International Journal of Economics and Finance; Vol. 8, No. 1; 2016
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Validation of J-Curve Hypothesis in the Nigerian Non Oil Sector

Jude O. Obasanmi[1] & Fidelis O. Nedozi[2]

[1] Department of Economics, Ambrose Alli University, Ekpoma, Edo State, Nigeria

[2] Institute of Continuing Education, PMB 1051, Benin City, Edo State, Nigeria

Correspondence: Fidelis O. Nedozi, Institute of Continuing Education, PMB 1051, Benin City, Edo State, Nigeria. E-mail: knoph4u@yahoo.com

Received: October 9, 2015 Accepted: December 4, 2015 Online Published: December 25, 2015

doi:10.5539/ijef.v8n1p15 URL: http://dx.doi.org/10.5539/ijef.v8n1p15

Abstract

J-Curve is a term used to describe the impact of currency devaluation on a country's balance of trade. In carrying out the study, two objectives stated which are; the validation of the j-curve hypothesis in the short (SR) and long runs (LR). Also, the researcher used the OLS in addition to distributed lag model because exchange rate devaluation does not take effect immediately giving room for lag model effect. The study span from 1985-2014. The study adopted its model from Rose and Yellen (1989) and Rose (1990). The unit root test was used to determine the stationarity of the data. From the results, the OLS result showed delayed J-curve hypothesis. Under the distributed lag (DL), the result shows obedience to the J-curve hypothesis. It is concluded that, policy makers should implement the theory only when the aggregate exchange rate differential between export (non oil) and import (all) is continuously greater than one or equal to one in favour of export (non oil export). One of the recommendations of the study is that policy makers should know that in the current competitive globe, no importing economy will relax to see its economy be a dumping ground (import bias), so superior trade policies should be advocated and implemented. The sustenance of development is one of Nigeria's challenges. The major policy implication of the study is that Nigeria should diversify the economy, deepen its non oil export and improve its infrastructural base.

Keywords: current account balance, devaluation, depreciation, distributed lag, diversification, exchange rate

1. Introduction

Economies the world over, have become increasingly interdependent. The importance of international trade to a nation's economic welfare and sustainable development, has been much recognised in the economics literature. Trade is based on the fact that no country can produce all goods and services, which people require for their consumption largely owing to resources differences and constraints (Manzur, 1995). As a result, this trade relationship suggests that economies need to export goods and services in order to generate revenue to finance imported goods and services, which cannot be produced domestically (Bahmani-Oskoee & Brooks, 1999; Adesoji & Sotubo, 2013). Trade has been described as an engine of growth which tremendous benefits all countries. Such benefits include increased production, acquisition of new ideas and technology, poverty reduction and employment generation, among others, depending on how it is managed. Many developing countries, however, have not benefited much from global trade arising, largely, from the uncompetitiveness of domestic goods and services occasioned by low quality and high prices relative to foreign-produced goods and a concentration on primary products, as well as non–diversification of the economic base. These factors contributed to the low level of exports by developing economies in global trade market.

The J-curve hypothesis suggests a specific pattern for the response of trade balance to exchange rate changes. Immediately following the devaluation of the currency, the volume of imports and exports may remain largely unchanged due in part to pre-existing trade contracts that have to be honoured. Moreover, in the short run, prices of imports becomes less cheap and prices for exports, becomes more cheap to foreign buyers. This is due to consumer's search for acceptable cheaper alternatives especially when goods and services are close substitutes.

Over the longer term, a devaluation in the exchange rate can have the desired effect of improving the Current Account Balance (CAB). Domestic consumers might switch their preference to domestic products and away from expensive imported goods and services, assuming equivalent domestic alternatives exist. Equally, many foreign consumers may switch to purchasing the products being exported into their country, which are now

cheaper in the foreign currency, instead of their own domestically produced goods and services. Therefore, based on the above perception, this study intends to empirically examine the validity of the J-Curve Hypothesis on the Nigerian economy on the short and long runs with reference to the non oil sector in Nigeria.

Previous studies on this topic in Nigeria Akonji, Essary, and Olayide (2013); Umoru and Eboreime (2013), relied on aggregate trade data of total exports and oil sector trade rather than using only non oil export, as study on aggregate trade and oil export trade may not yield the desired result because the quantity and price of oil are regulated by OPEC denying the forces of demand and supply to decide. Second, most of previous studies used conventional regression analysis to find parameter estimates and elasticities of the trade balances with respect to real depreciation and other relevant variables, whereas this paper applies techniques such as the DL (distributed lagged) model (when there is a devaluation, there is always a time lag for it to take real effect Danmola, Akonji, Wakili, & Sakiru, 2013). Third, this study uses differentials (changes) in current account balance and real exchange rate.

