects of exchange rate volatility on the economy.

In Nigeria, one of the major interventions in the foreign exchange market was the adoption of a flexible exchange rate system. As a result of the inability of the exchange control system (fixed exchange rate regime) to evolve an appropriate mechanism for foreign exchange allocation coupled with the absence of suitable fiscal rules and a proper financial management framework for oil-related risks in Nigeria's variable oil and fiscal revenues in the 1980s and 1990s which led to boom-and-burst-type of fiscal policies that generated large and unpredictable movements in government deposits and current account balances, it was discarded on September 26, 1986 while a new mechanism was evolved under the Structural Adjustment Programme (SAP), introduced in 1986 (Obiora and Igwe, 2006). The main objectives of the new exchange rate policy under the SAP were to reduce government intervention in the foreign exchange market, maintain a favourable external reserve position and ensure external balance without compromising the need for internal balance and the overall goal of macroeconomic stability (Obiora and Igwe, 2006). This development caused persistent exchange rate volatility, which yielded persistent naira depreciation over the years.

An IMF (1984) study, argued that exchange rate variability tends to induce macroeconomic phenomena that are undesirable like inflation and balance of payment problems. For instance, if exchange rate volatility leads to increased imports, trade adjustment programme that discourages import expansion could be unsuccessful. In addition, the intended effect of trade liberalization policy may be doomed by a variable exchange rate and could precipitate a balance of payment crisis (Arize, 1998).

The problems of volatility are not unknown to government, and for this, policies (monetary, fiscal and trade policies) have been formulated over time. Similarly, studies have also been carried out by Aliyu (2009); Akpan (2008); Ogunleye (2008); Obiora and Igwe (2006) to investigate the impact of exchange rate or its volatility on trade flows. Akpan (2008) investigated "the impact of real exchange rate on economic growth in Nigeria and found a positive correlation between real exchange rate and economic growth in Nigeria. Aliyu (2009) studied the impact of oil price shocks and exchange rate volatility on economic growth in Nigeria and found a unidirectional causality from oil prices to real gross domestic product and bidirectional causality from real exchange rate to real gross domestic product. The results further revealed that oil price shocks and appreciation in the level of exchange rate exerted positive impact on economic growth in Nigeria. Obiora and Igwe (2006) investigated the likely effect of exchange rate volatility on foreign direct investment in Nigeria. In their results exchange rate volatility was found to have a negative and significant effect on Nigeria's exports to the US. Adubi and Okumadara (1999) evaluated the nature and extent of prices and exchange rate volatility on agricultural trade flows in Nigeria. The results of autoregressive integrated moving average (ARIMA) and ordinary least squares (OLS) estimations indicate/that the appreciation of exchange rate and its volatility have negative impacts on agricultural trade flows in Nigeria, Ogunleye (2008) carried out an analysis of exchange rate volatility – foreign direct investment nexus in selected sub-Saharan African (SSA) countries. Both country specific time – series and panel model estimation techniques were used. The study found that exchange rate volatility generally contained foreign direct investment inflow to SSA countries. The differences these research findings imply that there still exists a gap in literature, a vacuum yet to be filled to get this unique problem solved. This has created a necessity for this study.

The present study seeks to empirically investigate the effect of volatility in naira exchange rate on trade flows in Nigeria for the period 1971 to 2011 studied, and to ascertain if there is causal relationship between exchange rate variability and foreign trade flows. By the time the study is completed we shall be in a position to find answers to the perennial questions in this all important macroeconomic sector of the Nigerian economy.

### 1.1. The Research Problem

In 1984, the international monetary fund (IMF) produced a study for the general agreement on Tariffs and Trade (GATT), on the impact of exchange rate volatility on world trade (IMF, 1984). That study was motivated by an increase in protectionist pressures, large exchange rate movements among the major currencies and a significant slowdown in world trade. The major objectives of the study are to liberalize trade by reducing the tariff structure, reduce exchange rate fluctuations, stabilize exchange rate and improve world trade. These objectives were not realized because some of these developments have reappeared notwithstanding the fact that most countries deregulated their exchange rate system. For example, the growth in world exports of goods and services declined sharply in 2001 and 2002 from its double – digit figure to take stock of the implications for currency volatility and trade of the shift from the largely fixed exchange rates among the major currencies to floating exchange rates after the breakdown of the Bretton Woods system in 1971-1973. As there have been other major developments in the international monetary system since then, it is now imperative to revisit some of the major issues raised in that study some 30 years later (Odili, 2015). Some of these developments would appear to have exacerbated fluctuations in exchange rates. The liberalization of capital flows in the last 35 to 40 years and the enormous increase in the scale and variety of cross border exports of goods and services have clearly increase the magnitude of exchange rate volatility in countries with underdeveloped capital markets and where there is not yet a track record of consistent and stable economic policies (Prased *et al.*, 2003). Currency crises in developing countries' financial markets, which have become more frequent in the last three decades than ever, are notable cases of large exchange rate volatility (WTO, 2003). This has been of particular concern to developing countries, to which Nigeria belongs, whose rising imports and depreciation of national currencies have become very worrisome in more recent times.

However, other changes in the world economy may have reduced the impact of exchange rate volatility. The proliferation of financial hedging instruments over the last 35 years or so could have reduced firms' vulnerability to the risks arising from volatile currency movements. In addition, for multinational firms, fluctuations in different exchange rates may have offsetting effects on the level of their profitability. As a growing fraction of international transaction is undertaken by these multinational firms, exchange rate volatility may have a declining impact on world trade (Odili, 2015).

Exchange rate volatility (uncertainty or risk) can either stimulate or depress trade (Bailey *et al.*, 1987; Cote, 1994). The volume of trade always is affected by exchange rate risk as prices and profits are indeterminate due to the uncertainty about the future spot rate at which transactions are to be conducted in international trade transactions. In addition, exchange rate uncertainty alters investment decisions, structure of output and distorts the pattern of trade by changing relative prices of domestic and foreign goods in specific industries (Fung *et al.*, 2006). Thus, in the absence of hedging instruments, risk- averse firms may respond by re-allocating resources towards the production of less risky non-tradeables resulting in the backward shift in the supply curve at a given price (Choudhry, 2005; Chipili, 2010).

Original theoretical models by Clark (1973); Ethier (1973); Baron (1976) and Hooper and Kohlhagen (1978) have been extended by varying the underlying assumptions in an attempt to either refute or justify the predicted negative relationship.

Accordingly, the exchange rate volatility – trade flows relationship continues to be actively investigated empirically. While the empirical focus is on verifying the theoretical validity of existing evidence, assessment of the size (magnitude) and direction of the impact of exchange rate volatility on trade remains inconclusive. Thus, the

existence of ambiguous empirical results has motivated many researchers to undertake further examination of the relationship in an attempt to establish robust and systematic empirical evidence (See (McKenzie, 1999; Clark *et al.*, 2004; Chit, 2008). Most empirical studies notably Arize *et al.* (2000); Arize *et al.* (2008); Fung *et al.* (2006); Baak *et al.* (2008); Ulugbek and Nishanby (2008) and Byrne *et al.* (2008) have found support for exchange rate volatility reducing the level of trade. In contrast, Giovannini (1988); Asseery and Peel (1991); Franke (1991); Dellas and Zilberfarle (1993) and McKenzie and Brooks (1997) have established empirical support for exchange rate volatility stimulating trade. A comprehensive survey of the literature on exchange rate volatility – trade link has been provided by Farrell *et al.* (1983); IMF (1984); Cote (1994); McKenzie (1991); UK Treasury (2003); Clark *et al.* (2004); Ozturk (2006) and Ozturk and Kalyonch (2009).

Many several factors account for variations in empirical results they include underlying assumptions in various theoretical models, sample periods studied, level of disaggregation of trade data, estimation techniques employed, countries studied and their peculiarities, and the specification of the standard trade equations: whether in volume or value terms and the choice of regressors (McKenzie, 1991; Clark *et al.*, 2004; Tenreyro, 2007). Lack of consensus on the appropriate proxy for exchange rate risk is another fundamental factor. Evidence suggests that empirical results are generally sensitive to the definition of exchange rate and measures of exchange rate volatility. Nonetheless, improvements in measures of exchange rate volatility and the effectiveness of estimation techniques have contributed to the strength of empirical results in recent years. Increasingly, most studies analyse sectoral trade flows in line with theory as opposed to aggregate trade data, use of high frequency data and alternative measures of exchange rate volatility, take into account time series properties of the data, focus on a number of industrial countries and extend empirical investigations to developing countries where the evidence is limited (McKenzie, 1999; Chipili, 2010).

Down home in Nigeria, a limited number of empirical works has been done on exchange rate volatility trade relationship. Notable studies undertaken include Ibikunle and Akhandu (2011); Oyovwi (2012) and Abba and Zhang (2012). Ibikunle and Akhandu (2011) investigated the impact of exchange rate volatility on trade flows in Nigeria using annual data for the 1970 to 2009 period. The study estimated the exchange rate with the use of generalized autoregressive conditional heteroskedasticity(GARCH). The results indicated that an inverse and insignificant relationship between exchange rate volatility and aggregate trade.

Oyovwi (2012) however, found that real exchange rate volatility has no significant effect on Nigeria's import using the Schwarz criterion and Akaike information criterion as lag length selection criterion to estimate parsimonious error-correction model (ECM). Conversely, Abba and Zhang (2012) used the Johansen multivariate co-integration technique in their study and found a positive and significant effect for the period 1970–2010 studied. Thus, the variations in empirical results, to a greater degree, have motivated the present study.

To date, relevant empirical studies do not suggest a clear-cut relationship between exchange variability and trade flows in Nigeria. Plausible reason may be due to lack of commodity disaggregation in most studies, to the time period studied, or to the fact that some studies examined only short-run effects to the neglect of consideration of its long-run impacts. Despite this lack of consensus, the prevailing economic situation in Nigeria seems to justify revisiting the question of the effects of exchange rate volatility on trade flows. The present study aims at clarifying the role of exchange rate volatility in international trade in relation to an emerging Nigerian market.

The present study promises to fill the gap in the empirical literature. It will focus attention on trade flows (exports and imports) as against either imports or exports researched separately in past studies. It will also pay special interest to sample period selection, foreign exchange rate regime switches as well as changes in the economic structure which are pertinent to international trade performance.

## 1.2. Objectives of the Study

Here, the study will state specific objectives to achieve. Specifically, the study aims at achieving the following stated objectives which are: (1) to ascertain if exchange rate volatility impacts significantly on trade flows in Nigeria; (2) to ascertain if real exchange rate impacts positively and significantly on trade flows in Nigeria, (3) to ascertain if terms of trade impacts positively and significantly on trade flows in Nigeria, and (4) to ascertain if real/foreign and domestic income impact positively and significantly on trade flows in Nigeria.

By the time the study is concluded and these objectives are achieved the paper will be in a position to discover relevant explanatory variables on which foreign trade flows depend in Nigeria to engender a stable growth of the Nigerian economy.

## 1.3. Hypotheses

Based on the relevant variables that are to be used in carrying out this research, we still formulate the following hypotheses:

1. Ho: Exchange rate volatility negatively and significantly influence the size and direction of trade flows in Nigeria.
2. Ho: Real exchange rate negatively and significantly impact on trade flows in Nigeria.
3. Ho: terms of trade negatively and significantly influence trade flows in Nigeria.
4. Ho: Real foreign and domestic income (mirrors of liquidity) negatively and significantly influence trade flows in Nigeria.

Section 2 of the work will review related literature and discuss evidence of empirical studies from past related topics, while section 3 will centre attention on methodology and model specification, data requirements and sources. Section 4 will concentrate on model estimates, analysis and discussions on results from tests. Finally, section 5 will make recommendations on findings from the study and conclude.

## 2. THEORETICAL AND CONCEPTUAL FRAMEWORK

Effects of exchange rate volatility on trade flows have been analysed in terms of risk or uncertainty. Exporters and importers are very risk-averse or less risk-averse and therefore would react differently to changes real exchange rate (Odili, 2015). Hooper and Kohlhagen (1978) and IMF (1984) postulated that if agents are risk-averse an increase in exchange rate volatility induces them to reduce the volume of trade and reallocate production towards domestic markets.

De-Gruauwe (1988) however, argued that the effect of an increase in the exchange rate will depend upon the convexity of the utility function, which will, in turn, depend on the degree of risk aversion. If agents are sufficiently less risk-averse an increase in risk associated with higher exchange rate volatility raises the expected utility of export revenue and induces exporters to export more to avoid a possibility of a reduction in their revenues. The process just described is known as the income effect of exchange rate volatility. Conversely, the high risk-averse group views the increase in exchange rate variability in terms of greater risk. Meaning that more real exchange rate volatility would prompt this category of exporters and importers to reduce exports and imports, respectively, and divert resources to other sectors of the economy. This is the substitution effect of exchange rate volatility. Under these assumption, if exports increase with exchange rate volatility, the greater the income effect, and would be depressed, if the substitution effect outweighs the income effect. Ultimately, the effect of real exchange rate volatility on exports and imports is ambiguous (Cote, 1994).

At this juncture, we shall now turn attention to conceptual treatise of exchange rate volatility. In particular, the conceptual underpinning for analysing effects of exchange rate volatility on trade centres on J-curve effect and Marshall – Lerner condition. These are discussed here under.

The J-curve phenomenon states that following a depreciation of the national currency, a deterioration of the trade balance is then followed by an improvement. At the moment of depreciation, there is a price effect due to higher prices of imported goods. Since there are some delays in transactions, which have been ordered in the short-run. Later, when traders have had some time to change their import strategy, they integrate their losses in competitiveness vis-à-vis goods produced abroad. This will provoke a quantity effect: the volume of imports is then adjusted downward while local production is probably increased to satisfy prevailing demand. In this way, adjustment to quantities traded is slower to adjust than are changes in relative prices. It is expected therefore that the final effect in the long-run is a net improvement in the trade balance. This phenomenon is known as the J-curve effect because when a country's net trade balance is plotted on the vertical axis and time is plotted on the horizontal axis of a graph the response of trade balance to devaluation looks like the curve of the letter J (see (Umoru and Oseme, 2013; Odili, 2015)).

