J-CURVE OR THE REVERSE J-CURVE IN NIGERIA: DOES STRUCTURAL BREAK MATTER?

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ABSTRACT

The study investigated whether structural break matters in shaping the J-Curve, which highlights the nexus between trade balance and exchange rate movements. The study drew evidence from Nigeria data from 1970 to 2018, while using the 1986 Structural Adjustment Program (SAP) as a fiscal policy initiative criterion to justify the break periods into Pre and Post-SAP. The study adopted the Auto Regression Distributed Lag (ARDL) and Non-Linear Auto Regression Distributed Lag (NARDL) models to account for the asymmetric and non-asymmetric effects. Though the J-Curve hypothesis is not confirmed for Nigeria, the N-shape for the overall and post-SAP period connotes its potentiality. Nevertheless, the failure of the Pre-SAP period to also exhibit an N-Shaped curve but rather an inverted or reverse J-Curve indicate that structural break matters in the shape typology of the J-Curve analysis. Furthermore, foreign income plays a more dominant role than domestic income in affecting Nigeria's trade balance. To this end, the study suggested that government should pay due consideration while structuring its policies, as the break periods indirectly influence policy outcomes such as J-Curve. In addition, the pursuance of economic diversification will assist to decimate the foreign income-domestic income gap, as well as stem domestic currency depreciation.

Keywords: J-Curve, Trade Balance, Devaluation, Structural Break

JEL: B50, E63, E65, F14

1. Introduction

The movement of goods and services is not restricted to internal boundaries but also across international boundaries. This has placed the role of net exports in stimulating economic growth in emerging and developing economies at a precipice of accruing gains of economies of scale from accessibility to larger markets and technological spillovers from trade interactions. Additionally, these trade interactions spew out exchange rates that are either depreciative or

appreciative in nature to ensure positive or negative net exports, which impacts on economic growth. This has ignited arguments by Bbaale and Mutenyo (2001) Giles and Williams (2000), Agosin (1999) that exports expansion stimulates economic growth.
Bosede and Olomola(2019), Uneze and Ekor(2012), Oshota and Adeleke(2015), Ibrahim(2015) commented that the trade balance, which entails the net account balance of imports and exports is said to be determined by sets of macroeconomic policies to include fiscal policy deficits, financial liberalization policy, Adjustment policy and most importantly exchange rate. These measures or generates trade competitiveness amongst global trade players as portrayed by Heun and Schlink (2004)

Al-Ezzee (2011) sees exchange rate as the price tag of exchange of goods and services that takes inflation differentials among countries into account. A change in the real exchange rate ignites economic activities in the channel of capital flows that has a net effect on foreign assets of a country. For this reason, Ali, Johari, Alias (2014) asserts that given the import of the exchange rate on macroeconomic activities, economists have shown interest in its relationship with trade balance. An argument, which they further enlighten that since the middle of the twentieth century, even with development of enhanced econometric analysis and availability of trade data, the empirical results surrounding this discourse has revealed divergent results with no consensus reached so far.

The relationship between trade balance and exchange rate, wherefore in the short- run, currency depreciation causes a worsening of the trade balance before its subsequent improvement in the long- run is conceptualize as the J-curve, whose analytical framework has not enjoyed consensus in economics debate. In essence, this relationship connotes the reactions of trade balance given changes in Depreciation and or Devaluation of a country's currency in relation to its trading partners.