2. Literature Review

2.1 Conceptual Issues

The J-curve hypothesis is the term to demonstrate the effect of currency devaluation on a country's balance of trade. The theoretical understanding of the hypothesis derived from the works of both Alfred Marshall (1923), and Abba Lerner (1944), which stated that "if initial balance of trade is Zero, and if the supply elasticities are infinite, then the absolute values of exports and imports demand elasticities have to be at least large enough to add up to unity to have an exchange rate devaluation and brings about the surplus of CAB in balance of payment". Kulkarni (2007), believed that, the theory can be established by looking at the changes in elasticity overtime. In the short run, elasticities are small, making the Marshall–Lerner condition less likely to be satisfied. He further stated that, with time, elasticities becomes bigger and passing the threshold point described by Marshall-Lerner, thus bringing about situation for an improvement of CAB in balance of payment.

Theoretically, if a country's currency is devalued, then, this will lead to an increase in exports (they become less expensive in foreign markets) and a decrease in imports (they become more expensive domestically). This should result in an improvement in a country's CAB, but this is not always the case. The effect of a price change on spending or revenues depends on price elasticity of demand.

The price of exports might fall because of devaluation of the currency and according to the law of demand, the quantity demanded will increase, but whether or not this leads to increase in export revenues depends on foreigners' price elasticity of demand for exports. Under the J-curve, the price of imported goods will rise if a currency falls in value, and according to the law of demand, the quantity demanded will fall, but whether or not this leads to fall in expenditure on imports depends on the price elasticity of demand for imports. The condition states that, reducing the value of the exchange rate will only be successful if the total value of the price elasticity of demand for exports and price elasticity of demand for imports is greater than one (Elastic). It may be written as an equation, stating that a fall in the exchange rate will reduce a current account deficit if:

$$PED_{exports} + PED_{imports} > 1$$

Exchange rate is the value of a given currency expressed as a proportion of another currency. There are two ways to express exchange rate. One is as the number of foreign currency units per unit of domestic currency, for example, N197/$1. The other is the number of domestic currency units per unit of foreign currency, for example, $1/N0.0051. When the exchange rate is changed (say, increased), the domestic currency loses value, causing exports to become cheaper for the rest of the world because foreign currency simultaneously gains value. Exports are therefore expected to go up. Likewise, imports are expected to decline as the rest of the world's goods and services become more expensive for domestic residents. Thus, the balance of trade (BOT) should increase. However, Alfred Marshall and Abba Lerner argued that an increase in exchange rate can lead to a BOT surplus only if elasticity of demand for exports by the rest of the world, and similarly demand for imports by domestic residents, are strong enough. They created the following test to determine whether the elasticities are strong enough:

Elasticity of imports (with respect to exchange rate)= E_M^{ER}

Note that *elasticity* is the responsiveness of a dependent variable to the change in an independent variable.

Thus

$$E_M^{ER} = \frac{\%\ change\ in\ quantity\ of\ imports}{\%\ change\ in\ exchange\ rate} = \frac{\frac{\Delta M}{M}}{\frac{\Delta ER}{ER}} = \frac{\Delta M}{\Delta ER} \times \frac{ER}{M}$$

For example, if a good price(s) increase from N300 to N400, the percentage increase in price is 33%, ((400-300)/300) which is determined by:

$$\frac{\Delta P}{P} \times 100 = \frac{1}{3} \times 100 = .33$$

Thus

$$E_M^{ER} = \frac{\Delta M}{\Delta ER} \times \frac{ER}{M}$$

Elasticity of exports (with respect to exchange rate)=

$$E_X^{ER} = \frac{\%\ change\ in\ exports}{\%\ change\ in\ exchange\ rate} = \frac{\frac{\Delta X}{X}}{\frac{\Delta ER}{ER}} = \frac{\Delta X}{\Delta ER} \times \frac{ER}{X} = E_X^{ER}$$

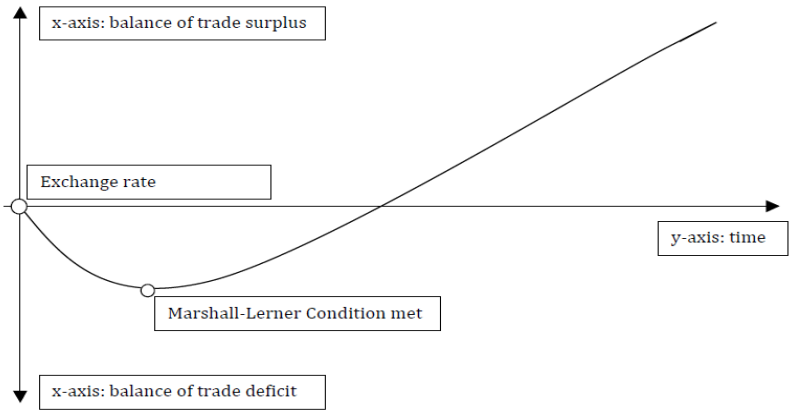
Thus, when elasticity is small, the quantity of exports increases by a small amount. Recall:

Export Revenue=Price of Exports × Quantity of Exports

Therefore if the quantity of exports increases only a little, and the price of exports decreases by more (as a result of the lower currency value), then the export revenue goes down. If the elasticity of imports is small, then a 10% increase in the exchange rate makes imports more expensive by 10%. However, if the elasticity of imports is very small, then an increase in exchange rate of 10% will reduce imports by less than 10%, causing the import bill to go up. Then, with small elasticity values, an increase in the exchange rate can lead to a balance of trade deficit.