On the other hand, the Marshall-Lerner condition states that for a currency depreciation to have a positive impact on trade balance, the sum of price elasticity of exports and imports in absolute values must be greater than one. This follows from the fact that, a depreciation in the price of exports, will lead to an increase in the quantity exported and at the same time, the price of imports will rise and their quantity demanded will diminish.

The net effects of these two concepts or phenomena is that greater quantities of exports at lower prices and diminished quantities of more expensive imports depends on imports and exports price elasticity. If exported goods are price elastic their quantity demanded will increase proportionately more than the decrease in price and total export revenue will increase. Similarly, if goods imported are elastic, total import expenditure will decrease. Greater exchange rate volatility will place significant adjustment costs on trade flows and as such will send conflicting signals to investors as it creates uncertainty about their profits. Conversely, lower volatility of the real exchange rate implies greater certainty about this important relative macroeconomic price (Kent and Naja, 1998).

From the foregoing conceptual framework, Treatise of the topic in hand, we shall make quick to assert that these known concepts of exchange rate volatility and devaluation hardly hold water in an emerging market economy of sub-Saharan African country, Nigeria. At best, they partially work in a Nigerian rentier economy that depends solely on a mono product (crude oil) export, as her major export commodity and foreign exchange earner. To reiterate, Nigeria is a mono product (oil) exporting nation, volatility of its price and control of its output are determined at the international oil market, hence its price is inelastic. In more recent times, Nigeria has faced the problem of continued decline of her domestic currency, the naira, with \$1 exchanged for almost ₦490 as at 31<sup>st</sup> December, 2016. This problem of exchange rate volatility, in has directly affected Nigeria's total exports and imports of goods and services over the years. Worse still, Nigeria depends on importation for most of her consumptive and productive goods and services, and she needs massive supply of foreign exchange resources. Nigerian foreign exchange resources have depleted in recent times partly due to dwindling crude oil price at the global market and partly due to disruption of crude oil production in Nigeria as a result of the activities of the Niger Delta militants who constantly blew up oil pipelines in their agitation for resource control (Odili, 2015). As long as the demand for foreign exchange exceeds the supply, the domestic currency would continue to depreciate thereby rubbishing known concepts and theories of exchange rate volatility and or depreciation as opposed to their workability or otherwise in the industrialized worlds of America and Western Europe. Being so, this study shall come up with a working conceptual framework for Nigeria that encapsulates its peculiarities which will help in the management of her foreign exchange market.

It is therefore conceptualized that a policy of guided (managed floating) exchange rate system for Nigeria. It states that a country which has a mono product (crude oil) as its major export commodity and foreign exchange earner or has a limited number of goods and services to export at the international market should adopt a policy of guided deregulation for its foreign exchange market instead of allowing a full deregulation of exchange rates. Full deregulation allows market forces (forces of demand and supply) to fix exchange rate for a country's currency with

other key currencies as well as full devaluation of the local currency. This is because in a situation whereby market forces are left to fix its exchange rates and that country goes to the global market without having sizable domestically manufactured (produced) goods and services to sell to the outside world, adopting a total (100 percent) deregulation policy devoid of a managed floating exchange rate system, that nation will likely experience substantial devaluation (erosion) of her local currency exchanging with other key currencies of the world. However, this trend if allowed to continue would not have a positive and significant impact on her total exports of goods and services since there are not enough goods and services to market at the international market, in the first place. Invariably the devaluation bid would neither lower the prices of locally produced goods serving as substitutes for imported goods nor would it influence the prices and supply of her mono product export, since these have been fixed at the global the crude oil market by the organization of petroleum exporting countries (OPEC). Besides, crude oil price is inelastic (Odili, 2007). In the face of this, Nigeria would face the problem of a double jeopardy in that her prices of both imported goods and services are high. Secondly, prices of domestically manufactured (produced) goods are equally high because imported raw materials at high costs were used in manufacturing them.

Therefore, a country that does not have much goods and services to sell at the international market should adopt a policy of guided deregulation for her foreign exchange market instead of allowing market forces to fix its foreign exchange rate with other key currencies so as to avoid total erosion of value of her domestic currency to the negative implications (consequences) for that country's exchange rate volatility, high domestic inflationary pressures and unstable growth of the economy. After all nation truly abandons her currency unregulated to the oscillations or vagaries of market forces to fix her exchange rates in the real sense of the practice of deregulation.

## 2.1. Theories of Exchange Rate Behaviour

Views on how the rate of national currencies, are determined, are varied. Over the years economists have attempted to explain what determines the rate at which one currency exchanges for another. These views have culminated into different approaches, theories or models with which we can try to identify or isolate any functional or causal relationship between the exchange rate and some other macroeconomic variables. There have been basically, two different theories or approaches to exchange rate behaviour: the elasticity and monetary approaches.

### 2.1.1. Elasticity Approach

Elasticity explanations of the behaviour of exchange rates stress on trade flows as the basic determinants of exchange rates. The theory links the demand for foreign exchange to the demand for foreign goods and services. Under the model, the balance of payment (BOP) especially the current account balance, is used as a measure of the forces of demand and supply of foreign exchange. For example, a surplus in a country's balance of payments indicates that the supply of foreign currency exceeded the demand for it. In the absence of any other transactions in the balance of payments, this balance will tend to put pressure on the price of foreign currencies against the domestic currency and cause their values to depreciate vis-a-vis the local one. The main trust of this approach is the substitution effects in consumption and production induced by relative price changes resulting from exchange rate devaluation.

Another aspect of elasticity approach to balance of payment - exchange rate relationship is the Marshall-Lerner (ML) condition (Marshall, 1923; Lerner, 1944). The theory states that when a country devalues its currency, the domestic prices of its imports are raised and the foreign prices of its exports are reduced. Thus, devaluation helps to improve BOP deficits of a country by increasing its exports and reducing its imports. But the extent to which it will succeed depends on the country's price elasticities of domestic demand for imports and foreign demand for exports. The main substance of Marshall -Lerner condition is that when the sum of price elasticities of demand for exports and imports in absolute terms is greater than unity, devaluation will improve the country's balance of payments.



A variant of the elasticity approach is the purchasing power parity (PPP) hypothesis. This is one of the leading hypotheses about the forces that determine exchange rate. It states that "the rate of exchange between two currencies depends on their relative purchasing power in the countries, in which they circulate, making allowance for costs of transactions and the effects of import duties or purchase taxes." There are two versions of the PPP hypothesis - the absolute and the relative versions (Caves and Jones, 1981).

The absolute version follows directly from the "Law of one price". This law proposes that perfectly competitive market causes a particular good to sell everywhere at the same price. However, many market imperfections exist and these could make the absolute purchasing power parity to be unrealistic. But, it may still hold in its relative version. The relative version of PPP relates changes over time in an equilibrium exchange rate to changes in a country's relative price levels. In other words, the relative version of the hypothesis in practice, presupposes a comparison of relative inflation rates among countries (Olukole, 1992). Olukole further explained that for a country, as a whole, the PPP involves comparing aggregate inflation rates or aggregate changes in prices. To determine exchange rate at this aggregate level, the PPP postulates that if the inflation rate in a given country accelerates relative to other countries, the country's currency would tend to depreciate relative to the other countries. This means that a relatively high internal price level will tend to bring about a depreciation of the currency on the foreign exchange market, just as a fall in price internally would tend to cause it to appreciate (Ndiomu, 1993).

### 2.1.2. The Monetary Theory

The monetary theory of exchange rate determination is one of the most recent. It is indeed a very popular model that has generated a lively debate in international economics and finance. The theory is last in the well-known tradition of the monetarists or the monetarist school, which regards money as the major prime mover in an economy. Thus, the monetary approach, as it is sometimes called, directs attention to the money stock as a primary determinant of the level of exchange rates. Its major thrust is the assertion that exchange rate fluctuations are largely explicable in terms of variations in the relative supplies of national currencies. Within the context of this view point, the monetary approach suggests that the money supply could be used to forecast movement of exchange rates, and that there exists an observable causal relationship between exchange rates and changes in money supply.

Levacic and Rebmann (1982) pointed out that by the monetarists model, changes in economic variables affect exchange rate through their impact on the demand for and supply of money balances. The theory thus stresses the view that the supply of and demand for money are strong forces in determining a country's external position. An increase in the demand for a country's money will lead to surpluses in the balance of payments while an increase in the supply of money, all things being equal, will give rise to deficits.

The monetary approach concerns itself with the deficit on monetary account, which in principle, consists of the items that affect the domestic monetary base (Ardalani, 2003). The approach emphasizes the monetary aspects of the balance of payments and looks beyond merchandise trade and incorporates the important role of financial assets (Odili, 2007). The main thesis of the monetary approach to exchange rates is that a country's exchange rate dynamics is essentially a monetary phenomenon, and that any observed disequilibrium in the balance of payments can be eliminated through an adroit manipulation of monetary variables especially domestic credit under controlled exchange rate, absence of sterilization by the monetary authorities, and stable demand for money function (Akpansung, 2013). It treats the supply of money as endogenous by assuming a feedback from the balance of payments through changes in international reserves to changes in the money and monetary liabilities of the central bank.

Under this approach, money market disequilibrium is seen as a crucial factor provoking balance of payment disequilibrium. Imbalances in the balance of payments will restore, equality between the demand for and supply of money in the absence of official intervention. This implies, however, that external disequilibrium is transitory and will self-equilibrate in the long-run (Johnson, 1976; Duasa, 2005; Vegh, 2011).

## 2.2. Evidence from Study

Empirical evidence regarding the impact of exchange rate volatility on trade flows is mixed. The impact differs across countries, sectors, and commodities such that no consensus exists (Cote, 1994; McKenzie, 1999; Clark *et al.*, 2004).

Trade models are conducted on both aggregate and sectoral trade data mostly on developed countries. However, increasing interest in developing countries has emerged in recent years. Time - series and panel data techniques have been used. While the use of aggregate trade data is permissible due to data limitations, it however, contradicts the micro-foundations of theoretical models that focus on firm behaviour (Clark, 1973; Ethier, 1973; Baron, 1976). Aggregate trade data restrict elasticity of income, price and exchange rate to be equal across sectors and commodities which is empirically refuted (Doyle, 2001; Devita and Abbot, 2004; Munyama and Todam, 2005; Ardalani and Bahmani-Oskooee, 2006).

Bahmani-Oskooee and Kovyryalova (2008), investigated the impact of exchange rate volatility on trade flows. Rather than use aggregate import and export data between one country and the rest of the world, or between one country and her major trading partners, they concentrated on 177 commodities traded between the United States(US) and the United Kingdom (UK) and employed co-integration and error-correction techniques to analyse the data covering 1971 - 2003 period. The results revealed that the volatility of the real bilateral dollar - pound sterling rate has a short - run significant effect on imports of 109 and exports of 99 industries. In most cases, such effects are adverse. They also found that the number of significant cases is somewhat reduced in the long-run with imports of 62 and exports of 86 industries which were significantly affected by the exchange rate volatility. They concluded that, in most cases, the effect is negative supporting the proponents of floating rates. It then means that a managed floating exchange rate system could halt its adverse effects on trade.

Bahmani-Oskooee and Wang (2008) investigated whether a country's comparative advantage commodities are adversely affected by exchange rate volatility. They decomposed bilateral exports and imports between two countries into industry level and concentrated on one of the major trading partners of Australia, the US, and employed data from 107 industries that engaged in trade between the two countries. They equally used a methodology that distinguished the short-run effects from the long-run effect.

The empirical results showed that exchange rate volatility has short-run negative and significant effects on imports and exports of majority of the industries for which data was available in 60 percent of the cases considered. However, the short-run effects spanned into the long-run only in the limited number of industries, though number of US importing industries affected in the long-run were found to be almost twice as many as US exports by industries. Alternatively, exchange rate volatility adversely affected Australian exports to the US more than it had affected her imports.

Bah and Amusa (2003) examined the effect of real exchange rate volatility on South African exports to the US for the period 1990-2000 using ARCH and GARCH models. They found that the Rand's real exchange rate volatility exerted a negative and significant impact on exports both in the long and short-run.

A similar study by Aziakpono *et al.* (2005) extended the work of Bah and Amusa (2003) over the period 1992 to 2004 by employing EGARCH method proposed by Nelson (1991) as a measure of variability of exchange rate. His results confirmed findings of Bah and Amusa (2003).

Todani and Munyama (2005) however used ARDL bounds testing procedure on a quarterly data for the period 1984-2004 to examine the impact of exchange rate variability on aggregate South African exports to the rest of the world as well as on goods, services and gold exports.

Their results showed that depending on the measure of variability employed, either there existed no significant relationship between South African exports and exchange rate volatility or when such significant relationship existed, it was positive.

Broad and Romalis (2003) looking at the effects of exchange rate volatility on dis-aggregated trade flows, found that volatility decreased trade in differentiated products relative to trade in commodities, although the effect was rather small, eliminating all real exchange rate volatility would increase trade in manufactured goods by less than 5 percent and total trade by less than 3 percent. In conclusion, they noted that developing countries would experience a more pronounced increase in trade due to the fact that they were more prone to volatile exchange rate than the developed countries.

Sabuhi and Piri (2008) and Abolagba *et al.* (2010) explored the effects of exchange rate, export volume, domestic saffron production on price of saffron, Iran's major non-oil export goods in the short and long-run. Employing autoregressive Distributed lag (ARDL) model showed that appreciating exchange rate had significant negative impact on export price of saffron while there was no significant relationship between export price and domestic production of saffron in the long-run.

