

EFFECTS OF EXCHANGE RATE TRENDS AND VOLATILITY ON IMPORTS IN NIGERIA: IMPLICATIONS FOR MACROECONOMIC POLICY

Okwuchukwu Odili

Department of Banking and Finance, College of Management Sciences,

Michael Okpara University of Agriculture, Umudike, Nigeria

odiliokwuchukwu@yahoo.com

Abstract

This study investigated the effect of exchange rate trends and volatility on Nigeria's imports from 1971 to 2011. The empirical methodology, employed co-integration and Parsimonious ECM model using Schwarz criterion and Akaike information criterion as lag length selection criterion. The findings revealed that exchange rate trends had positive and significant effect on imports only in the long run and that exchange rate volatility depressed imports. It further revealed that a unidirectional causality runs from exchange rate volatility to imports. The policy implication is that trends in exchange rate if not checked will lead to wide exchange rate volatility and poor performance of the import sector. This should be avoided, deregulation notwithstanding by adopting a managed float exchange rate system. Policy makers in Nigeria should consider exchange rate policies as a long-run fix to the problem of growth in foreign goods demand. The study strongly recommends diversification of the economy by shifting emphasis to the private sector, especially the small and medium scale enterprises (SMEs), to produce domestic competitive substitute for the imported goods.

Keywords: Exchange Rate, Trends, Volatility, Imports, Deregulation, ECM, SMEs

INTRODUCTION

Exchange rate is the rate at which one currency exchange for another. It is an important economic variable as its appreciation or depreciation affects the performance of other macroeconomic variables in any economy (Hashim and Zarma, 1996; Odili, 2014). Its value can be used to assess overall performance of an economy. It is therefore a very important variable

in policy decision-making in a country. The debate on exchange rate and its volatility has long divided economists and finance scholars. At one end, the arguments support the fixed exchange rate while at the other, the floating exchange rate system. The study of exchange rate and its volatility therefore, continues to be actively investigated empirically since the breakdown of the Bretton Woods fixed exchange rate system in the early 1970s (Crosby, 2000). Exchange rate volatility is a statistical measure of the tendency of exchange rate to rise or fall sharply within a short period. It is important in understanding foreign exchange market behaviour. Volatility in exchange rate (nominal/ real exchange rates) creates uncertainty in macroeconomic policy formulation, investment decisions and international trade flows (Cote, 1994).

Over the years, the major policy thrusts of the Nigerian exchange rate system and trade policies, revolves around, integrating the economy into the global market system, liberalization of trade and exchange rates to enhance competitiveness of domestic industries, effective participation in trade negotiations to harness the benefits in the multilateral trading system, adoption of appropriate technology and support of regional integration and co-operation.

Import trade in Nigeria therefore reflected the sequence of the various policies employed over time. The unending problems of exchange rate volatility, the fall in price of crude oil and the attendant economic depression, heralded the introduction of structural Adjustment programme (SAP) in 1986. As a result, trade and exchange rate policies were liberalized. This allowed exchange rates to be determined by the market forces. It is 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; and 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 risk due to uncertainty in expected returns and therefore they are less willing to engage in international trade. Secondly they claim that unanticipated exchange rate volatility will induce government to erect either generalized or sectoral trade barriers. Such barriers will be erected in order to offset the destabilizing effect of change in exchange rate that do not reflect changes in income, prices and other fundamental determinants of comparative advantage and international 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.

In response to the adverse effects of exchange rate volatility, most governments through the 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 regime) to evolve an appropriate mechanism for foreign exchange allocation in consonance with the goal of internal balance, it was discarded on September 26, 1986 while a new mechanism was evolved under the structural Adjustment Programme (SAP). The main objectives of the new exchange rate policy under the SAP were to preserve the value of the domestic currency, 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 Igue, 2006). This development caused persistent exchange rate volatility, which yielded persistent naira depreciation over the years.

A limited number of empirical works has been carried out on exchange rate and its volatility on imports in the context of Nigeria. The results of these empirical research findings were ambiguous. For instance Oyovwi (2012) 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) employed the Johansen multivariate co-integration technique and found a significant effect of exchange rate volatility on imports in Nigeria over the period 1970-2009. Thus, the variation in empirical results partially motivated the present study.

Purpose of the study

Since the exchange rate policies in Nigeria has left domestic currency in constant depreciation without stability, while the nation's imports appear to be non-responsive to import prices, the problem which this study intends to investigate concerns the effects of exchange rate trends and volatility on imports in Nigeria.

Research questions

To what extent does trend in exchange rate and its volatility influence imports in Nigeria?