Thus, for an increase in the exchange rate to lead to a balance of trade surplus, there must have strong enough elasticities with respect to imports and exports E_M^{ER} and E_X^{ER}, that they add up to at least 1, or in equation form $E_M^{ER} + E_X^{ER} \geq 1$.

This is known as the Marshall--Lerner Condition.



The two major determinants of elasticity values are:

1). The number of substitutes for the good. If there is a large number of substitutes available, the elasticity will be high, whereas the elasticity will be low if there is a small number of substitutes available.

2). Time passed after the change in exchange rate. The longer the time passed after the change in exchange rate, the higher the elasticity

2.2 Empirical Issues

Many empirical works have been provided on the validation of the J-Curve hypothesis. The general observation from these studies is that the results have been mixed depending on many factors including sample periods,

methodology adopted, estimation techniques, measures of volatility adopted and the countries considered (developed or developing). Some results are consistent with the J-curve trend while others depict non existence and rather effect other than the J-curve effect. Authors like Gupta-Kapoor and Ramakrishnan (1999); Leonard and Stockman (2001); Singh (2002); Akbostanci (2002); Hsing (2003); Hacker and Hatemi (2004); Narayan (2004); Stucka (2004); Akonji, Wakili, and Sakiru (2013); Umoru and Oseme (2013) have all find positive evidence in support of the J-curve effect. Yet, few others including Rose and Yellen, (1989); and Koch and Rosenswig (1990) have contrary opinions.

Rose and Yellen (1989), in a study employing the quarterly data for 1960-1985 on bilateral level between U.S and its six largest trading partners. The finding did not confirm the existence of J-curve pattern or long-run relationship between bilateral exchange rate and trade flows. Koch, and Rosensweig (1990), investigated the dynamics between the U.S dollar and components of U.S trade. Using time series-specification test and Granger causality test to investigate the J-curve hypothesis, two of the four components show a dynamic correlation that are weaker and more delayed than J-curve. J-curve confirmed a strong and rapid dependency of import prices on the currency.

Kim (2009), examined the macroeconomic determinants of Korea continued bilateral trade deficit with Japan and its favourable terms of trade with the U.S. He employed Johansen Cointegration and Error Correction Model on variables such as the trade balance, real exchange rate, domestic and foreign incomes and relative money supply. The study established that all variables exact influence on bilateral trade balances and discovered that long-run equilibrium exist among the variables. The J-curve effect was established between Korea and Japan.

In view of the J-curve hypothesis within the context of this study, Krueger (1983), as cited by Akonji, Wakili, and Sakiru (2013), justified the J-curve hypothesis. He argued that by the time exchange rate is to be determined, goods already in transit and under contract have been purchased, creating a situation leading to time lag in the impact of exchange rate determination changes. With the transactions already in progress prior to the exchange rate, adjustments are decided subsequently by commercial activity, reflecting a new competitive environment and with new exchange regime, giving room for the improvement in the balance of trade. As far back as 1973, Magee believed that after currency devaluation, the contracts that have been concluded at the old exchange rate dominate the short-run response of trade balance. But with time the emergence of new trade contract at relatively competitive prices begin to affect their favourable effect on trade volumes and exact positive influence on elasticities and thus improving the trade leading to J-curve hypothesis. These positions depict the fact that in considering the application of J-curve in economic discuss, it is very pertinent to consider time lags most especially for contracts concluded before exchange rates are further varied in the international financial markets.

Wilson and Kua (2000), found no significant impact of the Singapore's real exchange rate devaluation on the trade balance and as such the J-curve hypothesis was invalidated. Also, Bahmani-Oskooee et al. (2003), employed disaggregated data to test the J-curve hypothesis against India's trading partners. The empirical results of the study did not support the J-curve model in terms of short-run estimates but in the long-run, real devaluation of India's rupee had significant improvement effect on the trade balance.

Using Vector Error Correction Model (VECM) in their paper to unravel the short-run and long-run response of aggregate trade balance to exchange rate adjustment in Nigeria, Umoru and Oseme (2013), opined that the co-integration analysis shows a long-run relationship between the trade balance and the real exchange rate in Nigeria. The results of their study indicated a cyclical feedback between the trade balance and the real exchange rate devaluation of the naira. However, the analysis finds no empirical evidence in favour of the short-run deterioration of the trade balance as implied by the J-curve hypothesis. Rather, what is empirically supported is the cyclical trade effect of exchange rate shocks. As it were, a real exchange rate shock will initially improve then worsen and then improve the country's aggregate trade balance. The instant improvement in the trade balance which is correlated with real devaluation provides no support for the J-curve hypothesis in the Nigerian trade balance. Hence, the short-run predictions of the J-curve are not observable in Nigeria and it can indeed be concluded that Marshall-Lerner condition does hold in the long-run for the Nigerian economy during the study period.