To this end, exchange rate policy, which affects the foreign reserve either positively or negatively, is at the core of macroeconomic fundamentals of stability for a country. The selection of any exchange rate policy is predicated on the policy goals, structure and peculiarity of the economy. Nigeria overtime has adopted various exchange rate regimes ranging from fixed (government determined) to floating (market determined) exchange rate regimes to manage and boost her foreign reserves. The naira by mid 70s was pegged at about N0.6 to $1 but by 1986 when SAP was introduced to decimate the pressure on the overvalued naira given its heighten demand, it led to an astronomical devaluation of N2.02 to $1. After the introduction of SAP, the issue of multiple exchange rates became problematic as such, the creation of the Inter-Bank Foreign Exchange Market (IFEM), to stem this tide. From 1995 to date exchange rate regimes alternated from guided deregulation, Retail and wholesale Dutch Auction System and flexible exchange rate regime. These regimes saw the naira depreciating in an average of N22 to $1 in the mid-90s, N160 to $1 by late 2000s to an all -time high of about N320 to $1 in 2018. The implication of these trend on the trade balance of Nigeria within this period is

enormous, more so that Nigeria is classified as a mono-economy with crude oil as its major revenue earner that accounts for about 90% of its exports. It is worth mentioning that Nigeria's import is dominated by non-oil imports, which has averaged 85% overtime. To this connection, the Nigeria trade balance has noticed moments of deficits as well as surpluses. The 70s and 80s recorded trade balance deficits, which averaged N1, 900 billion primarily to the volatility of oil prices against high import bills for industrial capital goods. However, from 1984 to 2013, recorded trade balance surpluses, which averaged about N2, 000billion. However, Trade balance took a deficit trajectory from 2015 to 2018, while averaging N2, 020billion.

The nexus between trade balance and exchange rate movement cannot be overemphasized as such Kulkarni(2007) citing Marshall(1923) and Lerner(1944) ML-condition as a requisite to the efficacy of J-curve stipulates that; "If initial balance of trade is zero, and if the supply elasticities are infinite, then the absolute values of exports and imports elasticities have to be at least large enough to add up to unity to have an exchange rate devaluation that brings about the surplus in balance of payment". This creates a momentum that the elasticities become larger overtime, as such leading to the threshold point, as described by Marshall-Lerner that will offset current deficits in balance of payment for an improved or surplus trade balance. The time path for this chain of activities visualizes a J-curve. On the other hand, an inverted reaction given the trade balance-exchange rate nexus will lead to the reverse J-Curve. In essence, as pointed out by Danmola, Abba, Oladipo (2013) the time path of a J-Curve solicits both short run and long run implications of depreciation or appreciation and or devaluation or overvaluation on trade balance. To this end, Mackintosh, Brown, Costello (1996), Miles and Scott (2005) assert that it takes a few months and or two or three years for the short-run lag associated to the J-curve to trend, before the Marshall-Lerner Condition kicks-in. To cause long-run improvement in the Trade balance due to depreciation or devaluation and or appreciation or overvaluation of the domestic currency.

The mixed dispositions as structured in empirical literature for instance Gylfason and Risager (1984), Himarios (1985), Adznan and Masih(2018) have laid credence to the validity of the J-Curve effect, while Haynes and Stone (1982) Bahmani-Oskooee (1994) Bahmani-Oskooee and Kutan(2009)have contrary opinions as they provided evidence that the J-Curve effect holds only for certain countries or time periods. Further, evidence provided by Rose and Yellen (1989) and Rose (1991), Shahbaz, Awan, & Ahmad (2011) give results of no significant relationship between the trade balance and real exchange rate to warrant the existence of a J-Curve. Even though these divergent opinions exist, Petrovic and Gligoric (2009) arguments is that most of these works favour the existence of J-curve than its reverse.

For Nigeria, the argument for divergent opinions amongst scholars is no different, given the support to the presence of J-curve from the works of Odili(2014), Osundina and Osundina(2016), Olugbon, Omotosho and Babalola(2017). Contrary opinions to this effect are

provided by Aniekan and Sikiru (2013), Adegbemi, Solomon, and Olusegun (2018), Bigben (2018), Oluwoje and Ayodeji (2019) stipulating the absence of J-Curve effect for Nigeria.