What is the nature of causality between exchange rate volatility and imports in Nigeria?

How has the liberalization of the foreign exchange market impacted on imports in Nigeria?

Hypotheses

Ho₁: The level of exchange rate and its volatility does not significantly influence imports in Nigeria.

Ho₂: Exchange rate trends and volatility does not significantly granger-cause imports in Nigeria.

Ho₃: Exchange rate policies have not significantly influenced the direction of imports in Nigeria.

THEORETICAL FRAMEWORK

Effects of exchange rate and volatility on imports are analyzed in terms of risk or uncertainty. Importers are either very risk-averse or less risk-averse and therefore would react differently to changes in real exchange rates. 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. Two schools of thought exist that attempt to explain the effect of exchange rate volatility on imports: The traditional school and the risk portfolio school.

The traditional school pioneered by Clark (1973) holds that volatility increases risk of trade and therefore depresses trade flows. Early study of this issue focused on firm's behaviors and presumed that increased exchange rate volatility would increase the uncertainty of profits on contracts denominated in a foreign currency. And this would therefore, reduce international trade to levels lower than would otherwise exist without exchange rate volatility (Farrel, DeRosa and McCown 1983). This uncertainty of profits, would lead risk-averse agents to relocate their resources from high risk foreign markets to the lower home market.

The risk portfolio school of thought on the hand postulates that higher risk present greater opportunities for profit and should increase trade. The portfolio thesis also focuses on the effect of exchange rate volatility on expected profit. If profits are a convex function of the exchange rate, then increased exchange rate volatility will lead to increase expected profits, Giovannini (1988). This is possible especially if producers are risk-neutral.

One other aspect of the relationship between trade and exchange rate instability that needs to be mentioned is the role of "sunk cost" (Sercu and Vanhulle 1992). Much of international trade consists of differentiated manufactured goods that typically require significant investment by firms to adapt their products to foreign markets. This involves setting up marketing and distribution networks, and to set up production facilities specifically designed for export markets. These sunk costs would tend to make firm less responsive to short run movement in the exchange rate. Thus, firms would tend to adopt a wait and see approach and stay in trade.

Finally, Koren and Szeidl (2003) developed a theoretical model which brings out clearly the interactions among macroeconomic variables. They show that what matters is not the unconditional volatility of the exchange rate as a proxy for risk, as used in many empirical papers in the literature, but rather, that exchange rate uncertainty should influence trade volumes and prices through the covariance of the exchange rate with the other key variables in the model. In this general equilibrium context, they stress that it is not uncertainty in the exchange rate that matters, but rather whether this uncertainty magnifies or reduces the firm's

other risks on the cost and demand side, and ultimately, whether it exacerbates or moderates the risk faced by consumers. Risk therefore determines the decision of both the importers and consumers with regards to the volume and price of imports.

REVIEW OF RELATED EMPIRICAL LITERATURE

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

Bahmani – Oskooee and Kovryalova (2008) investigated the impact of exchange rate volatility on trade flows. The study concentrated on 177 commodities traded between the United States (US) and the United Kingdom (UK) and employed co-integration and error-correction techniques to analyze the data covering 1971 – 2003 periods. The results revealed that the volatility of the real bilateral dollar – pound 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 are significantly affected by the exchange rate volatility. They concluded that in most cases the effect is negative supporting the proponents of floating rates.

Egwakhide (1999) researched on import determinants using the stock adjustment import exchange model that has its root in the balance of payment theory and consumer theory of demand. The study revealed that import decisions are determined by the dynamics of foreign exchange with emphasis on availability. This conclusion is in agreement with exchange rate and volatility on imports.

Rose (2000), measured the effect of currency union on member's trade, and also tested the effect of exchange rate volatility on trade employing the gravity approach and using a very large data set involving 186 countries for five years 1970, 1975, 1980, 1985 and 1990. The primary measure of volatility adopted was the standard deviation of the first difference of the monthly logarithm of the bilateral nominal exchange rate, which was computed over the five years preceding, the year of estimation. Using the pooled data, their findings revealed a small but significant negative effect, reducing volatility by one standard deviation (7 percent) around the mean (5 percent) would increase bilateral trade by about 13 percent. This result was robust when using three alternative measures of volatility but not when the standard deviation over the previous five years of the level of the exchange rate is used. However, when random effects, are incorporated in the estimation, the magnitude of the effect of volatility on trade is reduced to about a third of the benchmark estimate or roughly 4 percent.