Furthermore, there was an empirical attempt by Umoru and Eboreime (2013), to address some unresolved issues regarding the J-curve trade effect of real exchange rate devaluation on Nigeria oil sector. As at today, the standard argument as regard the exchange rate elasticity of trade, is that, trade balance decreases in the short-run and improves in the long-run in view of real exchange rate devaluation which increases the competitiveness of the domestic producers. However, despite the well known argument, the short-run evidence is not supportive of the classic J-curve exchange rate effect on the trade balance of the Nigerian oil sector. In the short-run, the trade

balance of the Nigerian oil sector exhibited an inverted J-curve trend ensuing from a real devaluation of the Naira. Indeed, the trade balance contemporaneously gains improvement as made evident by the "all through" positive short-run and long-run coefficients of the lagged exchange rate. Though, the long-run effect is insignificant, the inverted and hence a delayed J-curve effect is brought into focus.

This behaviour takes for granted, the predicted J-curve effect, and hence it is concluded that the standard J-curve hypothesis cannot be validated for the Nigerian oil sector. The results of their study further showed that exchange rate devaluation does not provide the predicted J-curve instantaneous deterioration trend on the Nigerian oil trade balance in the short-run. The Nigerian exports and imports are frequently denominated in foreign currency; the US dollar is a possible explanation for the belated J-curve effect as Ogundipe (2014), opined. Other than the real effective exchange rate, foreign income was found to exhibit significant short-run and long-run impact on the trade balance in the Nigerian oil sector.

3. Theoretical Framework

The theoretical framework of the study has its root in the empirical works of Goldstein and Khan (1985) and Rose and Yellen (1989). The classical model for the J-curve theory explains the trade balance (CAB) as a function of exchange rate, domestic income and foreign income. Theoretically, the J-Curve hypothesis suggests that the partial derivative, $\partial TB_{jt}/QR_{jt}$ will be negative in the short-run and positive in the long-run.

Where;

∂T^{B}_{jt} = The non oil trade balance,

Q^{R}_{jt} = The real bilateral effective exchange rate

By theoretical expectations, the trade ratio is positively related to foreign income. Thus, an increase in foreign income increases demand for domestic goods thus foreign income is positively related to trade balance while domestic income exhibits a negative relationship with trade balance. Since domestic exports are foreign imports and the collolary is true, domestic import demand is equivalent to foreign export supply and domestic export supply is equivalent to foreign import demand. Therefore, the trade balance is the difference between the value of exports and imports. A negative value in the trade balance implies a trade deficit and is associated with an increase in the value of imports relative to exports and vice-versa.

4. Model Specification

Let's denote P, P*, e, eP* and E as export price in domestic currency, import price in foreign currency, the domestic price of a unit of foreign exchange, import price in domestic currency, and the real exchange rate or eP*/P. Applying and extending Rose and Yellen (1989), and Rose (1990), exports, imports, the real trade balance can be expressed as:

$$X = f(E, Y^*) \quad \text{(i)}$$

$$M = f(E,Y) \quad \text{(ii)}$$

$$CAB = X\text{-}M = f(E, Y^*) - f(E,Y) \quad \text{(iii)}$$

$$Or\ CAB = CAB(E,Y,Y^*) \quad \text{(iv)}$$

Where

E = Exchange Rate

X = export

M = import

CAB = Current Account Balance or Trade Balance

Y* = Real Income of the importing economy

Y = Real Income of the exporting economy

The partial derivative of the real current account balance with respect to devaluation is given as:

$$\delta CAB/\delta E = \delta X/\delta E - \delta M/\delta E - M > or < 0 \quad \text{(v)}$$

It can be shown that if CAB = 0, equation (v) will be reduced to the Marshall-Lerner condition. The sign of equation (v) depends on whether the volume effect of increased exports would be greater or less than the value effect of imports (Krugman & Obstfeld, 2003).

The sign of $\delta CAB/\delta Y$ in equation (iv) is unclear because higher real income in the home country may increase

imports, leading to a deterioration of the trade balance, or reduce imports due to growth in import-substitute production.

The sign of $\delta CAB/\delta Y^*$ in equation (iv) is also ambiguous because higher real income in the importing economies may increase exports to the importing economy from her trading partners (exporting economy) or reduce imports from her trading partners due to growth in import-substitute production in the importing economy

To measure the elasticity of the current account balance with respect to the real exchange rate, real income in the home country, and real income in the importing economy, equation (iv) can be expressed as:

$$CAB_{it} = \alpha_1 + \alpha_2 E_{ij} + \alpha_3 Y_{it} + \alpha_4 Y^*_t + u_t \quad \text{(vi)}$$

Where:

α_1 = Autonomous term

α_2 = Measures the elasticity of the trade balance with respect to the real exchange rate.

α_3 = Denotes the elasticity of the trade balance with respect to real income in the home country, and

α_4 = The elasticity of the trade balance with respect to real income in the importing economy.

The domestic and foreign incomes are measured as real GDP value.