To this end, the yawning gap has been the inability of these works to undertake a comparative analysis, while using any of the major policy shifts as listed elsewhere in this work to create a structural break for comparative analytical purpose. This work therefore uses Structural Adjustment Program (SAP) as a major policy watershed in Nigeria economic history, to create a structural break from 1970 to 1985 and 1986 to 2018 known as the pre and post SAP periods, to enable a comparison of the probable existence of J-Curve within these periods. The justification of the usage of SAP as a break period is predicated on the basis that the worsening economic numbers of the Nigerian economy, prior to the adoption of SAP, as a growth-enhancing policy initiative advocated by International Monetary Fund (IMF) was meant to correct this economic anomaly and project Nigeria on a growth path. To this end, discussions will be stimulated in the findings, as to whether it was germane to devalue the naira ab initio, given the Pre-SAP conditions, and whether indeed devaluation as a major policy thrust of SAP had served, its objective as deposited by the J-Curve. The paper is structured into five sections. Section one gives a general background clarifications of concepts of the study, while section two highlights the review of theoretical expositions and empirics surrounding the study. Thereafter, methodology and model specification are clearly articulated in section three. Section four discusses results and section five draws conclusions and policy recommendations.

2. Review of Literature

2.1 Theoretical Review

The mercantilist believed that economic growth predicated on the ability to possess precious metals. This meant that exports supported by international trade led to the discovery of these metals, while imports had to be discouraged via imposition of high tariff. This thinking came with implications of economic instability and failure, which became the serious bane of the mercantilist approach to international trade. This criticism lead to the evolution of the Standard Theory of International Trade from the works of Smith (1776) and Richardo (1817), which opined the relevance of free markets and trade that led to revolutionized trade in Great Britain with success recorded in industry and trade. The preposition of the Standard Theory of international Trade was that centeris paribus, given changes in exchange rate, there exist implications on the value and volume of trade. For instance, when more of a country's currency purchases another currency, it leads to depreciation of such a domestic currency, this affects exports positively as the domestic country's goods and services become cheaper. For imports, the volume of goods and services reduces as the value of the same goods and services increases. This chain of reactions affects the trade balance, which for the case in question becomes a surplus. The extension of the Standard Theory of international Trade as espoused by Bickerdike

(1920), Robinson (1947) and Metzler (1948) in their seminal presentations used the elasticity approach to explain the trade balance-exchange rate nexus considered in economics dictum as the Bickerdike-Robinson-Metzler (BRM) model. The crux of their argument was using the elasticity approach as presented by Marshall (1923) in constructing the substitution effects in consumption and production arising from the relative price changes that emanated from exchange rate changes. This provides a rationale for using devaluation or depreciation as a strategy towards improving trade balance.

Closely following the BRM model is its extension tagged the Marshall-Lerner (ML) condition, which stipulates that following a depreciation or devaluation, the trade balance of a domestic economy can only improve, if the aggregate sum of the price elasticities of imports and exports are greater than unity.

The absorption approach as posited by Alexander (1952) encapsulates the elasticity approach as well as the Keynesian aggregate macroeconomics model with constitute elements of Consumption, Investment, Government Expenditure and Imports or Exports. The approach connotes aggregate income from these variables should exceed their aggregate expenditure for an improvement in trade balance. In essence the archaic tradition of thinking that trade balance was simply the net effect of exports and imports was laid to rest, as the absorption approach linked exchange rate changes to relative prices and the effect on aggregate income and aggregate expenditure or absorption to reveal the status of the trade balance.

The demand and supply of money within the framework of the monetary approach is another channel, which used to examine the transmission effects of exchange rate to trade balance. In the event of demand for money exceeding the money supply, it will lead to the demand of inflows from external sources to bridge the shortfall, this precipitates a devaluation of the domestic currency to spurt exports and improve the trade balance. On the other hand, given money supply in excess of money demand, leading to currency appreciation, outflows of money and a negative trade balance. In essence, excess money supply causes a deficit trade balance.