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 data and concentrated on one of the major trading partners of Australia i.e. the US, and employed data from 107 industries that engage in trade between the two countries. They equally employed methodology that distinguished the short run effects from the long-run effects (i.e. bounds testing approach to co-integration and error-correction modeling). The empirical results showed that exchange rate volatility has short-run effects on imports and exports of majority of the industries for which data was available (60% of the cases). However, the short-run effects spanned into the long run only in the limited number of industries, though a 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 affected Australian exports to the US more than it affected her imports. The work by Dell' Ariccia (1999), provided a systematic analysis of exchange rate volatility on the bilateral trade of the 15 EU members and Switzerland over the 20 years from 1975 to 1994, using four different measures of exchange rate uncertainty; the standard deviation of the first difference of the logarithm of the monthly bilateral nominal and real (CPI) exchange rate, the sum of the squares of the forward rates, and the percentage difference between the maximum and the minimum of the nominal spot rate. In the basic regressions, exchange rate volatility had a small but significantly negative impact on trade: eliminating volatility to zero in 1994 would have increased trade by an amount ranging from 10 to 13 percent, depending on the particular measure of variability used. The results for both nominal and real variability are very close, which was not surprising, given that in the sample the two exchange rate measures were highly correlated. Dell' Ariccia (1999), then went on to take account of the simultaneity bias that would result from central banks trying to stabilize their exchange rates with their main trading partners. If they were successful, there would be a negative association between exchange rate variability and the level of trade, but it would not reflect causation from the former to the latter. He first used an instrument (the sum of squares of the three-month logarithmic forward rates) for the measures of exchange rate volatility to account for possible endogeneity in this variable. The results confirmed the negative relationship between volatility and trade, with the magnitude of the effect about the same as before. In addition, he used both fixed effects and random effects estimation methods to account for the simultaneity bias. In this case the effect was still significant, but the magnitude was much smaller. Total elimination of exchange rate volatility in 1994 would have increased trade by only 3-4 percent.

Broda and Romalis (2003), looking at the effects of exchange rate volatility on disaggregated trade flows, founds 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 manufacturers 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.

Tenreyo (2003) utilized a gravity equation similar to that of Rose (2000) for a broad sample of countries using annual data from 1970 to 1979. The measure of volatility is the same as that employed by Rose, except that the standard deviation of the log change in monthly exchange rates was measured only over the current year. Her main objective was to address several estimation problems in previous studies of the effect of volatility on trade. When these problems were not addressed and ordinary least square was used, she founds a small effect: reducing volatility from its sample mean of about 5 percent to zero resulted in an increase in trade of only 2 percent. When the more appropriate method was used, but without taking account of endogeneity, eliminating exchange rate uncertainty led to an estimated 4 percent increase in trade. However, when endogeneity was taken into account through the use of instruments, volatility had an insignificant effect on trade, a result that was robust on the choice of instruments.

Ozo-Eson (1984) investigated import determinant using a monetarist import model that incorporates supply of real money balances in the traditional import demand model. The result showed that money supply significantly influences import demand.

Oyovwi (2012) offered empirical evidence on the impact of real exchange rate volatility on Nigeria's imports. The study employed Augmented Dickey-Fuller (ADF) and co-integration to test stationarity and long-run equilibrium relationship of the variables. Parsimonious error correction mechanism was estimated with the Schwarz Criterion and Akaike information criterion as lag length selection criterion. The result indicated that real exchange rate volatility had no significant effect on Nigeria's imports.

This study is different from the above studies as none of them considered the effect of exchange rate trends and volatility on Nigeria's imports. The study aims at providing research evidence for exchange rates and macroeconomic policy decisions in Nigeria.

Overview of the Exchange Rate Policies in Nigeria

Since independence in 1960 up to 1986, Nigeria has adopted fixed exchange rate policy. This means that the government administratively determined the value of our local currency 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, 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) (Olukole, 1992) in (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 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% 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-à-vis the U.S dollar and the pound sterling (Hashim and Zarma, 1996).

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 payment, with an observed overvaluation of the naira, in September 1978, 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 foreign 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-relenting 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 – as a result of the volatility in exchange rate. Still there was another policy reversal in 1995 to that of a guided deregulation which necessitated the institution of the Autonomous Foreign Exchange market (AFEM) which later metamorphosed into a daily two ways quote 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 include, the unification of exchange rates between the official and inter-bank market and resolution of the multiple currency problems and the facilitation of greater market determination of exchange rates for the Naira vis-à-vis other currencies (Umoru and Oseme, 2013).