Some studies have examined the effect of exchange rate changes on trade at the sectoral level. Mindful of the Marshall-Lerner condition, Houthakker and Magee (1969) estimated price elasticity for different commodities in the United States. They found that price elasticity (changed) was low for raw materials but high for finished commodities. Carter and Pick (1989) examined the J-curve effect for US trade in agricultural goods. They pioneered research on the pass-through effect of exchange rate changes on agricultural exports and imports, and the net impact on the ^agricultural trade balance. They found evidence of the price effect of the J-curve in which depreciation led to a decline in the agricultural trade balance. The quantity effect, however, was only partly explained by the J-curve effect.

Odili (2015) found a J-curve effect only for agricultural goods, but not for manufacturing, using US data for 1977 to 1991. This could explain why some studies that used aggregate data failed to support the J-curve hypothesis - perhaps the J-curve effect, did not apply overall. Indeed, Hsing (1999) examined US trade with seven South African trading partners over the last 20 or 30 years. According to the countries studied, he showed that a J-curve existed for Chile, Ecuador and Uruguay while a lack of support was found for Argentina, Brazil, Colombia and Peru. These findings therefore suggested that the conventional wisdom of pursuing real exchange rate depreciation in order to improve the trade balance may not apply in some countries.

Umoru and Oseme (2013) explored the J-curve effect based on Nigerian data by adopting the vector error-correction methodology. The results of the study indicated a cyclical feedback between the trade balance and the real exchange rate depreciation of the naira. However, the analysis found no empirical evidence in favour of the short-run deterioration of the trade balance as implied by the J-curve hypothesis. Rather, what was empirically supported was the cyclical trade effect of exchange rate shocks. This implied real exchange rate shocks would initially improve, then worsen and then improve the country's aggregate trade balance which when correlated with real depreciation provided no support for the J-curve hypothesis in the Nigerian trade balance. It then means that short-run predictions of the J-curve were not observable in Nigeria.

Isitua and Igwe (2006) investigated the effects of exchange rate volatility on US -Nigeria trade flows using GARCH modelling, co-integration, error-correction apparatus and variance decomposition on data for the period 1985 to 2005. These authors found that exchange rate volatility had a negative and significant effect on Nigeria's goods exported to the US. In line with the theoretical expectation, US GDP exerted a positive effect on Nigeria's exports but curiously, the effect was not significant in the export function. As such Nigeria, should beef up her total of goods and services to the United States.

Oyinlola *et al.* (2010) examined the long-run and short-run impacts of exchange rate and price changes on trade flows in Nigeria using export and import functions. The bounds testing (ARDL) approach to co-integration was applied on a quarterly data from 1980Q1 to 2007Q4. The results revealed that in both the short-run and long-run estimates Nigeria's trade flows were chiefly influenced by income both domestic and foreign, relative prices, nominal effective exchange rates and the stock of external reserves. The results also showed that in the long-run,

devaluation was more effective than relative prices in altering imports demand at both baseline and augmented models. The reverse was, however, the case for exports demand. Furthermore, the sum of the estimated price elasticity of exports and imports demand in Nigeria exceeded unity indicating that the Marshall-Lerner condition holds thereby implying that a devalued naira portend a panacea to rising trade deficits of the country.

In sum, the extent to which exchange rate volatility affects trade depends critically on underlying model assumption. Key among the assumptions include the type of market structure in which firms operate, their attitude towards risk, currencies in which prices of exports and imports are denominated and the existence of hedging facilities to cover exchange rate risk.

### 2.3. Overview of the Exchange Rate Policies in Nigeria

Exchange rate is an important economic variable as its appreciation or depreciation affects the performance of other macroeconomic variables in the economy (Hashim and Zarma, 1996). Its value can be used to assess the overall performance of an economy. It is therefore a very important variable in policy decision-making of a country.

Any government at any point in time seeks the stability of the exchange rate because it provides economic agents the opportunity to plan ahead without fear of varying costs and prices of goods and services. On the other hand, instability of exchange rate can cause negative distortions in an economy. Nigeria started witnessing exchange rate instability in 1986 following the implementation of the government structural adjustment programme (SAP) coupled with the deregulation of the foreign exchange market as a result of supply constraint (Hashim and Zarma, 1996). The country's exchange rate policy has been aimed at preserving the external value of the domestic currency and maintaining a healthy balance of payments position, which indeed is a major provision in the enabling law (Sanusi, 2004).

The problem of foreign exchange market, which Nigeria is currently facing has much to do with the gap that exists between supply of foreign exchange and its demand (Odili, 2015).

The failure of the economy to supply enough foreign exchange to meet the demand forced the government to resort to rationing the available foreign exchange and this has led to speculative hoarding and the development of a parallel market. All these abnormal activities have caused instability of the exchange rate in Nigeria. Broadly, Nigeria adopted two exchange rate systems, the fixed and flexible exchange rate system (Olukole, 1992).

#### 2.3.1. The Fixed Exchange Rate System

Since independence in the 1960 up to 1986, Nigeria has adopted fixed exchange rate policy. This means that the government administratively determined the value of our local currency, the naira in foreign currencies. The system used in determining it was that of maintaining parity with pound sterling, using gold content of the Nigerian pound sterling which was 2.48824 grams, and it was later reduced to 1.24414 grams of fine gold as a result of the change of the Nigerian pound to Naira (Hashim and Zarma, 1996).

As a result of the crises that occurred in the international financial system, which led to the devaluation of dollar and the suspension of convertibility of dollar in gold in 1971-1974, the gold content approach was changed to dollar peg in Nigeria. With this approach, the U.S dollar to naira exchange rate was fixed at U.S dollar 1.52 to Nigerian naira 1.00 (Hashim and Zarma, 1996). Subsequently, the currency was pegged against a basket of currencies (Dutch Mark, Swiss Francs, French Francs, Dutch Guilder, Japanese Yen and Canadian Dollar) in 1976. The import-weighted basket approach was adopted in 1978. The weights were based on their relative shares of the countries whose currencies were included in the basket as per 1976 total imports. These currencies include the U.S dollar, the pound sterling and those in the basket of currencies approach (Hashim and Zarma, 1996).

In 1985, following the complaint by the international monetary fund (IMF), that there was high incidence of Nigeria naira exchange rate quotation rising above the stipulated 2 percent limit, the currency intervention system was adopted. Following the adoption of this system the naira exchange rate was quoted against a single

intervention currency (dollar) reducing the degree of divergence and with a nil arbitrage position vis-a-vis the U.S dollar and the pound sterling (Hashim and Zarma, 1996).

### 2.3.2. The Flexible Exchange

As a result of the economic crises which the Nigerian economy was witnessing and which was characterized by dwindling foreign exchange earnings and a serious deficit in the nation's balance of payments with an observed overvaluation of the naira, in September 1987 the naira was allowed to float, so as to overcome the problems affecting the economy.

The structural adjustment programme (SAP) was recommended for the economy, and the process was characterized by the deregulation of the Nigerian economy including the foreign exchange market. The floating of the exchange rate referred to as the second-tier foreign exchange market (SFEM) was in operation using dual exchange rate regime; that is the first and the second-tier exchange markets. The first-tier foreign exchange market was applicable to debt service payments, embassy expenses, subscription to international or pre-SFEM transactions, while the second-tier foreign exchange market was applicable to all transactions except those covered under the first-tier (Hashim and Zarma, 1996).

The transitory dual exchange rate system (first and second-Tier) metamorphosed into the Foreign Exchange Market (FEM) in 1987. Bureau de Change was introduced in 1989 with a view to enlarge the scope of FEM. In 1994, there was a policy reversal, occasioned by the non-remitting pressure on the foreign exchange market. Further reforms such as the formal pegging of the Naira exchange rate, the centralization of foreign exchange in the Central Bank of Nigeria, the restriction of Bureau de Change to buy foreign exchanges as an agent of Central Bank of Nigeria, etc. were all introduced in the foreign exchange market in 1994 consequent upon the volatility in exchange rate. Still there was another policy reversal in 1995 to that of a guided deregulation recommended to Abacha regime by Uremadu (1994) in a memo submitted to the Federal Government via Office of Secretary to Government while Chief Anthony Anini was the Federal Minister of Finance. It was adopted by the Federal Executive Council (FEC) for implementation. This necessitated the institution of the Autonomous Foreign Exchange Market (AFEM) which later metamorphosed into daily two ways quota Inter-Bank Foreign Exchange Market (IFEM) in 1999. The Dutch Auction System was reintroduced in 2002 as a result of the intensification of the demand pressure in the foreign exchange market and the persistence in the depletion of the country's external reserves. Finally, the Wholesale Dutch Auction system (WDAS) was introduced in February 20, 2006. The introduction of WDAS was also to strengthen the foreign exchange rate of the naira. Since the introduction of Wholesale Dutch Auction System (WDAS) on February 20, 2006, the liberalized foreign exchange market witnessed unprecedented stability most of which included the following: Unification of exchange rates between the official and inter-bank market and resolution of the multiple currency problems and facilitation of greater market determination of exchange rates for the naira vis-a-vis other currencies (Umoru and Oseme, 2013).

Finally, it is commonly held that trade flows are enhanced if a country switches from a floating to a fixed exchange rate regime. This is one of the main motivations for exchange rate stabilization in regional trade blocks, such as the European Union. The argument is that exchange rate volatility increases the risk of buying and selling in foreign countries. While this explanation based on risk aversion has intuitive appeal, its validity needs to be examined in a consistent framework. In particular, one must consider the overall macroeconomic uncertainty faced by firms and households and how this is affected by the choice of exchange rate system. However, this is beyond the scope of the present study.

### 2.4. Overview of Trade Policies in Nigeria

The Nigerian government like many other developing countries considers trade as the main engine of its development strategies, because of the implicit belief that trade can create jobs, expand markets, raise incomes,

facilitate competition and disseminate knowledge (WTO, 2005). The main thrust of trade policy is therefore the enhancement of competitiveness of domestic industries, with a view to stimulate local value-added and promote a diversified export base. A trade policy also seeks (through gradual liberalization of the trade regime) to create an environment that is conducive to increased capital inflows, transfers and adoption of appropriate technologies. The government pursues the liberalization of its trade regime in a very measured manner, which would ensure that the resultant domestic costs of adjustment do not outweigh the benefits. The reforms which accompany this policy direction are also aimed at re-orientation of attitudes and practices towards modern ways of doing business. However, the instrument of trade policy such as the tariff regime is designed in a manner that allows a certain level of protection for domestic industries and enterprises. An assessment of Nigeria trade policy since the 1960s reflects a trend which has been known to characterize uncertain and unpredictable trade regimes the world over. Trade policy since the 1960s has witnessed extreme policy swings from high protectionism in the first few decades after independence to its current more liberal stance (Adenikinju, 2005). Tariffs have at various times been used to raise fiscal revenue, limit imports to safeguard foreign exchange or even protect the domestic industries from competition. In addition, various forms of non-tariff barriers such as quotas, prohibitions and licensing schemes have on various occasions been extensively used to limit imports of particular items. The overall pattern portrays the long-held belief that trade policy can be used to influence the trade regime in the direction that can promote economic growth. Attempts were made to use trade policy to promote manufactured exports and enhance the linkages in the domestic economy, to increase and stabilize export revenue, and scale down the country's reliance on the oil sector (Olaniyi, 2005). Trade policies were accordingly directed at discouraging dumping, supporting import substitution, stemming adverse movements in the balance of payments, conserving foreign exchange and generating government revenue (Bankole and Bankole, 2004).

During the first decade of independence, Nigeria pursued an import substitution industrialization strategy. This involved the use of trade policy to provide effective protection to local manufacturing industries, through such measures as quantitative restrictions and high import duties. Many items were accordingly placed on import prohibition. During this period, all imports from Japan were placed under restriction. Machinery and spare parts imports were restricted and exchange controls on the repatriation of dividends and profits were enforced. Restrictions were also applied on capital goods, spare parts and non-essential imports.

From 1981, there was a policy shift towards exports promotion and a move to intensify the use of local raw materials in industrial production. However, the increase in the value of imports led to a worsening of the balance of payments (with the backdrop of the collapse in world oil prices), which forced the government to promulgate the Economic Stabilization (Temporary provisions) Act in April, 1982. Under this Act, tariffs on 49 items were raised, while a prohibition was imposed on importation of machines and frozen poultry. Further, 29 commodities were removed from the general import license regime and placed under specific license, while the use of pre-shipment inspection became widespread.

During 1983 - 1985, 152 items were brought under specific import license, and foreign exchange regulations became more stringent (Briggs, 2007). The central objective of trade policy was to provide protection for domestic industries and reduce the perceived dependence on imports, a corollary to that objective was a desire to reduce the level of unemployment and generate more revenues from the non-oil sector. Accordingly, tariffs on raw materials and intermediate capital goods were scaled down.

From 1986, there was a significant shift in trade policy direction towards greater liberalization. This shift in policy is directly attributed to the adoption of the Structural Adjustment Programme (SAP). The Customs, Excise, Tariff, etc., Consolidation Decree, enacted in 1988, was based on a new Customs Goods Classification Code (HS). It provided for a seven-year (1988-1994) tariff regime, with the objective of achieving transparency and predictability of tariff rates. Imports under the regime thus attracted valorem rates applied on the Most Favoured nation (MFN) basis. A new seven-year (1995-2001) tariff regime, established by Decree No. 4 1995, succeeded the previous (1988-

1994) regime. The tariff structure over the period 1988-2001 increased import duties on raw materials, and on intermediate and capital goods, while tariffs on consumer goods were slightly reduced. This was aimed at reducing distributions in resource allocation and combating smuggling. Both the 1988 and 1995 tariff schedules had provisions for reviews and amendments. However, then maintained the familiar mixed trends in tariff regimes. Three types of changes were subsequently common, namely, reduction in rates, increase in rates and/or removal from or addition to the import prohibition list.