Integrating change (differentials) and non oil export into the equation, the researcher has the following models for the study

$$\Delta CAB_{noxit} = \alpha_1 + \alpha_2 \Delta E_{ij} + \alpha_3 \Delta Y_{it} + \alpha_4 \Delta Y^*_t + u_t \quad \text{(vii) } SRF$$

SRF = Short Run Function

apriori expectations: α_2 & $\alpha_3 < o, \alpha_4 > o$

stating equation (vii) from origin,therefore

$$\Delta CAB_{noxit} = \alpha_1 \Delta E_{ij} + \alpha_2 \Delta Y_{it} + \alpha_3 \Delta Y^*_t + V_t \quad \text{(viii) } LRF$$

apriori expectations: α_1 & $\alpha_2 < o, \alpha_3 > o$

LRF = Long Run Function

According to Akonji, Wakili, and Sakiru (2013), by the time exchange rate is to be determined, goods already in transit and under contract have been purchased, creating a situation leading to time lag on the impact of exchange rate determination changes. Introducing such time lag (distributed lag) effect into the model, the researcher has

$$\Delta CAB_{noxit} = \alpha_1 + \alpha_2 \Delta E_{ij} + \alpha_3 \Delta Y_{it} + \alpha_4 \Delta Y^*_{it} + \alpha_5 \Delta E_{t-1} + \alpha_6 \Delta Y_{t-1} + \alpha_7 \Delta Y^*_{t-1} + z_t \quad \text{(ix) } SRF\ DL$$

apriori expectations : α_2 , α_3, α_5 & $\alpha_6 < o, \alpha_4$ & $\alpha_7 > o$

SRF DL = Short Run Function of Distributed Lag

stating equation (ix) from origin, therefore

$$\Delta CAB_{noxit} = \alpha_1 \Delta E_{ij} + \alpha_2 \Delta Y_{it} + \alpha_3 \Delta Y^*_{it} + \alpha_4 \Delta E_{t-1} + \alpha_5 \Delta Y_{t-1} + \alpha_6 \Delta Y^*_{t-1} + y_t \quad \text{(x) } LRF\ DL$$

apriori expectations : α_1, α_2, α_4 & $\alpha_5 < o$, α_3 & $\alpha_6 > o$

LRF DL = Long Run Function of Distributed Lag

Equations (vii) to (x) are use for this study.

5. Result and Discussion

The researchers used time series data obtained from various sources like CBN statistical bulletin, Journals, internet etc. Because of spurious nature of data series data, the researchers use unit root test to check for the stationarity of each variable under consideration in this study.

5.1 Unit Root Test

The variables in the model, being macroeconomic aggregates may be non stationary, so regression models using these aggregates, most likely will generate spurious result; and the outcome will be biased towards finding a significant relationships among variables (Granger, 1986; Onodugo, Ikpe, & Anowor, 2013). To overcome this undesirable outcome, the time-series aggregates are subjected to test of stationarity using unit root test. The results are summarized in Table 1 below.

Table 1. Unit root test - Argument Dickey-Fuller (ADF)

Variable	ADF calculated value in Level	ADF calculated value at 1st Difference	McKinnon 5% Critical value	Order of Integration
CAB_{nox}	-6.33	-	-2.98	1(0)
E	-	-5.58	-2.98	1(1)
Y	-4.28	-	-2.98	1(0)
Y^*	-6.25	-	-2.98	1(0)
E_{-1}		-5.77	-2.98	1(1)
Y_{-1}	-4.45		-2.98	1(0)
Y^*_{-1}		-5.98	-2.98	1(1)

Source: Authors' Regression Output.

As shown in Table 1 above, Current Account Balance of non oil export (CAB_{nox}), Real Income of the exporting economy (Y) and Real Income of the importing economy (Y*) are stationary at levels 1(*0*), since the ADF value of each of the variables (CAB_{nox}, Y and Y^*) at levels is greater than the McKinnon 5% critical values. Exchange Rate (E), is stationary at first order difference 1(*1*). Also, the DL output shows that, lag of Real Income of the exporting economy (Y_{-1}) is stationary at level 1(*0*), since the ADF values of each of the variables at levels are greater than the McKinnon 5% critical values. Lag of Exchange Rate (E_{-1}) and lag of Real Income of the importing economy (Y^*_{-1}) are stationary at first order difference 1(*1*). This means that the data converged after random walk, thereby absenting the presence of spuriousity in the data used.

5.2 Short Run and Long Run Regression Results

From Table 2 below, in the short run, the result shows that the independent variables explain 72% systematic variation of the dependent variable (Current Account Balance of non oil export-CAB_{nox}), while 29% is unexplained. This is validated by the R-bar-square of 60%. This suggests that the multi-regression data fit the lines. The F-statistic which is used to test for the overall significance of the estimated equation shows that all the explanatory variables are not equal to zero.

Under 1%, 5% and 10% significance levels, it means that at least one of the explanatory variables indeed affects or could explain the dependent variable. Under the t-statistic, and using the *rule of thumb*, only exchange rate (2.9) is individually significant since the absolute value is greater than '*2*' while domestic and foreign incomes are not individually statistically significant.