RESEARCH METHODOLOGY

Model Specification

The empirical model employed here is similar to that of Arize *et al.*, (2000, 2008), Choudhry (2005, 2008), Baum and Mustafa (2008), Abba and Zhang (2012) and Umoru and Oseme (2013). It incorporated most of the recent developments in the literature noted by McKenzie (1999). The models specifications are therefore as follows:

$$\ln IM_t = \beta_0^i + \beta_1^i \ln DI_t + \beta_2^i \ln TOT_t + \beta_3^i \ln RER_t + \beta_4^i ERV_t + \beta_5^i DUM_t + \mu_t \quad (1)$$

Equation 1 is a standard reduced long run solution of the behavioural demand function for imports (see Goldstein and Khan, 1978; and Gotur, 1985).

Where, IM_t = Total imports during period t, DI_t = Real domestic income proxied by GDP, TOT_t = A measure of relative price level – import prices: proxied by terms of trade, ERV_t = A measure of exchange rate risk faced by importers due to fluctuations in the exchange rate, RER_t = Real exchange rate within the sample period, DUM_t = Dummy variables representing fixed and floating exchange rate regimes within the sample period, μ_t = Error term. All variables are taken

in logarithm form hence all estimated parameters are elasticities. DI_t , domestic income variable that capture demand conditions in the domestic economy.

Thus, the *a priori* expectation is positive i.e. elasticities β_1 can exceed unity as income picks up the effects of other factors related to it that cannot be easily disentangled but influenced imports increases as well. TOT_t is the terms of trade. In the absence of actual relative import price data terms of trade is used as a proxy (Bahmani – Oskooee and Hegerty 2009). An increase in the foreign price relative to the domestic price of the competing good tends to depress imports. In this study, relative import prices are approximated by the terms of trade (TOT) due to lack of data on imports prices in Nigeria. Favorable terms of trade are anticipated to increase the volume of international trade. Therefore, it may be postulated that the terms of trade variable will exert a positive impact on imports. Thus, our *a priori* expectation on TOT_t is positive (i.e. elasticities $\beta_2^i > 0$.)

The real exchange rate is defined as nominal domestic currency price of one unit of the foreign currency adjusted for the inflation differential between the two countries. Thus, an increase in the real exchange rate represents depreciation while a decrease refers to real appreciation. Real depreciation increases the foreign currency price of imports and consequently tends to lower the volume of imports and imports revenue in domestic currency terms. Hence, the sign of the coefficient on RER_t in the import demand equation is negative (elasticity $\beta_3^i < 0$). In line with theoretical arguments, the expected sign on ERV_t is ambiguous (i.e. $\beta_4^i > 0$ or < 0 – semi-elasticity Government programmes and policies are expected to positively influence the Exchange Rate Policies and were therefore designed to improve trade flows by improving naira/dollar exchange rate. Hence, the sign of the coefficient on DUM_t in import demand equation is negative (elasticity $\beta_5^i < 0$), respectively. The data for this study where sourced from the various issues of the Statistical Bulletin of Central Bank of Nigeria (CBN) and National Bureau statistic (NBS).

EMPIRICAL RESULTS AND DISCUSSIONS

The data utilized in this study are presented in Appendix 1. They include annual data on each of the variables (dependent and independent) import, real exchange rate, exchange rate volatility, domestic income, terms of trade, and the dummy. In the Table (appendix 1), the values of imports, exchange rates and exchange rate volatility from 1971 to 2011 were presented. There were basically six types of exchange rate regimes practiced within the sampled period – the Fixed Exchange Rate (1971 – 1985), the Second-tier Foreign Exchange Market ‘SFEM’ (1986 - 1994), the Autonomous Foreign Exchange Market ‘SAFEM’ (1985-1998), the Inter-bank Forex