Nigeria's trade policy regime currently contained in the National Economic Empowerment Development Strategy (NEEDS) and the trade policy documents, has been geared towards enhancing competitiveness of domestic industries, with a view to, encouraging local value - added and promoting as well as diversifying exports. The mechanism adopted is gradual liberalization of the trade regimes. Thus, the government intends to liberalize the trade regime in a manner, which will ensure that the resultant domestic costs of adjustment do not out-weigh the benefits. This is the fundamental basis on which to gauge the direction and implementation of policy. NEEDS is a medium -term economic strategy which was adopted in 2003. It has been described as "Nigeria's plan for prosperity, the vision for a greater tomorrow". Within this perspective, NEEDS focus on four key strategies: re-orienting values, reducing poverty, creating wealth and generating employment. These key visionary goals are, in turn, built into three major macroeconomic frameworks namely, employing people, promoting private enterprise and appropriately reordering approaches to governance. The overall long-term vision of NEEDS includes social and economic transformation of Nigeria on a sustainable and competitive basis.

#### **2.4.1. Categorizing Nigeria's Trade Policy Regimes**

In this study, we identified three broad trade episodes in Nigeria. The first corresponds to a period in which - except for the fixed exchange rate policy - trade policy in terms of tariff measures and quantitative restrictions could be described as virtually absent. In other words, the structure of tariff did not change over that time period. During the second period, quantitative restrictions became a prominent tool with exchange rate policy being absent. The final episode is the liberalization era that started with the adoption of the SAP (Adenikinju, 2005). These are discussed in turn.

##### **2.4.1.1. Period of Highly Regulated Exchange Rate Policy: 1960-1974**

At independence, Nigeria's trade policy was virtually non-existent, a trend that continued until about 1967 before the civil war. However, exchange rate measures represented a major policy instrument for controlling trade. This was in terms of allocation rather than in terms of pricing. By 1970, due to the effects of the civil war, there was cause for concern over the state of the country's external payments position. Protection of the external payments position through prudent fiscal management, as well as by enlargement of foreign exchange receipts, was therefore a major objective of policy in the 1970/71 budget. Several measures were adopted. These included the imposition of additional indirect taxes on luxury commodities in high demand, relaxation of foreign exchange controls in respect of repatriation of dividends/profits and management fees, and announcement by the government of its intention to renegotiate the petroleum profits tax agreement. Among other measures were granting of tax exemptions to exporters of manufactured goods in respect to value or volume at a defined level, in order to encourage Nigerian manufacturers to export locally manufactured goods, and scrutiny of import valuation to discourage over invoicing of imports.

Following the suspension of dollar-gold convertibility on 15 August 1971, Nigeria adopted a new system of exchange rates with effect from 23 August, 1971. Foreign exchange transactions were classified into two broad categories: contracts denominated in US dollars, and contracts dominated in British Pounds sterling. Also, the Central Bank of Nigeria maintained a fixed buying and selling rate for the naira. Hence, until 1974, exchange rate policy was the major instrument for controlling international transactions.

#### 2.4.1.2. Era of Quantitative Restrictions and Exchange Controls 1975-1986

In 1975, in order to protect the two-new motor car assembly plants in Nigeria, government placed a quota on the importation of cars under 2000cc, representing the difference between demand for such cars and their local production. This marked the beginning of the use of quantitative and stricter tariff measures to control international trade. Import duty reliefs were granted to the extent that was judged not to jeopardize the competitiveness of local industries after taking into account other reliefs in the form of reduction in excise and company profit taxes. Some trade policy measures adopted between 1976 and 1978 were designed to help decongest the seaports, conserve external reserves and moderate imported inflation (Adenikinju, 2005). The policy of appreciating the external value of the naira was continued during these years. Controls were introduced on remittances.

The heavy drain on the nation's external reserves in 1981, following excessive disbursements of foreign exchange on importation at a time when foreign receipts were declining, called for a tightening of foreign exchange measures and imposition of tariffs, thereby raising average tariff. Owing to the dangerously low level of external reserves, certain medium and long-term and exchange control measures were introduced, aimed at a structural adjustment and diversification of the country's sources of foreign exchange earnings. The trade policy component of the stabilization measure was essentially exchange control measures. In 1983, under the Economic Stabilization (Emergency Provision) Act of April (as amended in November, 1982), Nigeria undertook comprehensive exchange control measures reducing the country's foreign exchange expenditure to a level that would be compatible with its reduced foreign exchange capacity.

Generally, these measures were pursued till 1985 with slight modifications by the military junta that seized power towards the end of 1983. During this period, the ratio of private investment to GDP had nose-dived considerably. The level of economic openness was not particularly different from the previous period. Average tariff was much lower than ever before then (Adenikinju, 2005).

#### 2.4.1.3. Era of Economic Reform and Liberalization: 1987 to Date

The deteriorating state of Nigeria's economy, particularly the external reserves position (which could barely finance two months of imports) and the general scarcity of commodities (then popularly called "ESSENCO" - to mean "essential commodities"), necessitated the military junta that seized power in 1985 to adopt the "World Bank/IMF prescribed reform measures popularly called the Structural Adjustment Programme (SAP). This involved moves towards a more market - friendly trading system and the dissolution of commodity marketing boards.

The adoption of the International Monetary Fund's Structural Adjustment Programme (SAP) facilitated the deregulation of the financial market that necessitated floating exchange rate regime in the wake of 1986 and prevailed till the end of April, 1993 for its first face. During this period (1986 and 1993), the nominal exchange rate exhibited steady increases with little spike but attained its first high spike in between the end of 1991 and March, 1993. While the real bilateral exchange rate of naira to a unit of U.S dollar witnessed high deterioration within the first nine months of the commencement of floating exchange rate regime and later depreciated steadily till April, 1990, before it rose up in May, 1990, and made a downward steep from December, 1990, through the second phase of fixed and floating exchange rate regimes, to December, 2000, before making a reversal to create the first spike at the second phase of floating regime. Afterwards, the nominal and real (starting from 1999 and 2001, respectively) exchange rates of naira to U.S dollar have maintained an upward trend till date, exhibiting the ineffectiveness of the monetary authorities in stabilizing the foreign exchange rate through the demand and supply of currency, controlling excessive importation of goods and improper management of the country's external reserves to back up the weak currency. Even though, there tends to be a wide dispersion between the real and nominal exchange rates between 1986 and 2008, it started to widen up from December, 1991 and this has marked the onset of intense high



inflationary period in Nigeria, However, the series of fluctuations and spikes that the exchange rate of naira to U.S dollar witnessed all through the first and second phase of floating exchange rate regime and during the second phase of the fixed regime period prompted this study to examine the effects of exchange rate volatility on international trade during the period under review. The continued decline of Nigeria’s local currency, the naira, with \$1 exchange for almost ₦490 as at 31<sup>st</sup> Dec., 2016 has brought to the fore the problem of exchange rate volatility which affects her exports and imports of goods and services over the years. By the time the study is completed, we shall be in a position to make useful recommendations on discoveries arising from research for policy action.

### 3. METHODOLOGY

The methodology deals with model specification, data requirements and sources of data and estimation techniques. Two analytical tools will be used in the study viz: descriptive statistic and multiple regression analytical model. Multiple regression analytical models will be used to estimate the relationship between the level of foreign trade flows (exports and imports) and the identified macroeconomic factors of influence such as terms of trade (mirror of balance of payments), real exchange rate, exchange rate volatility, real foreign income, real domestic income, etc. The descriptive statistics will be employed mainly to carryout economy analysis in relation to macroeconomic variables of interest. Empirical implementation of the economic model will make use of a time series data covering 1971-2011 to determine the effects of exchange rate variability on trade flows in Nigeria. The study will apply the data to an ordinary least squares (OLS) method and Johansen co-integration tests which will incorporate an error-correction approach to conduct its investigations and analysis. The time series properties of the data will first be analysed using the Augmented Dickey-Fuller (ADF) technique to execute unit root tests for the relevant trade variables.

#### 3.1. Model Specification

The estimated trade equations that shall be used in this study are similar to [Arize et al. \(2000\)](#); [Arize et al. \(2008\)](#); [Choudhry \(2005\)](#); [Choudhry \(2008\)](#); [Chipili \(2010\)](#) and [Odili \(2015\)](#) and shall incorporate most of the recent developments in the literature noted by [McKenzie \(1999\)](#). The relevance of these models is that they fit perfectly well into the present study as they will help in pursuing the main objectives the work is set to achieve. The present study will adopt and modify them by inclusion of some relevant variables such as the real exchange rate and the associated dummy variables representing fixed and flexible exchange rate regimes.

Following broadly the approach adopted in [Chipili \(2010\)](#) and [Odili \(2010\)](#) we specify the trade functions for Nigeria in natural log form as follows:

$$\ln \text{EXPORT}_t = b_0 + b_1 \ln \text{RFI}_t + b_2 \ln \text{TOT}_t + b_3 \ln \text{REXCHR}_t + b_4 \ln \text{EXCHR}_t + b_5 \ln \text{DUM}_t + U_t \dots \dots \dots \text{Equ (3.1)}$$

$$\ln \text{IMPORT}_t = b_0 + b_1 \ln \text{RDI}_t + b_2 \ln \text{TOT}_t + b_3 \ln \text{EXCHR}_t + b_4 \ln \text{EXCHR}_t + b_5 \ln \text{DUM}_t + U_t \dots \dots \dots \text{Equ (3.2)}$$

Equations 3.1 and 3.2 are standard reduced from long-run solutions of the behavioural demand and supply functions for exports and imports, respectively, in line with [\(Goldberg and Khan, 1985; Gotur, 1985\)](#).

Where;

- EXPORT<sub>t</sub> = Total exports during time t, defined in international trade as selling goods and services produced in the home country to other markets.
- IMPORT<sub>t</sub> = Total exports during period t, defined in international trade as goods and services that are brought in from another country for sale. Imported goods and services are provided to domestic consumers by foreign producers.

$RFI_t =$	Real foreign income in time $t$ , defined as total Nominal foreign income minus Nominal foreign income multiplied by domestic inflation rate (Odili, 2015). Foreign nominal income in US dollars has been converted into the local currency, the naira.
$RDI_t =$	Real domestic income in time $t$ , defined as total Nominal domestic income minus Nominal domestic income multiplied by domestic inflation rate (Odili, 2015).
$TOT_t =$	Terms of trade in period $t$ , defined as a measure of relative price level in terms of export/import ratio or prices. Terms of trade is the value of a country's exports relative to that of its imports. It is calculated by dividing the value of exports by the value of imports, then multiply the result by 100 percent. Terms of trade of a country improves when the prices of its exports rise in comparison with the prices of its imports, vice versa. TOT is a mirror of balance of payments in the context of the present study.
$REXCHR_t =$	Real exchange in time $t$ , defined as Nominal exchange minus Nominal exchange rate multiplied by domestic inflation rate, while exchange rate is the price of one currency in relation to another.
$EXCHRv_t =$	Exchange rate volatility in time $t$ , defined as a measure of exchange rate risk faced by exporters/importers due to fluctuations in the exchange rate.
$DUM_t =$	Dummy variables representing fixed and floating exchange rate regimes within the sample period studied.
$\mu_t =$	Random error term which captures all other unknown influences (uncertainties) or factors of trade flows not stated in the model.

All variables are taken in logarithmic form hence all estimated parameters are elasticities.  $RDI_t$  and  $RFI_t$  (real domestic and foreign income) are mirrors of liquidity variables that capture demand conditions in both domestic and foreign economies, respectively. Thus, the *a-prior* expectations on  $RDI_t$  and  $RFI_t$  are positive meaning that elasticities of  $b_1$  in equations 3.1 and 3.2 can exceed unity as income picks up the effects of other factors that are related to it which cannot be easily disentangled but have influenced exports/imports increases as well. The foreign income data used is in billions of current US dollars which were multiplied by the real exchange rate to calculate the real exports and imports in Nigerian domestic currency, the naira (Odili, 2015).

### 3.2. Data Requirements and Sources

Secondary data will be used to estimate the above stated models. The data to be employed will be extracted from different sources which will include CBN (2000;2005;2010;2011) and Reports and Statement of Accounts (various), International Financial Statistics of IMF volume 2007 (various), World Bank Tables as well as the Nigerian Annual Abstract of Statistics (various), published by the Federal Office of Statistics (FOS), Abuja.

### 3.3. Data Estimation Method

Different estimation techniques have been employed in the analysis of exchange rate volatility – trade flows relationship. They include, among others ordinary least squares, Vector autoregressive (VAR) based cointegration and error correlation models autoregressive distributed lag (ARDL) bounds testing procedure (Ozturk, 2006). The use of the VAR technique has increased in recent years, as it accommodates general dynamic relationship among variables. Failure to take into account dynamism in relationship is cited as a contributing factor for obtaining weak results in most early studies (Doyle, 2001).

Underlying the concept of cointegration or long-run equilibrium analysis is that in many cases, time series variables are non-stationary but move together over time, hence they share a common stochastic trend (Astenou and Hall, 2007). Working with non-stationary variables, often leads to spurious regression results from which further inference becomes meaningless. Usually, the first difference transformation 1 (1) eliminates this linear trend, which makes the series stationary. Therefore, while estimating model equations 3.1 and 3.2, we will equally test for

the unit root characteristics of these relevant variables and the extent to which the variables are cointegrated. This will be done using the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests (see Engel and Grange (1987)).

The concept of cointegration implies that if there is a long-run relationship between two or more non-stationary variables, deviation from the long-run path are stationary. Cointegration tests help to determine the stationarity of the residuals generated from running a static regression in level of one or more of the regressors on the regressed. Therefore, the underlying long-run equilibrium relationship among variables in equations 3.1 and 3.2 will be examined using the Johansen and ARDL cointegration methods. In addition, short-run dynamic of these variables can be incorporated using the ARDL method by expressing the two equations in error-correction forms as has been observed in past studies (see (Bahmani-Oskooee and Hegerty, 2006; Musonda, 2008; Odili, 2015)).