Table 2. Summary of short run and long run regression results

Independent Variable	Short Run Estimation	Long Run Estimation
Constant	4510.98	-
	(0.55)	
E	-79.72**	-6.40**
	(-2.94)	(-2.6)
	[0.15]	[0.02]
Y	-0.12*	-0.09*
	(-0.72)	(-0.50)
	[0.49]	[0.62]
Y^*	-0.03**	-0.01*
	(-1.87)	(-1.41)
	[0.09]	[0.07]
R^2	0.72	0.67
$\overline{R^2}$	0.60	0.58
F-statistic	6.29	7.32
	[0.01]	[0.01]
D Watson Statistic	2.05	2.01

Source: Authors' Regression Output.

From the co-efficients of the independent variables, all conformed to *apriori* expectation except the foreign

income (Y*) or income of the importing countries. Outside, the independent variables use in this study, there are other variables that affect the dependent variable (CAB_{nox}). The result of the constant, indicates that outside the independent variables used in this study, the CAB_{nox} is 4510.98 units, Also, a unit devaluation in exchange rate increases the CAB_{nox} by 79 units. Also, a unit decrease in domestic income (Y) increases the CAB_{nox} by 0.12 units. In the same vein, a unit decrease in foreign income (Y^*) increases the CAB_{nox} by approximately 0.03 units. All in the short run. This result indicates that Nigerian exports are highly price elastic in the short run which defies *j curve* in the short run. The result of the DW statistic indicates of 2.0474 shows the absence of auto-correlation and it indicates that the model is unbiased.

In the long run, the result shows that the independent variables explain approximately 67% systematic variation of the dependent variable (CAB_{nox}), while 33% is unexplained. This is validated by the R-bar-square of approximately 58%. This suggests that the multi-regression data fit the line. The F- statistic which is used to test for the overall significance of the estimated equation shows that all the explanatory variables are not equal to zero . Under 1%, 5% and 10% significance levels, it means that at least one of the explanatory variables indeed affects the dependent variable. Under the t-statistic, and using the *rule of thumb*, only exchange rate (2.6) is individually significant since the absolute value is greater than '*2*' while domestic and foreign incomes are not individually statistically significant.

From the co-efficients of the independent variables, all conformed to the *apriori* expectation except the foreign income (Y^*) or income of the importing countries. Since the regression is run from origin, a unit devaluation in exchange rate increases the CAB_{nox} by 6.39 units. Also, a unit decrease in domestic income (Y) increases the CAB_{nox} by 0.09 units. In the same vein, a unit decrease in foreign income (Y^*) increases the CAB_{nox} by approximately 0.01 units. This result indicates that Nigerian exports are price elastic in the long run which supports the *j-curve*. But since the effect on CAB_{nox} is more in the short run than the long run, by way of summary, the result does not validate the j-curve. The result of the DW statistic of 2.0074 shows the absence of auto-correlation, indicating the model is unbiased.

5.3 Distributed Lagged (DL) of Short Run and Long Run Regression

Table 3 below shows the distributed lagged estimations of the Short Run and Long Run models (equations ix and x).

The result of the short run shows that the independent variables ($E, Y, Y^*, E_{-1}, Y_{-1}, Y^*_{-1}$) explain 90% systematic variation of the dependent variable (CAB_{nox}), while 10% is unexplained. This is validated by the R-bar-square of 80%. This suggests that the multi-regression data fit the lines very well. The F- statistic which is used to test for the overall significance of the estimated equation shows that all the explanatory variables are not equal to zero. Under 1%, 5% and 10% significance levels, *p-value of* 0.005, it means that at least one of the explanatory variables indeed affects the dependent variable. Under the t-statistic, and using the *rule of thumb*, all the independent variables are individually statistically significant except lags of exchange rate and domestic income (1.43 and 0.29) are not individually significant since their absolute values are less than '*2*'.

From the co-efficients of the independent variables, all conformed to *apriori* expectation except the foreign income (Y^*) or income of the importing countries. Besides, the independent variables used in this study, there are other variables that affect the dependent variable (CAB_{nox}). The result of the constant indicates that outsides the independent variables used in this study, the CAB_{nox} is -7053.560 units. Also, a unit devaluation in exchange rate increases the CAB_{nox} *by* approximately 75 units. A unit decrease in domestic income (Y) increases CAB_{nox} by approximately 0.32 units. In the same vein, a unit decrease in foreign income (Y^*) increases the CAB_{nox} by approximately 0.05 units. A unit devaluation exchange rate lagged ($\boldsymbol{E_{-1}}$) increases the CAB_{nox} by approximately 16 units. Also, a unit decrease in lagged domestic income ($\boldsymbol{Y_{-1}}$) increases the CAB_{nox} by approximately 0.04 units. In the same vein, a unit increase in lagged foreign income ($\boldsymbol{Y^*_{-1}}$) increases CAB_{nox} by approximately 0.03 units. All in the short run. The result of the DW statistic indicates of 1.899, approximately '2' shows the absence of auto-correlation and it indicates that the model is unbiased.