Market 'IFEM' (1999-2001), the Dutch Auction System 'DAS' (2002-2005), and the Wholesale Dutch Auction System 'WDAS' (2006-2011). Exchange rate fluctuations expectedly did not occur in the period of fixed exchange rate. For sixteen years (1971-1985) minor variations occurred in the exchange rate, showing a yearly average exchange rate of N0.6629 to the dollar. The exchange rate remained less than one naira to the dollar throughout the period. From 1986 when Nigerian started practicing different forms of flexible exchange rate system, the exchange rate of the naira to the dollar fell drastically from a low rate of N2.0206 in 1986 to N17.2984, N102.1052, N133.5005, and N153.8616 in 1992, 2000, 2004 and 2011, respectively. This showed the ineffectiveness of the monetary authority in stabilizing the foreign exchange market through the demand and supply of currency, control of excessive importation of goods and improper management of the country's external reserve to back up the weak currency. While the exchange rate has exhibited a rising trend with considerable fluctuations, the values of import have also been on the increase especially after 1986. This is due to the liberalization of the financial sector and the deregulation of exchange rate system which stimulated the economic activities in Nigeria and led to intense capital flows. The value of imports in 1971 was N1,078.9 million and by 1987 it rose to N17,861.7 million. Thereafter there was a tremendous increase in imports value with a record high of N755, 127.7m, N1,358,180.3m, N3,108,519.3m and N10,237,775.6m in 1995, 2001, 2006 and 2011, respectively. Theoretically, exchange rate depreciation will lead to an increase in import prices, resulting to a fall in imports volume under the assumption that purchasing power parity holds. This is expected to correct the problems of balance of payments. However, the volume of imports has continued to increase in spite of the depreciation of exchange rate. It should be noted however, that the main driver of the Nigerian economy is crude oil. The increase in oil prices led to increase in its exports and accumulation of external reserve. This in turn, increases the capacity of Nigeria's imports. This explains the reason for the decline in imports between 1982 and 1986 as shown in appendix 1. Evidence from the table showed that merchandise imports fell considerably between 1982 and 1986. This was the period of economic recession and chronic balance of payments problems actuated by the oil price crash during the period.

The dependence on crude oil and a few other export commodities made Nigeria particularly vulnerable to world price fluctuations. Nigeria's overall commodity terms of trade (price of exports divided by price of imports multiplied by 100) fell substantially from 155.97 in 1980 to 85.85, 76.19, and 84.26 in 1981, 1982 and 1983, respectively. This period coincided with the period of oil price crash which constituted great percentage of the Nigerian export commodities. From 1971 to 2011, Nigeria's Terms of trade averaged 158.79, reaching an all-time high of 333.55 in 1974 and a record low of 73.85 in 1978.

The terms of trade may be influenced by the exchange rate because a rise in the volume of a country's currency lowers the domestic prices of its imports but may not directly affect the prices of the commodities it exports. This is why Nigeria enjoys relatively a favourable terms of trade because the crude oil price which constitute a larger percentage of Nigeria's exports is not determined in Nigeria. The real domestic income is proxy by the Nigeria's GDP. Nigeria recorded a low growth in GDP from 1971 to 1986 ranging from N5,650.90 million in 1971 to N41,974.7 million in 1979 and N69,146.99 million in 1986. This was the period when the Nigerian economy was highly regulated and dependent to some extent on the agricultural sector to sustain it.

The fixed exchange rate system was the foreign exchange rate policy instrument in use. During this period, the Nigerian exchange rate policy tended to encourage over-valuation of the Naira which in turn, encouraged imports, discourage non-oil export and assisted in sustaining the manufacturing sector's over-dependence on imported inputs. From 1987 to date there has been substantial annual increase in GDP with recorded figures of N105,222.84 million in 1987, N899,863.22 in 1994, and N8,487,031.57 million in 2011. The figures actually depicted a continuous improvement over the preceding year. This could be traced to the positive result realized via economic reforms like the Structural Adjustment Program (SAP) and the adoption of flexible exchange rate system, which turned Nigeria into a market oriented economy, after the collapse of oil prices in the early 1980s and the build-up of unimaginable external trade arrears. Finally, the dummy variables, the exchange rate systems practiced in Nigeria, were assigned the value of '0' for the fixed exchange rate system and value of '1' for the flexible exchange rate system.

The historically antecedent of the trend in the variables employed in the models for the purposes of analyses, clearly demonstrated comparatively, that a market oriented economy, a deregulated and liberalized economy that allows for subtle variability and less government intervention in the supply of foreign exchange and in the determination of exchange rates, performed better than a controlled and regulated economy.

Unit Root Tests

The first stage in model estimations is to test for the stationarity properties of the variables by employing the unit root tests. Non-stationary data produces spurious regression; hence the results may be misleading. The augmented Dickey-Fuller (ADF) Unit Root Test was used to establish the stationarity of data. Table 1 presents the result of Augmented Dickey- Fuller unit root tests for model.

Table 1: Unit Root Tests (E-view 8.0)

| Variables | Augmented Dickey Fuller | | | |
|--------------------------|-------------------------|---------------|-------------------------|---------------|
| | With constant | | With constant and trend | |
| | I(0) Level prob. | I(1) FD prob. | I(0) Level prob. | I(1) FD prob. |
| Import | 0.9242 | 0.0000 | 0.5437 | 0.0000 |
| Domestic income | 0.9000 | 0.0001 | 0.8246 | 0.0009 |
| Terms of trade | 0.0845 | 0.0000 | 0.0124 | 0.0000 |
| Real exchange rate | 0.9504 | 0.0000 | 0.5052 | 0.0003 |
| Exchange rate volatility | 0.0060 | 0.0000 | 0.0010 | 0.0000 |

FD – first difference

As indicated in Table 1 above, all variables under consideration appeared to be I(1) variables. This is evidenced in their respective probability values. The maximum order of integration of the variables under consideration in the table appeared to be I(1). The results therefore, implied that the variables are stationary at first difference and none of the variables were integrated of higher order of stationarity than I(1).