#### 4. DATA ANALYSIS AND DISCUSSIONS ON EMPIRICAL RESULTS

##### 4.1. Unit Root Tests

Table 1 below presents the results of Augmented Dickey-Fuller (ADF) unit root tests for both export demand and import demand models for equations 3.1 and 3.2 respectively.

Table-1. Unit Roots Test

Variable	DF	ADF Level Test Critical Values	T-Statistic	P-values	Lag Length	Order of Integration	Determ includes
Ln RDI	1%	-3.61	-5.20*	0.0001	0	1(1)	C
Ln EXCHR	1%	-3.61	-7.47*	0.0000	1	1 (1)	C
Ln EXPORT	1%	-3.61	-6.92*	0.0000	0	1 (1)	C
Ln RFI	1%	-3.61	-5.20*	0.0001	0	1 (1)	C
Ln IMPORT	1%	-3.61	-7.19*	0.0000	0	1 (1)	C
Ln REXCHR	1%	-3.61	-5.53*	0.0000	0	1 (1)	C
Ln TOT	1%	-3.62	-6.77*	0.0000	1	1 (1)	C
Ln RDI	1%	-4.21	-5.13*	0.0009	0	1 (1)	C&T
Ln EXCHR	1%	-4.20	-7.36*	0.0000	1	1 (1)	C&T
Ln EXPORT	1%	-4.21	-6.83*	0.0000	0	1 (1)	C&T
Ln RFI	1%	-4.21	-5.13*	0.0000	0	1 (1)	C&T
Ln IMPORT	1%	-4.21	-7.09*	0.0000	0	1 (1)	C&T
Ln REXCHR	1%	-4.21	-5.47*	0.0003	0	1 (1)	C&T
Ln TOT	1%	-4.2	-6.67*	0.0000	1	1 (1)	C&T

Notes: Critical values for unit root tests are MacKinnon (1996) one-sided p-values. All variables are expressed in natural logarithm. \* implies 1% level of significance. Determ= deterministic, C is constant while T stands for (linear) trend. Ln preceding variables above stands for natural logarithm.

As shown in Table 1, the unit root test results conducted using the Augmented Dickey-Fuller (ADF) method reveal that trade, income, the real naira – US dollar exchange Rate, exchange rate data series are 1 (1) level stationary. Thus, exchange rate volatility imposes level effects on trade flows in Nigeria and is therefore included in the cointegration test in line with Pattichis *et al.* (2004); Astenou and Hall (2007) and Chipili (2010). The results also showed that the bounds testing approach is applicable in the present study since none of the variables have been integrated at a higher order of stationarity than 1 (1). Consequently, the existence of a stable long-run equilibrium between trade flows, income real exchange and exchange rate volatility is confirmed by both the trace statistic (trace) and maximal eigen value tests results in Table 4 and 5 for both exports and imports, respectively consistent with Baak *et al.* (2007). The error-correction term (ECM) in the dynamic models in Tables 9 and 10 displays an appropriate and statistically significant negative sign thereby providing further evidence of the validity of cointegration. The intercept is unrestricted while the trend is excluded in the cointegration tests in line with Chipili (2010). In order to detect the existence of cointegration in the import demand function, a dummy denoted DUM taking the value of zero (0) from 1971 to 1985, and 1994 to 1998, for the fixed exchange rate regime, and the

value of 1 from 1986 to 1993 and 1999 to 2011, for the flexible exchange rate regime has been included. The dummy captures a spike in both imports and domestic income.

**4.1.1. Cointegration Tests and Analysis**

The Johnsen maximum likely-hood procedure will be applied to a Vector Auto regressive (VAR) version of equations (3.1) and (3.2), respectively to determine the existence of a long-run relationship among these variables.

Before proceeding to the results of the co-integration test, we considered first, the optimal lag length for the VAR specification. Tables 2 and 3, showed the results of the lag length for the different information criteria used in the export and import demand models, respectively.

**Table-2.** VAR Lag Order Selection Criteria for Export Demand Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-173.5695	NA	0.000662	9.706459	9.967689	9.798555
1	29.55338	329.3884	8.12e-08	0.672790	2.501400*	1.317461
2	69.20888	51.44497	7.82e-08	0.475196	3.871185	1.672441
3	102.7289	32.61405	1.426-07	0.609250	5.572619	2.359070
4	184,1679	52.82533*	3.64e-08*	-1.846915*	4.683834	0+455480*

Source: Authors' computations from E-views package  
 \* indicates lag order selected by the criterion  
 LR: sequential modified LR test statistic (each test at 5%level)  
 FPE: Final prediction error  
 AIC: Akaike information criterion  
 SIC: Schwarz information criterion  
 HQ: Hannan-Quinn information criterion

**Table-3.** VAR Lag Order Selection Criteria for Import Demand Model

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-173.5691	NA	0.000662	9.706437	9.967667	9.798533
1	29.55338	329.3878	8.12e-08	0.672790	2.501400*	1.317461
2	69.20565	51.44078	7.82e-08	0.475371	3.871360	1.672616
3	102.7253	32.61371	1.42e-07	0.609444	5.572812	2.359264
4	184.1621	52.82387*	3.64e-08*	-1.846599*	4.684149	0.455795*

Source: Author' computations from E-views package  
 \* indicates lag order selected by the criterion  
 LR: sequential modified LR test statistic (each test at 5%level)  
 FPE: Final prediction error  
 AIC: Akaike information criterion  
 SIC: Schwarz information criterion  
 HQ: Hannan-Quinn information criterion

Lag selection using LR, FPE, AIC and HQ, respectively is '4' except the SIC which is '1'. Lag 4 could have been the right choice as could be seen from Table 3 above. However, its results for co-integration and VECM gave a unit singular matrix in the analysis. Therefore, SIC lag length selection criterion which is 1 was used for the analysis.

Based on this optimal lag length, we carried out the Johansen procedure to ascertain the number, if any of co-integrating relationships in equations (3.1) and (3.2). Both the Maximum Eigen value and the Trace Statistic are reported in Tables 4 and 5 below, for export demand and import demand models, respectively. For both the maximum eigenvalue and trace statistic, the null hypotheses were that there are no co-integrating vectors, while the alternative hypotheses were that at least 1 co-integrating vectors for the maximum eigenvalue and trace statistic, respectively. Based on the optimal lag length chosen by the lag selection criteria, the results of the Johansen co-integration tests are here presented below:

Table-4. Johansen co-integration Test for Exports

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.668669	130.0286	95.75366	0.0000
At most 1*	0.567582	86.94772	69.81889	0.0012
At most 2*	0.487934	54.25157	47.85613	0.0111
At most 3	0.300003	28.14884	29.79707	0.0765
At most 4	0.177536	14.23834	15.49471	0.0766
At most 5*	0.156027	6.615752	3.841466	0.0101

Hypothesized Max-Eigen 0.05

No. of CE(s) Eigen value Statistic Critical Value Prob\*\*

<b>None*</b>	<b>0.668669</b>	<b>43.08085</b>	<b>40.07757</b>	<b>0.0223</b>
At most 1	0.567582	32.69615	33.87687	0.0686
Almost 2	0.487934	26.10273	27.58434	0.0764
At most 3	0.300003	13.91050	21.13162	0.3724
Almost 4	0.177536	7.622587	14.26460	0.4184
At most 5	0.156027	6.615752	3.841466	0.0101

Source: Authors' computations from E-views package

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon *et al.* (1997) p-values

Table-5. Johansen Co-integration Test for Imports

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.668669	130.0273	95.75366	0.0000
At most 1 *	0.567581	86.94645	69.81889	0.0012
At most 2*	0.487930	54.25039	47.85613	0.0111
At most 3	0.299984	28.14794	29.79707	0.0765
At most 4	0.177542	14.23851	15.49471	0.0766
At most 5*	0.156025	6.615658	3.841466	0.0101

Hypothesized Max-Eigen 0.05

No. of CE(s) Eigenvalue Statistic Critical Value Prob\*\*

<b>None*</b>	<b>0.668669</b>	<b>43.08087</b>	<b>40.07757</b>	<b>0.0223</b>
At most 1	0.567581	32.69606	33.87687	0.0687
At most 2	0.487930	26.10246	27.58434	0.0764
At most 3	0.299984	13.90942	21.13162	0.3725
At most 4	0.177542	7.622857	14.26460	0.4183
At most 5 *	0.156025	6.615658	3.841466	0.0101

Source: Authors' computations from E-views package

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon *et al.* (1997) p-values

The co-integration test results show that there was co-integration in both the export model variables and import model variables, respectively, with the trace test giving 3 co-integrating equations and max-eigenvalue test giving 1 co-integrating equation. Once there is a co-integrating vector, a long run relationship is established (Gujarati, 2003). The models were normalized on the export (EXPORT) and import (IMPORT) variables in order to obtain the long-run parameter estimates. All data were in their forms. This implies that the parameter estimates generated from the normalization are also interpreted as elasticities. Table 6 depicts the results of the co-integration status of the models employed in this study using the ARDL Bounds test.

Table-6. Co-integration Testing Using ARDL Bound Test

Equation	F statistic	Lower 1(0)	Bound	Upper 1(1)	Bound	Remark
Export	2.5560	2.87		4.00		Conclusively Co-integration
Import	3.1728	3.60		4.90		Conclusively Co-integration

Source: Author computations from E-views package

**Notes:**

In the export model, lower bound  $1(0) = 2.87$  and upper bound  $1(1) = 4.00$  at 5% significance level, while in the import model, lower bound  $1(0) = 3.60$  and upper bound  $1(1) = 4.90$  at 1% significance level. The lag structure was selected based on the Schwarz information criterion.

The results showed that there were long-run relationships in the models. The export model exhibited long-run relationship when the vectors of variables were normalized on exports. A similar outcome was obtained in the import model. The long-run relationship of variables in the export and import models are presented in Tables 7 and 8, respectively below.

**4.1.2. Results of Long-run Estimates for exports**

The results of descriptive and quantitative analysis for long-run estimates of impact of exchange rate volatility on trade flows (exports and imports) are presented on Tables 7 and 8 below.

The long-run estimates for lagged exports, real foreign income, terms of trade, real exchange rate, exchange rate volatility and dummy variable for the export demand model are reported in Table 7.

**Table-7.** Results of Long-run Co-integration Tests for Exports

Variable	Coefficient	Std Error	t-Statistic	p-value
Ln EXPORT (-1)	-0.567	0.192	-2.948**	0.007
Ln RFI (-1)	-0.417	0.276	-1.514*	0.045
Ln TOT (-1)	-0.598	0.267	-2.239*	0.016
Ln REXCHR (-1)	0.737	0.342	2.158*	0.041
EXCHRV (-1)	-0.242	0.090	-2.681*	0.028
DUM (-1)	-0.188	0.260	-0.721	0.478

Source: Authors computations from E-views package  
 Key: \*\* significant at 1% level, \* significant at 5% level.

From Table 7 above, the results of our long-run cointegration analysis for impact of exchange rate volatility on imports indicated that lagged exports of goods and services (EXPORT) is the leading indicator of exports in Nigerian trade relations with other countries. It is negative and highly significant at 1 percent level, in influencing Nigerian exports. Past exports and reinvestment of returns there from are supposed to engender more exports. However, the plausible reason for carrying a wrong sign (i.e. negative instead of a positive) may be due to the fact that Nigeria is a mono product (crude oil) exporting country and had not made enough efforts to diversify her export base to include massive exportation of other commodities to enable her take advantage of existing opportunities in export of other goods and services order than crude oil to other countries. Another plausible reason for decrease in exports under a highly-depreciated exchange rate of local currency consequent upon exchange rate volatility is that devaluation may not increase exports because we do not produce enough goods and services to market in international markets hence past exports did not engender more exports. This is in line with [Oyinlola \(2010\)](#) who concluded that “devaluation was more effective than relative prices in altering imports demand. The reverse is the case for exports demand.” The plausible reason for this conclusion is that we have less goods and services being sold at the international trade. Furthermore, [Isitua and Igwe \(2006\)](#) were more exact in supporting the present findings when they found that “exchange rate volatility has a negative and significant effect on Nigerian exports to the U.S”.

Results also reveal that four out of the six explanatory variables (dummy which is mirror for fixed and floating exchange rate system, inclusive), lagged exports, real foreign income, terms of trade, and dummy assumed wrong signs while the remaining two: real exchange rate and exchange rate volatility had their right signs. Long-run cointegration results besides established that exchange rate volatility (EXCHRV) negatively and significantly impacted on exports. It ranked the second in influencing export trade in Nigeria. This is in line with economic thinking supported by relevant theories and concepts ([Bah and Amusa, 2003](#); [Bahmani-Oskooee and Kovyryalova,](#)

2008; Odili, 2015). Besides, results reported that the export elasticity of exchange rate volatility was -0.242. The policy implication of this is that a 1 percent increase exchange rate volatility would prompt a 24.2 percent reduction in Nigerian exports to her trading partners. This particular discovery has encapsulated the seriousness of the effects of a volatile exchange rate in Nigeria since it suggested that exchange rate volatility depressed Nigeria's exports to a higher proportion. This result is consistent with the findings of Takaendesa (2005) and Odili (2015).

Next in importance in order of significance is the terms of trade (TOT) which is ranked third in the series. The results of our long-run cointegration tests show that it is significant at a 5 percent level. However, it exhibited a wrong sign (that is, it had a negative impact on Nigerian exports' relations with her trade partners) which is against our *a priori* expectations. It means that as Nigeria's export/import ratio rises (improves), it instead leads to a decrease in total volume and value of goods and services exported to other countries. This discovery is consistent with Sabuhi and Piri (2008) who found that Iran's terms of trade nosedive (worsened) due to the distortions of exchange rate volatility brought about by negative and significant impact it had on her export of non-oil goods. Iran is a major crude oil exporting count like Nigeria. As crude oil exports improve their terms of trade, Iran's massive importation of non-oil goods and services causes their overall exports comparable to total imports to decrease. Nigeria that is also a major oil exporting country suffers a similar fate in her export/import ratio. Any wonder, Odili (2015)'s findings concurred that "depreciation (devaluation) may not increase trade after all".