Following this theoretical basis, the J-Curve model takes its structure, when there is devaluation or depreciation, in the short run, the trade balance worsens only to recover towards an upward trajectory after witnessing the Marshall-Lerner Condition. Bahmani-Oskooee (2008) has provided reasons for this short-run behaivour to include; first, the sticky nature of prices will not allow the quick response of trade balance improvements to the newly devalued exchange rate expected to lower domestic prices. Given this, a deteriorating trade balance before the advent of the devalued exchange rate will continue until the ML condition sets in. Secondly, the propensity of rising economic growth, at the point of depreciation or devaluation, for a developing economy might result to increases in imports especially of technological apparatus. Exceeding exports result to deficit trade balance in the short run but the gains of exchange rate depreciation on trade balance becomes a reality in the long- run given the ML condition. Thirdly, adjustment lags in delivery time, replacement of inventories, production process and

contractual obligations could affect the quantum of exports and imports given the exchange rate changes.

2.2 Empirical Review

Literature has availed tremendous empirical evidence on J-curve analysis ranging from cross-country analysis to country specific time series analysis using variegated methodological framework across various period. Using Vector Autoregressive (VAR) framework with Panel Analysis Rose and Yellen (1989) for USA and Six of its trading partners found the absence of J-Curve pattern, whose result is in the reversal given Santos-Paulino (2010) study for 13 Small Island Developing States(SIDS). Applying the same methodology, Bahmani-Oskooee and Harvey(2016) for Singapore and Malaysia, Quratul-Ain and Tufail (2013) for Eight Developing Countries, Bahmani-Oskooee and Gelan (2012) for Nine African Countries 1971-2008, Bahmani-Oskooee and Bolhassani(2012) for US and Canada using disaggregated data for 152 industries, Bahmani-Oskooee (1985) for Thailand, India, Greece and Korea found mixed results for the presence of J-Curve for some countries and its absence for others. In other studies that applied Panel Auto Regression Distributed Lag (ARDL) they also obtained divergent results ranging from the confirmation or the presence of J-Curve. Such works include Bahmani-Oskooee and Fariditavana (2016) for US and Six of its trading partners, Bahmani-Oskooee and Ratha (2004) for USA and Four Developing Countries. Yet for others using Panel ARDL, they obtained mixed results amongst the cross-section of countries used for their studies. Such works include Bahmani-Oskooee and Harvey (2009) for Indonesia with 13 of its bilateral trading partners, Halicioglu and Stone (2008) for Turkey and her 13 trading partners, Bahmani-Oskooee and Malixi(1992) for group of LDCs.

Empirical evidence of J-Curve studies inferring from country specific studies within VAR framework suggest the existence of J-Curve for works such as Eshetu (2017) for Ethiopia, Ishtiaq, Qasi and Ahmad(2016) for Pakistan, Caporale,Mudida and Gil-Alana(2015) for Kenya, Ziramba and Chifamba (2014) for South-Africa, Rena, Shahabz and Chani (2011) for Papua New Guinea, Gupta-Kapoor and Ramakkrishnan (1999) for Japan, Magee(1973) for USA, while works such as Siklarey and Kecili(2018) for Turkey, Arabi and Addalla (2014) for Sudan, have found results on the contrary of non-presence or non-existence of J-Curve hypothesis; But to Akbostanci (2004) for Turkey, the study obtained a Mixed result of the presence of J-Curve in the Long run but its absence in the Short run, while applying the VAR methodological framework.

Further results for country specific studies that utilized the ARDL approach, also obtained similar findings of divergent results. Such works include Zeeshan, Asghar and Shahid(2016) for Pakistan, Sulaiman and Addul-Rahim(2014) for Thailand, which did not confirm presence of J-Curve, unlike Adznan and Masih (2018) for Malaysia, Wanjau(2014) for Kenya, which did; while Iyke and Ho(2017) for Ghana obtained mixed results given that no presence of J-Curve was confirmed using ARDL but there was a presence of J-Curve via the application of the Non-Linear Auto Regression Distributed Lag(NARDL), methodological approach.