Co-Integration Analyses

Having confirmed the stationarity properties of the variables, we proceeded to determine the existence of a long-run relationship among these variables. The result of the Johansen procedure presents the Maximum Eigen value and the Trace Statistic as shown in Table 2 below. For both the maximum eigen value 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.

Table 2 Import Co-integration Test – (JOHANSEN METHOD)

| | | | | |
|--|------------|-----------|----------------|---------|
| Series: LNIMP, LNDI, LNTOT, LNRER, ERV, DUM | | | | |
| Lags interval (in first differences): 1 to 1 | | | | |
| Unrestricted Co-integration Rank Test (Trace) | | | | |
| Hypothesized | | Trace | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | 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 |
| Trace test indicates 3 cointegratingeqn(s) at the 0.05 level | | | | |

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized | Max-Eigen | 0.05 | | |
|--------------|------------|-----------|----------------|---------|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None * | 0.668669 | 43.08087 | 40.07757 | 0.0223 |
| 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 |

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

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The co-integration test results showed that there was co-integration in the model, with the trace test giving 3 co-integrating equations and max-eigen value test giving 1 co-integrating equation. Once there is co-integrating vector, a long run relationship is concluded (Gujarati, 2003). The long-run relationship of the model is presented in Table 3 below.

Table 3: Long Run Relationship

| Variables | Coefficient | Std. error | t-statistics | P-value |
|-------------|-------------|------------|--------------|---------|
| LN IMP (-1) | -0.143952 | 0.153263 | -0.939248 | 0.3566 |
| LNDI(-1) | 0.355740 | 0.219529 | 1.620469 | 0.0373* |
| LNTOT(-1) | 0.533956 | 0.211133 | 2.529003 | 0.0181* |
| LNRER (-1) | 0.637493 | 0.272115 | 2.34273 | 0.0438* |
| ERV (-1) | -0.676774 | 0.171909 | -3.93682 | 0.0213* |
| DUM (-1) | -0.071674 | 0.207471 | -0.345465 | 0.7326 |

** indicates 1% level of significance, * indicates 5% level of significance

The elasticity estimate indicated that in the long-run import price relative to domestic price, real exchange rate and exchange rate volatility were the major determinants of Nigeria's import demand. The import demand is inelastic to relative prices. This was evident from the terms of trade elasticity value of 0.53 in the long-run model. This appeared to be a reflection of low substitutability between domestically produced goods and imported ones. Much of consumer goods and productive inputs were imported owing to marked declines in manufacturing capacity utilization in Nigeria. Thus, even with a decline in local prices the demand for imports still rose disproportionately as most imported goods do not have competitive domestic substitutes.

On the other hand, the import demand is elastic to real exchange rates and exchange rate volatility. This was evident from their elasticity values of 0.6375 and -0.6768, respectively.

These elasticities had significant effects on Nigeria's demand for foreign goods. Thus policy makers in Nigeria might have to consider exchange rate policies as a long-run fix to the problem of growth in foreign goods demand. An increase of 10 percent in domestic income leads to a rise of about 35.57 percent in Nigeria's demand for foreign goods. This seemed to be obvious on account of the important contribution of imports to offsetting domestic shortage of consumer durables as well as provision of inputs into production processes.

Error Correction Model (ECM)

As Engle and Granger (1987) representation theorem suggested, the existence of co-integration among the $I(1)$ variables entailed the presence of short-run error correction relationship associated with them. The relationship represented an adjustment process by which the deviated actual export was expected to adjust back to its long-run equilibrium path (Takaendesa, 2005). The attractiveness of the Error Correction Model (ECM), therefore, was that it provided a framework for establishing links between the short-run and long-run approaches to econometric modeling. The results of the equation for the Error Correction Model (ECM) are presented in Tables 4 below.