The results of our long-run cointegration regression estimates show that real exchange rate is fourth in magnitude in impacting Nigerian exports. Real exchange rate is positive and significant at 5 percent level in influencing exports within the period studied. Since the variables is the only indicator that assured its right positive sign among all others, it then goes to show that a rise in real exchange rate will prompt a rise in total exports. Again, according to J-curve effect and Marshall-Lerner condition theories of exchange rate volatility, devaluation or depreciation of exchange rates is expected to result in a surge in export demand (Odili, 2015). The reports of long-run estimates in Table 7 show that the elasticity of REXCHR is 0.7373 in the export demand model. The policy implication of this is that with a J percent devaluation or depreciation of the local currency (the naira) will cause total export revenue (value) to increase by 73.73 percent. This is as a result of the fact that with depreciation in naira, domestic export commodities would become relatively cheaper compared with the world exports and this development will lead to increased demand for Nigeria's exports. However, the question that needs to be addressed is: what other goods despite crude oil do we take to the international market as exports in a bid to take advantage of this opportunity chancing out in a situation where we devalue or depreciate our local currency? A vacuum yet to be filled in exports will then be created and only an effective diversification policy into non-oil exports will cushion this gap. The real exchange rate is often adjudged to represent the country's international competitiveness and it is always a key variable in trade relations (Odili, 2007). Moreover, Nigeria is an import dependent country, hence, devaluation or depreciation of her exchange rate will not immediately lead to increased export of goods that serve as substitutes for imports.

Furthermore, results of real foreign income (RFI) from Table 7 above, show that RFI is negative and significant in impacting on exports. RFI ranked 5<sup>th</sup> in magnitude and with an elasticity of 41.7 percent in influencing Nigerian exports for the period covered by the study. The results from Table 7 above, equally show that the long-run merchandise exports from Nigeria were largely driven by expansion or contraction in economic activities among her trading partners. That is, it shows that export demand depends on economic conditions obtaining in trading partner countries (Chipili, 2010). In particular, the reports revealed that an increase of 1 percent in real foreign income would lead to a 41.7 percent decrease in Nigeria's total export revenue to the rest of the world. This is against our economic thinking that an increase in the flows of foreign income would have positively impacted on her total exports. A plausible reason for this disappointing result is that Nigeria being import dependent country, any increase in her foreign income could have been invariably used (channeled) to import of consumable goods and raw materials for her domestic productive industries. This finding is consistent

with Sabuhi and Piri (2008) and Abolagba *et al.* (2010) whereas exchange rate appreciated in Iran (a major oil exporting country) that it led to rise in both foreign and domestic income, they imported more goods and services than they achieved in their total exports since crude oil is their major export commodity, just like as it is in Nigeria. So, it is immaterial whether their local currency appreciated or depreciated as well as increase in volume of both their foreign and domestic income as it would not significantly change their import dependent orientation as an oil exporting nation.

Finally, results of the dummy variable (mirrored by 0 for a fixed exchange rate system and 1 for a floating exchange rate regime) reveal that it had a negative and insignificant impact on exports. This is against our *a-prior* economic thinking that a fixed exchange rate system should encourage devaluation or depreciation of local currency so that prices of our export goods become comparatively cheaper than their imported substitutes which ought to positively impact on our total exports revenue. A plausible reason for negative results of the dummy variable could be that devaluation or depreciation of our local currency would not automatically translate into an increase in total exports to trading partners since Nigeria is a mono product (crude-oil) exporting country and has not been producing adequate volumes of other non-oil goods for exports. Another plausible reason could be that a depreciated (devalued) naira would exchange at high rate for foreign currency used in importing raw materials which serve as inputs for our domestic production of export commodities. These high costs of imported raw materials would in the process increase total costs of production which Nigerian investors (exporters) would competitively add or reflect in the prices of exported goods thereby countering the gains of devaluation in the final analysis.

#### 4.1.3. Long-run Estimates for Imports

The long-run estimates for lagged imports, real domestic income, terms of trade, real exchange rate, exchange rate volatility and dummy variable for the import demand model are presented in Table 8 below.

From Table 8, results of long-run cointegration tests indicate that real domestic income, terms of trade, real exchange rate and exchange rate volatility are the major determinants of import demand in Nigeria.

Table-8. Results of Long-run Cointegration Tests for Imports

Variable	Coefficient	Std. Error	T-statistic	P-value
Ln IMPORT (-1)	-0.144	0.153	-0.932	0.357
Ln RDI (-1)	0.356	0.220	1.621*	0.038
Ln TOT (-1)	0.534	0.211	2.529*	0.018
Ln REXCHR (-1)	0.638	0.272	2.343*	0.044
EXCHRV (-1)	-0.677	0.172	-3.937*	0.021
DUM (-1)	-0.072	0.207	-0.345	0.733

Source: Authors' computations from E-views package  
Key: \* Significant at 5 % level

However, exchange rate volatility led total import volumes and values in Nigeria, followed by terms of trade (TOT) as second, then real exchange rate as third and real domestic income as fourth, in their order of magnitude.

Results also reveal that four (4) out of the six (6) explanatory variables had right signs while lagged import and real exchange rate assumed wrong signs. In all, real domestic income and terms of trade retained their right positive signs while exchange rate volatility and dummy variable retained their right expected negative signs.

In addition, results also reveal that import demand is inelastic to relative prices as it has been evident from the elasticity values of 0.534 and -0.144 for terms of trade and lagged import, respectively in Table 8 above. These results portend a reflection of low substitutability between domestically produced goods and imported ones. A plausible reason for this trend is because much of our consumer goods and productive inputs were imported from foreign countries due to marked declines in the nation's manufacturing capacity utilization (Odili, 2015). It then means that even with a decline in local prices the demand for imports could still rise to disproportionate levels as



most imported goods hardly have competitive domestic substitutes. Conversely, the import demand is elastic to real exchange rates and exchange rate volatility from the results of Table 8. This has been glaringly evident from their elasticity values of 0.638 and 0.677 for REXCHR and EXCHR, respectively. These elasticities have had both their respective positive and negative significant effects on Nigeria's demand for foreign goods.

In particular, from Table 8 above, the results of our long-run cointegration analysis indicate that exchange rate volatility is the leading determinant of imports in Nigeria. It is negative (with right sign) and highly significant at 5 percent level, in influencing imports. This result is similar to that on Table 7, where exchange rate volatility not only ranked second in negatively and significantly impacting on Nigerian exports, it also retained its right sign. From these results, it thus portends that both total imports and exports are negatively sensitive to movements in exchange rate volatility in line with [Chipili \(2010\)](#); [Broad and Romalis \(2003\)](#); [Umoru and Oseme \(2013\)](#) and [Bahmani-Oskooee and Kovryalova \(2008\)](#) where exchange rate volatility had a negative and significant effect on trade flows. Since increase in exchange rate risk (volatility or variability) negatively and significantly impacts on both total imports and exports, within the period of fixed or floating exchange rate system, a moderate approach to foreign exchange market management in the form of a guided deregulation otherwise known as a managed floating exchange rate system should be recommended for policy in order to ameliorate its negative variability effects on trade flows in Nigeria. This policy stance is in a bid to improve both total imports and exports for the stable growth of the Nigerian economy.

Results from Table 8 besides reveal that terms of trade (TOT) positively and significantly impacted on Nigerian imports from other countries. In fact, it ranked second in influencing total import volumes and values. It also shows that 1 percent increase in terms of trade will by more than 53.4 percent rise in total imports. It also shows that a favorable TOT or balance of payment (bop) improves Nigerian import trade most proportionately. It then means that policy targets that massively increase our exports of goods and services reflected in a positive TOT or bop would invariably rise our imports of both consumable and productive goods that will boost the national economy in the near future. In this regard, policy of effective diversification into agriculture and other non-oil exports will help in such a dispensation as Nigeria, presently finds herself. However, whether the overall trade balance improves on account of real ₦/USD depreciation will depend on the relative strength of commodities being exported and their demand varies according to prevailing economic conditions in trading partner countries (see [Chipili \(2010\)](#)).

Similar to results on Table 7, the influence of real exchange rate (REXCHR) on import trade judging from Table 8 is both positive and significant (see [Bahmani-Oskooee and Hegerty, 2008](#); [Bahmani-Oskooee and Hegerty, 2009](#)). In line with theoretical predictions, real depreciation of the naira exchange rate rises total exports and depresses imports. Contrary to theoretical predictions, total imports have been improved by the real depreciation of the naira as shown in Table 8 results.

The plausible reason given for these positive and significant increase in both total imports and exports prompted by depreciation of the real exchange rate of the local currency, the naira, is that Nigeria being an import dependent country for both her consumer and productive goods, depreciation or devaluation of the real exchange rate would hardly have any appreciable negative impact on her total imports and exports all things being equal, as has been previously established elsewhere in this study. This finding conforms with [Odili \(2015;2007\)](#) and [Chipili \(2010\)](#). However, the peculiarity of the Nigerian investment environment where devaluation of the real naira exchange rate or full deregulation of her foreign exchange market will not lead to a remarkable increase in her total exports of goods that serve as substitutes for imports, Nigeria should opt for a guided deregulation policy of her foreign exchange market so as to fix an appropriate rate for the exchange of local currency with the foreign key currencies to enable a better international trade transactions with her trading partners so as to engender a stable economic growth.

Next in importance in order of size is the real domestic income (RDI) which ranked fourth in the series. Results of our long-run estimates from Table 8 above, show that it is positive and significant at 5 percent level with the

right sign. That is, it has a positive influence on imports which is in line with our *a-priori* expectations. What this means is that as real domestic income rises, it equally leads to an increase in total imports of both consumptive and productive goods for a stable growth of the economy, all things being equal. This discovery is consistent with existing evidence (see (Arize *et al.*, 2000; Arize *et al.*, 2008)) that income exerts a very strong positive influence on both imports and exports. However, real foreign income has become an exception in the present study where its impact is negative on total exports contrary to theoretical predictions. The negative income coefficient reflects the reduction in demand for non-oil export commodities as foreign income grows due to the substitution of imports for domestic ones. In other words, the contribution of foreign income growth to the demand for crude oil and gas exports (see Bahmani-Oskooee and Hegerty (2008)).

Moreover, adaptation of exports in trading partner countries to local taste is cited as the possible explanations for the large income coefficients (see (Munyama and Todam, 2005; Arize *et al.*, 2008)). In addition, export demand depends on economic conditions obtaining in trading partners countries. As implied earlier most Nigerian export commodities are semi-finished with relatively small account of value-added. They are used as raw materials for the production of final goods in trading partner countries. Thus, their demand varies according to prevailing economic conditions in trading partner countries (see Chipili (2010)).

Furthermore, results of our long-run cointegration analysis show that lagged import variable has a negative and insignificant influence on total exports against our *a-priori* economic thinking. A plausible reason for this poor unexpected result is that when naira exchange rate depreciates against foreign currencies, due to effect of high exchange rate volatility and reduction in foreign exchange reserves their combined effects would lead to drop in total imports. This discovery is also in line with the findings of Bahmani-Oskooee and Kovyryalova (2008) that exchange rate volatility has negative effects on imports, and Olaniyi (2006) who concluded that devaluation was more effective in altering imports demand than in exports demand.

Finally, results of the dummy variable (proxied by 0 for a fixed exchange rate regime and 1 for a floating exchange rate system) in Table 8, reveal that it had a right negative and insignificant impact on exports. This result is consistent with our *a-priori* expectations that both a fixed exchange rate system and a floating exchange rate regime elicit high devaluation or depreciation of the local currency which raises the prices of imported goods compared with the prices of locally produced goods that serve as import substitutes thereby depressing total imports.

## 4.2. Error Correction Model (ECM) and Short-Run Estimates for Exports and Imports Analysis

### 4.2.1. Error Correction Model (ECM)

Given the presence of cointegration which led to the conclusions on the inherent long-run relationship of variables in our export demand and import demand models, we proceeded to investigate the short-run dynamics of both the export demand and import demand functions. The Engel and Grange (1987) representation theorem has suggested that the existence of cointegration among 1(1) variables entailed the presence of short-run error correction relationship associated with them. The relationship represented an adjustment process by which any deviation in actual total exports is expected to adjust back to its long-run equilibrium path (Takaendesha *et al.*, 2005). The attractiveness of the error correction model (ECM) therefore is that it provides a framework for establishing links between the short-run and long-run approaches to econometrics modelling (Odili, 2015).

### 4.2.2. An Analysis of Short-run Estimates for Total Exports/Imports

The results for the parsimonious dynamic import and export demand specifications are reported in Table 9 and 10 below. The absence of serial correction as revealed by the values of their D.W stat (1.947) and (1.833) for total exports and total imports, respectively, provides statistical support for the appropriateness of the short-run model as capturing the underlying dynamic structure of the variables in the VAR. To ensure accurate statistical inference,

heteroskedasticity – robust standard errors are constructed through the use of Newly – West method and are reported in both Tables 9 and 10 similar to Arize *et al.* (2008).

Changes in total imports and exports are insensitive to changes in exchange rate volatility as their short-run behavior is mostly influenced by own past changes. Changes in total exports are affected by changes in past foreign income and exchange rate volatility.