Works drawing evidence from Nigeria Data, in using VAR as their methodological approach, such as Oluwoje and Ayodeji (2019), BigBen (2018), Adegbemi, Solomon, and Olusegun (2018), Oyinlola, Omisakin and Adeniyi (2013), Ogundipe, Ojeaga and Ogindipe (2013), Aniekan and Sikiru(2013), Chuku, Usenobong, Ndifreke, and Ekpeno (2011), have substantiated the non-existence of Marshall-Lerner conditions leading to the absence of J-Curve, while the reverse is the case for Olugbon, Omotosho and Babalola (2017), Danmola, Abba and Oladipo (2013). Using ARDL and NARDL framework, Bawa, Abdul, Sani and Dauda (2018) found out the asymmetric behaivour of the J-Curve analysis as well as its presence in the long run against the non-existence of the J-Curve in the Short run. Using same methodological approach Umoru and Eboreime (2013) yielded that the classic J-Curve could not be established but rather an inverted J-Curve was validated. Further, however weak their methodology was in using Ordinary Least Squares, Okaro (2017) reported the presence of J-Curve while Loto(2011) invalidated the Marshall-Lerner condition using Nigeria's data.

The comprehensive reportage of the relationship between Exchange rate movement and the Trade balance shows the utilization of methodologies ranging from Vector Auto Regression (VAR) or Vector Error Correction Model(VECM) technique, Auto Regression Distributed Lag(ARDL), Non-Linear Auto Regression Distributed Lag(NARDL), Ordinary Least squares(OLS), Panel VAR, Panel ARDL to obtain mixed opinions across Country Specific time series, Cross-sectional data, Panel data with variegated time frameworks. In some cases, the results validated the presence of J-curve phenomenon, while in others; this was absent, revealing rather inverted J-Curve, N-Curve, S-Curve and I-curve effects. Yet in other cases, there was no significant relationship between Exchange rate Devaluation or Depreciation and Trade balance. Of import in these empirics, for Nigeria is that, no work to the best of knowledge of this study has undertaken a structural break analysis, to observe if indeed structural breaks matters, in determining the shape of the J-Curve. To this end, the work utilized the 1986 Structural Adjustment Program (SAP) fiscal initiative, as criteria to justify the break period, to enable comparison of the presence or absence of the J-Curve phenomenon within the Pre and Post SAP framework, as well as the overall period. This further gives insight on the relevance of fiscal break policies in determining the shape of the J-Curve. These gaps in literature is what this study provides.

3. Methodology

The study elicits an ex-post facto research design to enable the determination of a cause-effect relationship between the explanatory variables and the regress and. In essence, the methodology adopted is the Auto Regressive Distributed Lag (ARDL) developed by Peseran, Shin & Smith (2001) to assess both the short run and long run effects of the relationship among the variables of interest. The ARDL method is a single reduced form equation that does not require pre-testing for unit root, thus conduct estimation with mix order of integration of I(0) and I(1). Additionally, the beauty of the ARDL framework is elicited in its efficiency for small and finite samples, as well as its ability to determine long run association amongst the variables

of interest through the Bounds testing of Cointegration. The study will also utilize the Lag Selection criteria to select the optimal lag for the representation of both the Asymmetry and Non-Asymmetry models specified in the work.