Table 4: Parsimonious Short-Run Dynamics, Vector Error Correction Model

| Variables | Coefficient | Std. Error | t-Statistic | Prob. |
|-----------------|-------------|------------|-------------|----------|
| D (LN IMP (-1)) | 0.0924 | 0.15979 | 0.5785 | 0.5671 |
| D(LN DI (-1)) | 0.4180 | 0.23137 | 1.8097 | 0.0429* |
| D (LN TOT (-1)) | 0.5334 | 0.12703 | 4.1990 | 0.0295* |
| D(LN RER(-1)) | -0.2314 | 0.95433 | -0.2425 | 0.8100 |
| D(ERV(-1)) | 0.1262 | 0.15456 | 0.8165 | 0.0497* |
| D(DUM(-1)) | -1.0161 | 0.24806 | -4.0963 | 0.0003** |
| ECM(-1) | -0.2311 | 0.13070 | -1.7682 | 0.0481* |
| Constant | 0.0873 | 0.09651 | 0.9043 | 0.3728 |

**indicates 1% level of significance, *indicates 5% level of significance

The results showed that domestic income had a positive and significant impact on imports in Nigeria. The elasticity of 0.4187 was an indication that an increase in domestic income by 10 percent would lead to an increase in imports by 41.87 percent in Nigeria. Terms of trade exhibited a positive and significant impact on import in the short-run. The elasticity of -0.5334 implied that 10 percent improvement in terms of trade (favorable terms of trade) would lead to an increase in import by 53.34 percent. The real exchange rate was not supported by the import model in the short-run.

This could be attributed to the fact that in Nigeria most imported goods do not have competitive domestic substitutes; therefore changes in exchange rate did not significantly influence them in the short-run. This created a critical necessity for alternative demand management policies of which fiscal and monetary policies had a pivotal role to play. The error correction term conformed to expectations as regarded sign and significance. The magnitude of -0.23, in the import model, implied that following a divergence from equilibrium, about 23 percent of adjustment took place in the current period.

Granger Causality Test

This study carried out Granger causality test to determine the nature of causality between exchange rate volatility and imports in Nigeria. The result is presented in table 5 below.

Table 5: Granger Causality Test

| Null Hypothesis | Obs | F-Statistics | Prob. |
|----------------------------------|-----|--------------|---------|
| ERV does not Granger cause LNIMP | 39 | 4.61622 | 0.0168* |
| LNIMP does not Granger cause ERV | | 0.01047 | 0.9896 |

Granger causality results revealed a unidirectional causal flow from exchange rate volatility to import but no causality running from import to exchange rate volatility. This is shown in their respective probabilities of 0.0168 and 0.9896. The results indicated that exchange rate volatility created uncertainty in the domestic business environment. This study therefore concluded that exchange rate volatility Granger cause imports

CONCLUSION AND RECOMMENDATIONS

This study analyzed the impact of exchange rate trend and volatility on imports in Nigeria using time series data from 1971 to 2011. The time series characteristics of the data series was tested using Augmented Dickey-Fuller test followed by the Johansen co-integration to determine the existence of long run relationship. The analysis was capped with the estimation of the parsimonious short-run dynamic error correction model. The study also employed the Granger causality test to determine the nature of causality between exchange rate volatility and imports.

The study found that the variables were characterized by a unit root at levels but, the hypothesis of non-stationarity was rejected at first difference. This was consistent with strand of empirical studies on characteristics of time series data, which according to Engle and Granger (1987), required differencing before they could attain stationarity.

The Johansen co-integration test revealed three (3) co-integrating equations at the 5 percent level using the trace statistic and one (1) co-integrating equation at the 5 percent level using the maximum eigen value.

The study found that in both the short-run and long-run, Nigeria's imports were chiefly influenced by exchange rate trend and volatility, domestic income, terms of trade and exchange rate policy switch. The findings further revealed that exchange rate volatility depressed imports in the long-run. The findings provided significant policy implications in relation to exchange rate management in particular, and overall macro-economic policy formulation and management in general. This study recommends that wide exchange rate volatility should be avoided, deregulation notwithstanding by adopting a managed float exchange rate system since risk-averse importers would strongly reduce their activities, switch resources in order to minimize their exposure to the effect of exchange rate risk. This, in turn, could alter the distribution of output across other sectors. Trade policy actions aimed at stabilizing trade flows were likely to generate uncertain results. This is because the imported goods had no competitive domestically produced close substitutes. Nigeria's import commodities appear to be price inelastic. Exchange rate volatility was found to have significant effect on Nigeria's demand for foreign goods in the long run. A one-for-one response of import demand to the exchange rate was, however, not supported by the model in the short-run. The study, therefore recommends that policy makers in Nigeria should consider exchange rate policies as a long-run fix to the problem of growth in foreign goods demand. Diversification of the economy by shifting emphasis from oil to non-oil agricultural and manufacturing sectors especially the small and medium scale operators should be emphasized and encouraged. In the short-run, imports would be indispensable in the Nigerian economy, against the background of genuine development needs. This should create a crucial role for alternative demand management policies of which fiscal and monetary policies will have a pivotal role to play in the long run.