On the other hand, the insensitivity of terms of trade (TOT) and lagged total exports to exchange rate volatility could be attributed to the existence of contractual obligations exporters enter into which cannot be breached without severe legal and financial consequences. For imports, the notion that a month or there about is too short a time for people to adjust consumption patterns by switching to alternative products and/or markets appears plausible. As observed by Hooper and Kohlhagen (1978) relatively inelastic short-run export supply could also be a factor. In addition, firms do not respond instantaneously to price changes (Demers, 1991).

The ECM indicates a high speed of adjustment per month for total exports (0.38) and a moderate speed of adjustment is observed for total imports (0.23) similar to Bustaman and Fayanthakunaran (2006). Total exports and imports take about five and eight months, respectively to adjust to changes in income, terms of trade (TOT), real exchange rate and exchange rate volatility once disequilibrium occurs.

Finally, the significance of the error correction term indicates that market forces ensure equilibrium is restored following a disturbance.

We shall now present the results of the export demand and import demand model equations (3.1) and (3.2) for the error – correction model (ECM) in Tables 9 and 10 below.

Table-9. Parsimonious Short-run Dynamics, Error-Correction

**Model for exports**

Variable	Coefficient	Std error	t-statistic	P-value
C(1)	-0.379	0.234	-1.624**	0.02
$\Delta$ EXPORT <sub>(-1)</sub>	0.087	0.177	0.492	0.63
$\Delta$ RFI <sub>(-1)</sub>	2.232	0.920	2.426**	0.02
$\Delta$ TOT <sub>(-1)</sub>	0.169	0.207	0.815	0.42
$\Delta$ REXCHR <sub>(-1)</sub>	-1.513	1.056	-1.433	0.16
$\Delta$ EXCHR <sub>(-1)</sub>	0.120	0.060	-1.992**	0.04
$\Delta$ DUM <sub>(-1)</sub>	-1.078	0.274	-3.927*	0.00
ECM <sub>(-1)</sub>	-0.380	0.234	-1.624**	0.03
Constant	-0.038	0.107	-0.358	0.72
R <sup>2</sup> = 46.04%				
Adj R <sup>2</sup> = 33.85%				
f-stat = 3.78				
prob(t-stat) = 0.00				
D.W. stat = 1.95				
	LM(sc)	Nor	Het	
	0.66	1.20	1.41	
	[0.52]	[0.55]	[0.26]	

Notes: LM(sc) = Breusch-Godfrey serial correction test; Nor = J-B test for normality of residual; Het=Breusch- Godfrey test for heteroskedasticity, \*,\*\*, + 1%, 5% significance level, respectively and P-values are in square brackets. The error correction term C(-1) is negative and significant at 5% level. This indicates that there is significant long-run relationship between exports variables.

From Table 9 results above, lagged exports, real foreign income, and error-correction model (ECM) indicator retained their expected signs while terms of trade, real exchange rate, exchange rate volatility and dummy variable surprisingly assumed wrong signs in the short-run dynamics model for total exports.

A favorable terms of trade (TOT) is supposed to prompt rise in total exports of goods and services. However, the results of our short-run estimates showed a negative and insignificant effect of TOT on total exports. It revealed that a 1 percent increase in the terms of trade would result in 16.91 percent reduction in total exports in Nigeria in the short-run. A plausible reason for this unexpected inverse response could be due to the fact that Nigeria does not have enough goods and services to match its total export opportunities within the period covered.

Again, the real exchange rate showed a negative and insignificant impact on total exports. This implies that a 1 percent change in exchange rate as a result of devaluation and/or depreciation of its local currency will have negative and insignificant impact on Nigeria’s total exports of goods and services in the short-run. This result is inconsistent with our *a-priori* expectations. A plausible explanation for this inverse result is that Nigeria is a mono product (crude oil) exporting country and a devaluation of the naira in the short-run would not have any significant effect on its major export commodity its export demand is also inelastic.

Also, the exchange rate volatility is however positive and significant in influencing total exports, with elasticity of -0.1203. It then means that 1 percent increase exchange rate volatility would result in exports. An economic reason for this positive effect of exchange rate volatility instead of negative on trade is that in the short-run due to lag time the negative impact of exchange rate risk would not have its full effect on total exports, but in the long-run it would have fully manifested.

The coefficient in the error-correction term is negative and statistically significant thereby confirming the cointegration results earlier obtained from the prior bounds testing (ARDL) procedure. Theoretically, the estimated coefficient of the error – correction term (ECM) should be negative and lie within an interval of zero and one. As such, the larger the magnitude of this coefficient is the faster the speed of adjustment toward the long-run equilibrium. In the export demand model, any deviation from the static equilibrium is quickly corrected at a rate of about 38 percent within the year.

**4.2.3. Results of Short-run Estimates for Imports**

Table 10 below presents results of the short-run estimates for the import demand model.

**Table-10.** Results of Short-run Estimates for Import Model

Variable	Coefficient	Std error	t-statistic	P-value
C (1)	-0.231	0.131	-1.736**	0.05
ΔIMPORT (-1)	0.092	0.160	0.579	0.57
ΔRDI (-1)	0.419	0.231	1.810**	0.04
ΔTOT (-1)	0.533	0.127	4.199	0.03
ΔREXCHR (-1)	-0.231	1.954	-0.242	0.81
ΔEXCHRV (-1)	0.126	0.155	1.17**	0.05
ΔDUM (-1)	-1.016	0.248	-4.096*	0.00
ECM (-1)	-0.231	0.131	-1.768*	0.05
Constant	-0.083	0.097	0.904	0.37
R <sup>2</sup> = 38.22%	LM(sc)		Nor	Het
Adj R <sup>2</sup> = 24.27%	0.30		1.21	2.04
f-stat = 2.74	[0.75]		[0.55]	[0.15]
prob(t-stat) = 0.025				
D.W. stat = 1.83				

Notes: LM(sc) = Breusch – Godfrey serial correlation test; Nor = J-B test for normality of residuals, Het = Bresusch– Godfrey test for heteroskadastivity; \*\*, \* = 1%, 5% significance level, respectively, p-values are in square brackets. The error correction term C(1) is negative and significant at 5% level. This indicates that there is significant long-run relationship between the variables

From Table 10 above, the results showed that six variables (lagged imports, real domestic income, terms of trade, real exchange rate, dummy variables and ECM) had right signs while only one (exchange rate volatility) assumed a wrong sign. First, real domestic income had positive and significant influence on total exports in Nigeria, in line with our economic thinking. Its elasticity of 0.419 is an indication that a 1 percent rise in real domestic income would lead to an increase in total imports by 41.9 percent in Nigeria.

Terms of trade (TOT) exhibited a positive and significant impact on total imports according to *a-prior* expectations. Its elasticity of -0.533 implies that a 1 percent improvement in favorable terms of trade would result to an increase in total exports of goods and services by 53.3 percent in the short-run.

Next, the real exchange rate had a negative but insignificant influence on imports according to our economic thinking. A devalued or depreciated local currency is expected to depress import trade in the short-run due to high

cost of imported goods compared to other domestic substitutes, all things being equal. A plausible reason for its insignificance effect of exchange rate on total imports could be attributed to the fact that in Nigeria most imported commodities do not have competitive domestic substitutes.

Surprisingly the exchange rate volatility assumed a positive and significant impact on total imports in the short-run against our *a-priori* expectations. An economic explanation for its assuming a positive influence on total imports instead of negative as in the long-run is that in the short-run, due to lag time adjustments to risks arising from exchange rate volatility are yet to start having any negative effect on total imports due to existence of contractual obligations exporters enter into which cannot be breached without severe legal and financial consequences. Moreover, for imports, the understanding that a month or there about is too short a time for people to adjust consumption patterns by switching to alternative products and/or markets appears also plausible. This is also consistent with Hooper and Kohlhagen (1978) that relatively inelastic short-run export supply could also be a factor. Besides, firms do not respond instantaneously to price changes (Demers, 1991) as cited elsewhere earlier in this study.

Finally, the error-correction term (ECM) confirmed to our economic thinking with regard to assuming expected negative sign and significance at 5 percent level. The magnitude of -0.23 observed in the import demand model implies that following divergence from equilibrium, about 23 percent of a moderate speed adjustment took place within the current period considered.

In sum, total merchandise imports, volume in Nigeria is therefore related to real domestic income, terms of trade, real exchange rate, exchange rate volatility as well as corrections to disequilibrium. Every other fitness statistic ( $R^2$ , F-statistic, D.W. stat, LM(sc), Nor and Het) results confirmed appropriateness of the parsimonious short-run dynamics, vector error-correction model for both export demand and import demand models.

#### 4.3. Impulse Response Analysis

Impulse response is defined as the conditional expectations based on history (Odili, 2015). The Marshal-Lerner (ML) condition stated that currency devaluation could be effective if the sum of long-run price elasticities of export and import demand exceeded unity in absolute value provided that the trade balance which was assumed to be equal to the current account balance were zero initially. The results from Tables 7 and 8 above, show that the corresponding trade flow price elasticities for total exports and imports in Nigeria were 0.5983 and 0.5340, respectively. The sum was evidently greater than 1. Thus, from a policy perspective, it would be a pointer to the effectiveness of naira devaluation as a tool for addressing problems of external trade deficits in Nigeria by deductive reasoning, we can deduce that real depreciation of the naira ought to have increased total exports and depressed total imports assuming the Marshal-Lerner condition worked for Nigeria. This discovery is consistent with the findings of Umoru and Eboeime (2013) who found long-run negative and significant effects of exchange rate volatility on trade flows in Nigeria. However, when this occurred Nigeria was short of having adequate volume of goods to export to other countries since she is an import dependent country and a mono product (crude oil) exporting nation. The only feasible way that she can wriggle out of this ugly situation will be by adopting a policy of effective diversification into agricultural production and massive production of other exportable industrial goods to enable her jack up her exports in order to take advantage of export trade opportunities chancing out and/or created by the depreciation (or devaluation) of the local currency and decrease in total imports of goods and services.

By economic intuition, the country's aggregate trade effect of exchange rate volatility has not been supportive of the predicted short-run J-curve effect. Therefore, the aggregate trade balance was not significance in the short-run as it has been clearly observed in the parsimonious short-run error correction estimates. The results of our tests and analysis also showed that cyclical effects of the exchange rate volatility shocks were passed on to the

aggregate trade balance. However, this pattern did support the classical J-curve pattern of [Baukus et al. \(2011\)](#). This discovery is also consistent with those obtained by [Akboostanci \(2005\)](#) for the Turkish economy.

## 5. SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

### 5.1. Summary of Findings and Recommendations

This paper analyzed the impact of real exchange rate variability (volatility) on trade flows in Nigeria using a vector error correction method and utilized time series data that covered 1971 to 2011 studied. The study is special judging from past works not only because it applied the Autoregressive Distributed Lag (ARDL) bounds testing method to measure real exchange rate volatility, but it also augmented the existing standard model formulations in literature through the incorporation of dummy variables which captured the influence of policy changes in both the export and import demand models.

The first step in the empirical analysis involved testing the time series characteristics of the data using Augmented Dickey Fuller (ADF) tests. This was followed by applying the Johansen cointegration and ARDL bounds testing approach to estimate the long-run cointegration factors. The analysis was then capped with the estimation of the parsimonious short-run dynamic vector error correction model.

The paper observed that the variables were characterized by a unit root at levels, but the hypothesis of non-stationarity was rejected at first difference. This is consistent with strand of empirical studies on characteristics of time series data which, according to [Engel and Grange \(1987\)](#) required differencing before they could attain stationarity.

The Johansen cointegration tests revealed three (3) cointegrating equations at 5 percent level using trace statistic and one (1) cointegrating equation at 5 percent level using maximum eigenvalue. The cointegration tests using ARDL bounds test revealed that export demand model was insignificant at 5 percent level while the import demand model was significant at 1 percent level. At this juncture, we can now make our policy recommendations based on the findings of this work to state as follows:

1. Findings from the study established that exchange rate volatility had a negative and highly significant effect on total exports and imports in the long-run in Nigeria, but a positive and moderate significant effect in the short-run. An unstable exchange rate system most often erodes external competitiveness of the export sector because it undermines the incentive structure. That the exchange rate volatility coefficients were significant with negative right signs suggest that risk-averse exporters and importers would strongly reduce their activities, switch their sources of supply and demand or change policies so as to minimize their exposure to the adverse effects of exchange rate variability in the Nigerian investment climate. This, in turn, could alter the distribution of output across other sectors of the economy. Moreover, trade policy actions aimed at stabilizing trade flows actions likely generated uncertain results. For these reasons, these policy recommendations are advanced for action (i) That wide variability in our exchange rates system should be seriously avoided via a guided deregulation of foreign exchange market (or managed floating exchange rate system) and (ii) That export promotion programmes such as ban on luxuries should be seriously pursued. Furthermore, findings from these results portend that both total exports and imports are negatively sensitive to movements in exchange rate volatility in line with [Chipili \(2010\)](#); [Broad and Romalis \(2003\)](#); [Umoru and Oseme \(2013\)](#) and [Bahmani-Oskooee and Kovryalova \(2008\)](#) where exchange rate volatility assumed a negative and significant effect on trade flows. Since increase in exchange rate risk (volatility or variability) negatively and significantly impacts on both total imports and exports, within the period of fixed or floating exchange rate system, a moderate approach to foreign exchange management in the form of a guided deregulation of the foreign exchange market (also called a managed floating exchange rate system) is hereby strongly recommended for policy action in order to ameliorate its negative variability effects on trade flows in Nigeria. This policy posture should be adopted in a bid to improve total exports and imports for the stable growth of the Nigerian economy.