3.1 Model Specification

The model specification follows the BRM model while utilizing the Marshall-Lerner condition (for elasticity of the trade balance ratio, exchange rate movements), which is triangulated with the absorption approach (for aggregate domestic income) and monetary approach(for foreign income) as transmission channels to trade balance. Rincon (1998), Boyd, Caporale & Smith(2001), Bahmani-Oskooee & Brooks(1999), Gupta-Kapoor & Ramakrishman (1999), Bigben(2010), Onafowora (2003), Dash(2013), Bawa, Abdul, Sani & Dauda (2018) substantiates this specification. To this end, the specification of the models as ARDL and NARDL are as follows

$$TB_t = \omega_0 + \omega_1 XRATE_t + \omega_0 DY_t + \omega_3 FY_t + \mu_t \quad (1)$$

$$TB_t = \omega_0 + \omega_1 XRATE_t^+ + \omega_2 XRATE_t^- + \omega_3 DY_t + \omega_4 FY_t + \mu_t \quad (2)$$

Where, TB = Trade Balance calculated as the ratio of exports to imports. The approach has the advantage of suppressing negative values from the use of the variance approach, making log transformation difficult. Further, according to Boyd, Caporale & Smith (2001) the transformation of the TB accounts for the Marshall-Lerner condition. Xrate = Nominal Exchange rate measured as naira to one US dollar. DY = Current GDP at Basic Prices in billions is taken as a proxy for Domestic Income. FY= Current GDP at Basic prices of the United States of America (USA) is the proxy for Foreign Income. It is understandable that Nigeria is USA largest foreign trading partner in sub-Saharan Africa, given that with the mono-product economy of Nigeria in oil, she supplies 8% of USA oil demands, which is nearly half of Nigeria's daily oil production. Nigerian Planning Commission (2019), Aliyu and Bawa (2015). $Xrate^+$ and $Xrate^-$ = reflects the positive (naira appreciation) and negative (naira depreciation) of the non-linear behaivour of exchange rate on trade balance. That is, $Xrate^+$ depicts the appreciation of the domestic currency to the dollar, while $Xrate^-$ denotes the depreciation of the domestic currency to the dollar, the partial sums of the positive and negative values deposited in the Xrate will have linear effects on trade balance if they exhibit statistical significance of the same sign and size with the linear equation, else the effects are asymmetrical. ω_i= parameter estimates. μ_t= disturbance term. CBN (2011) and (2018) Statistical Bulletin and International Financial Statistics (IFS) database (2019) are considered as data sources for this work. Trade balance data enhanced by the extrapolation of the relevant information for imports and exports for the period 1970- 1974 at five point moving averages provided additional impetus for analysis.

The specification of equation 1 and 2 into the conventional ARDL and NARDL form reflected on equations 3 and 4 respectively for estimation becomes

$$\Delta LTB_t = \omega_0 + \sum_{i=1}^{n} \omega_{1i} \Delta LTB_{t-i} + \sum_{i=0}^{n} \omega_{2i} \Delta LXRATE_{t-i} + \sum_{i=0}^{n} \omega_{3i} \Delta LDY_{t-i} + \sum_{i=0}^{n} \omega_{4i} \Delta LFY_{t-i} + \gamma_1 LXRATE_{t-1} + \gamma_2 LDY_{t-1} + \gamma_3 LFY_{t-1} + \rho_1 ECT_{t-1} + \mu_{1t} \quad (3)$$

$$\Delta LTB_t = \omega_0 + \sum_{i=1}^{n} \omega_{1i} \Delta LTB_{t-i} + \sum_{i=0}^{n} \omega_{2i} \Delta LXRATE^{+}_{t-i} + \sum_{i=0}^{n} \omega_{3i} \Delta LXRATE^{-}_{t-i} + \sum_{i=0}^{n} \omega_{4i} \Delta LDY_{t-i} + \sum_{i=0}^{n} \omega_{5i} \Delta LFY_{t-i} + \gamma_1 LXRATE^{+}_{t-1} + \gamma_2 LXRATE^{-}_{t-1} + \gamma_3 LDY_{t-1} + \gamma_4 LFY_{t-1} + \rho_1 ECT_{t-1} + \mu_{1t} \quad (4)$$

Note: **Δ**= Differenced Operator; **ω**= Short run parameter estimates; Y= Long run Parameter estimates; ω_0= Constant term.; ECT= lagged by one year, which represent the Error correction term linking long and short run equilibrium given a distortion; ρ= the adjustment parameter estimator. Other variables maintain same definition elsewhere in the paper. Further note that equation 3 and 4 which represent non-asymmetry and asymmetry models respectively to provide the basis for replicating six(6) models that are estimated to cover overall estimates, Pre-SAP and Post SAP estimates for comparative analysis.