Table 3. Summary of short run and long run regression (DL)

Independent Variable	Short Run Estimation	Long Run Estimation
C	-7053.56	
	(-0.22)	
	[0.84]	
E	-75.24	-235.58
	(-3.68)	(-4.99)
	[0.01]	[0.00]
Y	-0.32	0.17
	(-2.30)	(0.96)
	[0.06]	[0.38]
Y*	-0.05	-0.10
	(-3.46)	(-3.60)
	[0.01]	[0.01]
E_{-1}	-16.06	115.83
	(-1.43)	(3.88)
	[0.20]	[0.01]
Y_{-1}	-0.04	-0.21
	(-0.30)	(-0.90)
	[0.77]	[0.40]
Y^*_{-1}	0.028	0.10
	(2.62)	(4.07)
	[0.03]	[0.01]
R^2	0.90	0.83
$\overline{R}^2$	0.80	0.66
F-statistic	9.02	4.80
	[0.01]	[0.04]
D Watson Statistic	1.90	2.03

Source: Authors' Regression Output.

The result of the long run shows that the independent variables *(E, Y, Y*, E_{-1}, Y_{-1}, Y^*_{-1})* explain 83% systematic variation of the dependent variable (CAB_{nox}), while 17% is unexplained. This is validated by the R-bar-square of approximately 66%. This suggests that the multi-regression data fit the lines very well. The F-statistic which is used to test for the overall significance of the estimated equation shows that all the explanatory variables are not equal to zero. Under 1%, 5% and 10% significance levels, and a *p-value* of 0.03, it means that at least one of the explanatory variables indeed affects the dependent variable. Under the t-statistic, and using the *rule of thumb*, all the independent variables are individually statistically significant except change in domestic income and lag of change in domestic income (0.95 and 0.89) are not individually significant since their absolute values are less than '*2*'.

From the co-efficients of the independent variables, all conformed to *apriori* expectation except the domestic and foreign incomes (*Y and Y*).* Also, a unit devaluation in exchange rate will increase the *CAB of non oil export* by approximately 235 units. Also, a unit increase in the domestic income (*Y*) will increase the CAB *of non oil export* by approximately 0.17 units. In the same vein, a unit decrease in foreign income *(Y**) will increase the *CAB of non oil export* by approximately 0.10 units. Also, a unit revaluation of exchange rate lagged (E_{-1}) increases the change in *CAB of non oil export* by approximately 115 units. A unit decrease in domestic income (Y_{-1}) lagged increases the *CAB of non oil export* by approximately 0.21 units. In the same vein, a unit increase in lagged foreign income (Y^*_{-1}) increases the *CAB of non oil export* by approximately 0.103 units. All in the long run or from origin.

The result of the DW statistic indicates of 2.02, approximately '2' shows the absence of auto-correlation, indicating the model is unbiased. By way of summary, the result of the regression under distributed lag validates *j-curve* in the non oil sector, and also endorsing the work of Akonji, Wakili, and Sakiru (2013) who said that at the time exchange rate is to be determined, goods already in transit and under contract have been purchased, creating a situation leading to time lag on the impact of exchange rate determination changes.

6. Conclusion and Recommendations

This study attempts to provide empirical evidence on unresolved issues regarding the J-curve hypothesis using the Nigerian non oil export for the period 1985-2014. The application of distributed lag (DL) was introduced because exchange rate devaluation does not take place immediately due to forward market usually experienced in foreign trade. This was also determined under the short and long runs. In order to check and correct the convergence of the data after random walk the unit root of stationality was done which shows that the data are stationary at initial -*I(0)*-and first order-*I(1)*-. The two results (OLS and distributed lag) showed the absence of autocorrelation which indicated that the models are not biased. Under the OLS, the result indicates that exchange rate devaluation does not provide the predicted J-curve hypothesis instantaneous deterioration trend on the Nigerian non oil current account balance in the short-run. A devaluation of the currency was followed in the short run by a sharp increase in the balance of the current account but which then dipped before rising again in the long run. This is described as a delayed *J-Curve* according to Karniandand Clarke (2009).

This act of sharp rise in the short run and denial of instantaneous deterioration trend invalidates the j-curve hypothesis. This is due to the fact that most foreign trade is done using the forward pricing or market. This led the researcher to use of the distributed lag. Although, the results of the SR show an increase in the CAB_{nox}, it is not compared to the increase in the *LR* of the CAB_{nox}. The continuous appreciation of the CAB_{nox} is due to the elasticity of Nigerian non oil exports. . Because of the obedience of the result to the principles *of j-curve* hypothesis, the *DL* results validates the *j-curve* hypothesis in Nigerian non oil export. This is in line with Akonji, Wakili, and Sakiru (2013) who said that by the time exchange rate is to be determined, goods already in transit and under contract have been purchased, creating a situation leading to time lag on the impact of exchange rate determination changes. What this means to policy makers is for them to look beyond oil and open-up other sectors (diversify) of the economy and improve the export base of the country, so as to benefit from the advantage(s) of the theory.