LIMITATIONS OF THE STUDY

Disaggregated import data allows the determination of how specific commodities are affected by exchange rate volatility as aggregate data tend to obscure industry specific responses, in this research notwithstanding the aggregation bias, the estimation of total import equation serves as a benchmark against which specific individual commodity effects can be evaluated. Secondly the research was wholly funded by the researcher and this affected the time spent in carrying out the research.

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APPENDIX 1: Annual Data on Dependent and Independent Variables

| Year | Import N' million | Terms of Trade N | Real exchange Rate N/US\$1.00 | exchange Rate Volatility |
|------|----------------------|---------------------|----------------------------------|-----------------------------|
| 1971 | 1,078.9 | 1190.88 | 0.6955 | 0.0266 |
| 1972 | 990.1 | 144.85 | 0.6579 | 0.0000 |
| 1973 | 1,224.8 | 186.02 | 0.6579 | 0.0000 |
| 1974 | 1,737.3 | 333.55 | 0.6299 | 0.0207 |
| 1975 | 3,721.5 | 132.35 | 0.6159 | 00.0065 |
| 1976 | 5,148.5 | 131.13 | 0.6265 | 0.0024 |
| 1977 | 7,093.7 | 107.57 | 0.6466 | 0.0084 |
| 1978 | 8,211.7 | 73.85 | 0.6060 | 0.0232 |
| 1979 | 7,472.5 | 145.02 | 0.5957 | 0.0302 |
| 1980 | 9,095.6 | 155.97 | 0.5464 | 0.0110 |
| 1981 | 12,839.6 | 85.85 | 0.6100 | 0.0463 |
| 1982 | 10,770.5 | 76.19 | 0.6729 | 0.0136 |
| 1983 | 8,903.7 | 84.26 | 0.7241 | 0.0276 |
| 1984 | 7,178.3 | 126.60 | 0.7649 | 0.0200 |
| 1985 | 7,062.6 | 165.96 | 0.8938 | 0.0364 |
| 1986 | 5,983.6 | 149.08 | 2.0206 | 1.4097 |
| 1987 | 17,861.7 | 169.98 | 4.0179 | 0.2190 |
| 1988 | 21,445.7 | 145.45 | 4.5367 | 0.4050 |
| 1989 | 30,860.2 | 187.85 | 7.3916 | 0.1817 |
| 1990 | 45,717.9 | 240.36 | 8.0378 | 0.2404 |
| 1991 | 89,488.2 | 135.81 | 9.9095 | 0.7166 |
| 1992 | 143,151.2 | 143.63 | 17.2984 | 3.5104 |
| 1993 | 165,629.4 | 132.08 | 22.0511 | 1.0549 |
| 1994 | 162,788.8 | 126.58 | 21.8861 | 0.0000 |
| 1995 | 755,127.7 | 125.89 | 21.8861 | 0.0000 |
| 1996 | 562,626.8 | 232.76 | 21.8861 | 0.0000 |
| 1997 | 845,716.6 | 146.82 | 21.8861 | 0.0000 |
| 1998 | 837,418.7 | 89.78 | 21.8861 | 0.0000 |
| 1999 | 862,515.7 | 137.85 | 92.6934 | 4.2283 |
| 2000 | 985,022.4 | 197.53 | 104.1952 | 2.2116 |
| 2001 | 1,358,180.3 | 137.53 | 111.9433 | 1.0729 |
| 2002 | 1,512,695.3 | 115.30 | 120.9702 | 5.4634 |
| 2003 | 2,080,235.13 | 148.44 | 129.3565 | 3.6084 |
| 2004 | 1,987,045.3 | 231.64 | 133.5004 | 1.1158 |
| 2005 | 2,800,856.3 | 258.73 | 132.1470 | 1.1246 |
| 2006 | 3,108,519.3 | 235.63 | 128.6516 | 0.6321 |
| 2007 | 3,911,952.6 | 212.42 | 125.8331 | 3.3449 |
| 2008 | 5,186,802.6 | 195.91 | 118.5669 | 2.4945 |
| 2009 | 5,102,534.4 | 163.77 | 148.9017 | 2.0028 |
| 2010 | 7,614,440.5 | 151.45 | 150.2980 | 0.4470 |
| 2011 | 10,237,775.6 | 139.01 | 153.8616 | 1.9624 |

Source: CBN 2005 and 2011 Statistical Bulletin and Researchers computation 2014