2. Study profoundly established that lagged exports of commodities is the leading indicator in the export demand model. It is unexpectedly negative and highly significant in influencing Nigerian exports. Past exports and reinvestment of revenue there from are supposed to engender further exports. That it assumed a negative wrong sign instead of positive could be attributed to the fact that Nigeria is a mono product (crude oil) exporting country and she is yet to adequately diversify her export base to include massive exportation of other goods and services order than crude oil. Another explanation for decrease in total exports under a highly depreciated local currency consequent upon exchange rate volatility is that devaluation may not increase exports because we do not produce adequate goods and services to sell in international markets hence past exports could not engender more exports. This is in line with the findings of [Oyinlola \(2010\)](#) who found that “devaluation was more effective than relative prices in altering imports demand. The reverse is the case for exports demand”. Based on the foregoing facts, the paper recommends for policy action that efforts should be intensified by all and sundry, diversify our export base via massive production of other exportable commodities and import substitutes to enable Nigeria take advantage of export opportunities chancing out in her investment climate.
3. Study also established that Nigeria’s import commodities are price inelastic to relative prices. This is because imported goods have no competitive home manufactured close substitutes. According to our discovery from the results of tests and analysis, a devaluation or depreciation of the naira will cause total export revenue to rise by 73.73 percent. This will be as a result of the fact that with depreciation in the local currency, domestic export commodities would become relatively cheaper than other world exports. However, Nigeria does not have available adequate volume of home manufactured goods to sell in international markets to enable her take advantage of the export opportunities created by devaluation of her local currency. In such a situation, this paper recommends that an effective diversification policy into non-oil exports be pursued to help cushion the gap existing in our export strides. Moreover, Nigeria is an import dependent country, hence, devaluation of her exchange rate will not automatically lead to increased exports of commodities that serve as substitutes for exports. We, here and now, recommend that Nigeria should take serious action to minimize her import dependent posture. She should devise policies that would make her people look inwards for diversification into agriculture and produce of consumables and productive goods they are capable of producing. A country her people import toothpicks and the likes from abroad cannot be said to be serious in taking their destiny into their hands with regard to import substitution and export maximization in the times.
4. Study, besides established that terms of trade (TOT) which is a mirror of balance of payment (BOP) or export/import ratio had a negative impact in the export demand model and positive effect in the import demand model in the long-run and were both statistically significant. On the other hand, the short-run dynamics revealed a positive and insignificant effect on the export demand equation while there was a positive and significant impact on the import demand equation. Terms of trade exhibited an unexpected negative impact on total exports. What this portends is that as Nigeria’s export/import ratio improves, it instead leads to a decrease in total volume and value of goods and services exported to other countries. This finding is consistent with, [Sabuhi and Piri \(2008\)](#) who discovered that Iran’s terms of trade worsened due to distortions of exchange rate volatility brought about by negative and significant influence it had on her export of non-oil goods. Iran, like Nigeria, is a major crude oil exporting country. As crude oil exports improve their terms of trade, Iran’s massive importation of non-oil goods and services causes their total exports compared to total imports to decrease. Our recommendation here is that Nigeria should expand their export base to include production of exportable and import substitute commodities so as to curtail her over dependency on importation for her consumable and productive goods. Furthermore, the positive and significant impact of TOT on total imports is an indication that investors were positively disposed towards imports irrespective of exchange rate risks or fluctuations. It then means that a sizeable proportion of our export proceeds or revenue were being channelled

into import demand. It also shows that a favourable term of trade or bop improves Nigerian import trade most proportionately. It then means that policy targets that massively increase our exports of goods and services reflected in a positive TOT or BOP would invariably rise our imports of both consumable and productive goods that will boost the national economy in the near future. In this perspective, a policy of effective diversification into agriculture and other non-oil exports is recommended in such a dispensation as Nigeria presently finds herself. Additionally, we recommend (i) That more stringent measures like outright ban on importation of unnecessary consumables and manufactured goods that serve as substitutes, (ii) Quantitative restrictions like high tariffs should be adopted to reduce trade deficits and deter over import dependency posture of the country as at now.

5. Study, equation established that real foreign income is negative and significant in impacting on exports in the long-run while in the short-run, it is positive and significant in influencing Nigerian exports. On the other hand, the real domestic income was found to be positive and significant in both the long-run and short-run in impacting on total exports. This finding showed that an increase of 1 percent in real foreign income would lead to a 41.7 percent decrease in Nigeria's total export revenue against our expectations that it would have positively impacted on her total exports. Reason advanced for these disappointing results is that Nigeria is an import dependent country and any increase in her foreign income would be channeled to import of consumable goods and raw materials for her domestic productive industries. This discovery is consistent with [Sabuhi and Piri \(2008\)](#) and [Abolagba et al. \(2010\)](#) whereas exchange rate appreciated in Iran (a major crude oil exporting country) that it led to rise in both foreign and domestic income, they imported more goods and services than they achieved in their total exports since crude oil is their major export commodity like Nigeria. It is here recommended that policy makers should plan on how to change import dependent orientation of Nigeria as oil exporting nation via diversification of the economy into agriculture and restricting importation to only on essential raw materials, productive goods (machineries and equipments) and centre attention on production of consumables and manufactured goods that serve as substitutes. In addition, study established that real domestic income had a positive and significant influence on total imports in line with our expectations. It shows that as real domestic income rises, it leads to an increase in total imports of both consumptive and production goods for a stable growth of the economy, all things being equal. This finding is consistent with existing evidence in [Arize et al. \(2001;2008\)](#) that income exerts a very strong positive influence on both imports and exports. Nonetheless, real foreign income as earlier observed, had negative impact on total exports contrary to theoretical predictions. The negative income coefficients reflect the reduction in demand for non-oil export commodities as foreign income grows due to the substitution of imports for domestic ones. This is because with much inflows of foreign income, Nigerians grew high taste for foreign goods. Moreover, export demand depends on economic conditions obtaining in trading partner countries as well as their adaptation of exports to their local consumption. Besides, most Nigerian export commodities are semi-finished with relatively small amount of value-added. They are used as raw materials for the production of final goods in trading partner countries. Based on the foregoing arguments, we shall therefore recommend that Nigeria should improve in processing their export commodities to finished products with high-value added as this would rise their total exports as well as enable them exploit their export potentials in the near future.
6. Study, further established that real exchange rate (REXCHR) had a positive and significant impact on both exports and imports in the long-run, while in the short-run dynamics models it assumed a negative and insignificant effect on them against our expectations. Results showed that REXCHR is positive and significant at 5 percent level in influencing exports within the period studied. Since this variable is the only indicator that assumed its rightful positive sign among all others it then confirms that a rise in real exchange rate will prompt a rise in total exports in Nigeria. This finding is in line with [Odili \(2015\)](#)'s discovery that devaluation or depreciation of exchange rates is expected to cause a surge in export demand. Also, results confirmed that



the elasticity of REXCHR is 0.7373 in the export demand model in the long-run meaning that a 1 percent devaluation of the local currency will increase total export revenue or value by 73.73 percent. This is consistent with economic thinking that with a depreciation of the local currency, domestic export commodities would become relatively cheaper compared to other world exports thereby leading to high demand for Nigeria's exports. However, Nigeria is a major exporter of a mono product (crude oil) with minimal other non-oil exports to take advantage of her increased exports demand. Additionally, Nigeria is an import dependent country for her consumptive and productive goods and devaluation or depreciation of her exchange rate will not automatically lead to increased export of goods that serve as substitutes for imports. In the prevailing circumstance, we shall recommend for Nigeria's expansion of its export base to include other non-oil commodities as well as processing of these goods to increase their value-added contents which will enhance their import attraction in international markets. Again, study established that real exchange rate had a positive and significant influence on total imports against theoretical predictions that real depreciation of the naira exchange rate should rise total exports and depress imports. Contrariwise, total imports have been improved by the real depreciation of the naira. The economic explanation for this development is that Nigeria being an import dependent country for both her consumer and productive goods, depreciation or devaluation of the real exchange rate would not have an appreciable negative impact on her total imports and exports all else equal. This finding conforms into the findings of [Odili \(2015;2007\)](#) and [Chipili \(2010\)](#). However, due to the peculiarity of the Nigerian investment environment where devaluation of local currency or full deregulation of her foreign exchange market would not lead to a remarkable increase in her total exports that serve as import substitutes, we strongly recommend that Nigeria should adopt a guided deregulation policy of her foreign exchange market so as to fix an appropriate rate for the exchange of local currency with key currencies of the world to enable a better international trade transactions with her trading partners in a bid to engender a stable economic growth in future.

7. Study also established that the dummy variable (proxied by 0 for a fixed exchange rate system and 1 for a floating exchange rate regime) was negative and insignificant in both export and import models long-run, but negative and highly significant in both export and import models in the short-run. A negative and insignificant impact of the dummy variable on exports is against our expectations that a fixed exchange rate system should encourage devaluation or depreciation of local currency to cause prices of our export commodities become comparatively cheaper than their imported substitutes which will positively influence our total exports revenue. One reason for its negative posture is that devaluation or depreciation of the naira would not immediately translate into a risk in total exports to trading partners since Nigeria is a mono product (oil) exporting country and has not been producing adequate volumes of other non-oil goods for exports. Another reason for its negative influence on exports could be that a devalued or depreciated naira would exchange at high rate for foreign currency used in importing raw materials that serve as inputs for our domestic productions of export commodities. These high costs of imported raw materials add up to total costs of production which Nigerian exporters competitively add or reflect in the prices of exported goods thereby countering the gains of devaluation. On the other hand, the dummy had a right negative and insignificant impact on total exports is in line with economic thinking that a fixed exchange rate system and a floating exchange rate regime elicit high devaluation or depreciation of the local currency which raises the prices of imported goods compared with the prices of domestically manufactured goods which serve as import substitutes thereby depressing total imports. From the foregoing discussion, it is glaringly established that the exchange rate system switched in both export and import demand models were insignificant but had the expected negative sign. The implication of these findings in this study is that exchange rate system switches assumed some dampening effects on trade flows in Nigeria. Based on these discoveries the study therefore strongly (is a guided deregulation of the foreign exchange market) as against a free-floating exchange rate

system recommends a managed floating exchange rate system (expected to be always fixed by the forces of demand and supply) in order to check excessive exchange rate volatility as well as reduce the prices of export commodities. This new policy if implemented will assure stability of the real exchange rate and encourage trade adjustment programmes in Nigeria that had, in the main, stressed the need for export expansion devoid of high exchange rate volatility. Besides, the intended positive effect of a trade liberalization policy being pursued by past governments might not only be doomed by a variable exchange rate but also could, in fact, precipitate a balance of payment crises in the long-run as being presently witnessed in Nigeria.

8. Finally, findings from the study profoundly established that the sum of the estimated price elasticities of export and import demand in Nigeria exceeded unity indicating that the Marshall-Lerner condition holds. However, contrary to our *a priori* expectations, the results found no empirical evidence in favour of the short-run deterioration of trade balance as proposed by the J-curve hypothesis. Rather, what was originally supported is the cyclical trade effect of exchange rate shock would initially improve, then worsen and then improve the country's aggregate trade balance. Hence, we conclude that the short-run predictions of the J-curve were not observable in Nigeria, but the Marshall-Lerner condition did hold in the long-run for the Nigerian economy. Under normal economic situation, therefore, devaluation or depreciation of the domestic currency, the naira, would work, nonetheless, Nigeria has a peculiar feature of being an oil export dependent economy, in which case both imports and exports have inelastic demand. Based on the foregoing findings, the study therefore strongly recommends for a policy action a guided deregulation of the foreign exchange market policy. A guided deregulation of the foreign exchange market will both rise our total exports and moderate total imports that will grow a stable national economy.

In sum, the study has established that in both the short-run and long-run, trade flows in Nigeria are mainly influenced by exchange rate volatility, real exchange rates, real foreign and domestic income, terms of trade and exchange rate policy switches. Results further revealed that exchange rate volatility depressed exports and imports in the short-run. The present study has also provided support for Marshall-Lerner condition in Nigeria. This was evidenced from the fact that the sum of the estimated elasticities of export and import demand is greater than or exceed unity. Besides, the instant improvement in the trade balance which was correlated with real depreciation has provided support for existence of J-curve hypothesis in the Nigerian trade balance. Hence, the short-run predictions of the J-curve were not observable in Nigeria and it could indeed be hypothesized that Marshall-Lerner condition did holds in the long-run for the Nigerian economy during the period studied. Therefore, the findings from the results of the present study have profoundly established that exchange rate volatility has significant influence on trade flows in Nigeria and that effective manipulation of its determinants can help cushion negative effect of its variability on trade thereby engender a stable growth of the economy.

## 5.2. Conclusion

Import and export demand equations for Nigeria have been analyzed over the period 1971-2011 with emphasis on exchange rate volatility as one of the key determinants. The Johansen cointegration method was used to examine the underlying long-run equilibrium relationship between trade flows and their determinants. In line with theory and recent trends in the literature, aggregate exports and imports were analyzed.

The results revealed the existence of a stable long-run equilibrium relationship between trade flows, real foreign and domestic income, terms of trade, real exchange rates and exchange rate volatility. Exchange rate volatility tends to matter most in the long-run while in the short-run, trade flows typified by aggregate imports and exports were insensitive to exchange rate volatility. Both imports and exports were sensitive to the volatility in the naira exchange rates in the long-run: value of total imports and exports reduced. While total export commodities exhibited higher sensitivity to exchange rate volatility, by and large, the value of total export commodities

decreased suggesting that exporters of these commodities are in most cases deterred by exchange rate fluctuations. Hence, the negative influence of exchange rate volatility on some export commodities should, all else being equal, depress the trade balance.

Finally, the results suggest that exchange rate volatility is an essential part of exchange rate and trade policy formulation as it might influence the allocation of resources between tradeable and non-trade able sector in Nigeria. Thus, a stable exchange rate is inevitable for trade promotion via the application of a guided deregulation of the foreign exchange market policy to achieve an appropriate exchange rate with minimal variability which will prompt a stable growth of the Nigerian economy in the near future.

**Funding:** This study received no specific financial support.

**Competing Interests:** The authors declare that they have no competing interests.

**Contributors/Acknowledgement:** All authors contributed equally to the conception and design of the study.

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