Policy makers should diversify the economy via increased export of non oil products which will be the driver of the hypothesis. Also, should know that in the current competitive globe, no importing economy will relax to see its economy be a dumping ground like ours (import bias), so superior trade policies should be advocated and implemented in-order to sustain the growth of the economy and furthermore, the managers of the economy at the national level should find an equilibrium point between this hypothesis and other hypotheses that affect the economy actual development, because devaluation as a single policy (*j-curve*) cannot bring the needed development.

References

Adesoji, A. A., & Sotubo, O. D. (2013). Non-Oil Exports in the Economic Growth of Nigeria: A Study of Agricultural and Mineral Resources. *Journal of Educational and Social Research, 3*(2), 403-418.

Akonji, D. R., Wakili, A. M., & Sakiru, O. O. (2013). Dynamics of the Trade Balance: An empirical investigation of Nigerian J-Curve Hypothesis. *Journal of Humanities and Social Science, 7*(4), 51-57. http://dx.doi.org/10.9790/0837-0745157

Akonji, E. K., Essary, S. M., & Olayide, S. O. (2013). *Intermediate Economic Analysis*. Calalar: Anoeralan Publishing Company Ltd.

Central Bank of Nigeria. (1996). CBN *Briefs Series No 96106*. Lagos: CBN Publishers.

Central Bank of Nigeria. (2009). *Statistical Bulletin*. Lagos: CBN Publishers.

Chong, H., & ChongTan, M. L. (2008). The J-curve Dynamic of Japan: An application of ARDL Model. *Applied Economics, 27*(6), 1099-1112.

Gater, J. (1980). Devaluation and Balance of Payments. Adjustment in a Developing Country: An Analysis. Relating to Jamiaca 1954-1972. *Nigerian Journal of Economics and Social Studies, 22*(3), 31-43.

Goldstein, M., & Khan, M. S. (1985). Income and Price Effects of in Foreign Trade. *Handbook of International Economics, 2*(61), 1041-1105. http://dx.doi.org/10.1016/S1573-4404(85)02011-1

Gujarati, D. N. (2003). *Basic Econometrics* (4th ed.). New York: McGraw-Hill.

Gupta-Kapoor, A., & Ramakrishna, U. (1999). Is There a J-curve? A New Estimation for Japan. *International Economic Journal, 13*(4), 71-79. http://dx.doi.org/10.1080/10168739900080029

Han-Min, H. (2005). Re-examination of J-curve Effect for Japan, Korea and Taiwan. *Japan and the World Economy, 2*(17), 43-58.

Jhingan, M. L.(1997). *Macro Economic Theory*. New Delhi: Vriuda Publication United.

Johansen, S. (1995). *Likelihood-Based Inference in Co-integrated Vector Autoregressive Models*. Oxford: Oxford University Press. http://dx.doi.org/10.1093/0198774508.001.0001

Kim, A. (2009). An empirical analysis of Korea's trade imbalance with the U.S.A and Japan. *Journal of the Asia Pacific Economy, 114*(3), 211-226. http://dx.doi.org/10.1080/13547860902974971

Koch, P., & Rosensweig, J. (1990). The Dynamic Relationship Between the Dollar and the Components of U.S Trade. *Journal of Business and Economic Statistics, 8*(3), 355-364.

Krueger, A. (1983). *Exchange Rate Determination*. London: Cambridge University Press.

Kulkarni, K. (2007). *Readings in International Economics*. New Delhi: Serial Publication.

Magee, S. P. (1973). Currency Contracts, pass through, and Devaluation. *Brookings Papers of Economic Activity, 1,* 303-325. http://dx.doi.org/10.2307/2534091

Manzur, M. (1995). *Exchange Rates, Prices and World Trade*. London: Rout Ledge Publishers.

Morgan, J., & Katsikeeas, W. M. (1997). *Trade Liberalization, Exchange Rate Change and Tax Revenue in West Africa*. Hunter College Department of Economics Working Papers No 403.

Onodugo, V. A., Ikpe, M., & Anowor, O. F. (2013). Non-oil export and economic growth in Nigeria: A time series Econometric model. *International Journal of Business Management & Research, 3*(2), 115-124.

Oyovwi, O. D., & Ukavwe, A. (2013). Exchange Rate Volatility Effect on Trade Variations in Nigeria. *Mediterranean Journal of Social Sciences, 4*(6), 401-406.

Rose, A. K., & Yellen, J. L. (1989). Is there a J-Curve? *Journal of Monetary Economics, 24,* 53-64. http://dx.doi.org/10.1016/0304-3932(89)90016-0

Soludo, C. C. (1998). *Macro Economic Modeling of Africa Economics*. Lagos: Acena Publishers.

Umoru, D., & Eboreime, M. I. (2013). The J-Curve Hypothesis and the Nigerian oil sector: The Ardl Bounds Testing Approach. *European Scientific Journal*, *9*(4), 314-332.

Umoru, D., & Oseme, A. (2013). Trade Flows and Exchange Rate Shocks in Nigeria: An Empirical Result. *Asian Economic and Financial Review, 3*(7), 948-977.

World Economic Outlook April. (2015).