A priori Expectation

$\omega_2 > 0$, which connotes the expectation that in the short run, currency depreciation or devaluation will lead to deteriorating trade balance. $Y_1 < 0$, connotes the expectation that in the long run currency depreciation or devaluation will lead to improvement in the trade balance. When the relationship between exchange rate movements and Trade balance exhibits the combined effect of $\omega_2 > 0$ relationship in the short run, and $Y_1 < 0$ relationship in the long run, then a J-Curve shape evolves.

$\omega_3 < 0$ or > 0 and $Y_2 < 0$ or > 0 are short and long run coefficients respectively, which reflects that an expected positive domestic income will enhance the spending power of consumers to precipitate imports, which will decimate the trade balance or that substitution effects will warrant the demand for domestic products, which will lead to a decrease in imports, given the increase in domestic income as such improving the trade balance. $\omega_4 > 0$ or < 0 and $Y_3 < 0$ or > 0 are short and long run parameter estimates respectively, as such it is expected that an increase in the real purchasing ability of the foreign economy will bolster exports of the domestic economy as such leading to an enhanced trade balance, while on the other hand, if the improvement of the foreign economy's income is as a result of the production of exports substitution goods and services, it will cause a reduction in her imports, which will affect the trade balance of the domestic economy negatively.

4. Results and Discussion of findings

The disaggregated descriptive statistics are structured as stylized facts for the period 1970 to 2018(Overall data), 1970 to 1985 (Pre-SAP), 1986 to 2018 (Post-SAP) and presented on table1.

Table 1: Descriptive Statistics of Variables of interest

Descriptive Statistics for Agg. Estimates 1970-2018				
	Obs	Mean	Min	Max
TB(EX/IM) ratio	49	1.44	0.74	2.82
XRATE(N:1$)	49	68.8	0.55	306.08
DY(Billions N)	49	149.7282	9.18	568.5
FY(Billions $)	49	8541.057	1073.3	20544.34
Descriptive Statistics for Pre-SAP Estimates 1970-1985				
TB(EX/IM) ratio	16	1.17	0.74	2.15
XRATE(N:1$)	16	0.67	0.55	0.89
DY(Billions N)	16	54.60625	9.18	164.48
FY(Billions $)	16	2407.858	1073.3	4338.98
Descriptive Statistics for Post-SAP Estimates 1986-2018				
TB(EX/IM) ratio	33	1.56	0.8	2.82
XRATE(N:1$)	33	101.8	1.75	306.08
DY(Billions N)	33	195.8479	27.75	568.5
FY(Billions $)	33	11514.73	4579.63	20544.34
Source: Author's Extractions From e-views 10 output				

A bird's eye view of table 1 depicts that from the overall statistics of 1970 to 2018, trade balance averaged at 1.44 units with the minimum and maximum value showing 0.74 and 2.82 units recorded in the year 1970 and 1989 respectively. The nominal exchange rate within the same period has recorded a mean of N68.8 to one$, while the minimum and maximum values of N0.55 and N306.08 to $1 was recorded in the year 1980 and 2018 respectively. Over this same period of 49 observations, Nigeria's domestic income averaged $149.7billion, with the minimum and maximum values $9.2Billion and $568.5billion in the year 1970 and 2014 respectively. Foreign Income measured as a proxy of US GDP, averaged $8,541.1billion over 1970 to 2018. It is also evident that the minimum and maximum value of foreign income within this period records a $1,073.3billion and $20,544.34billion in the year 1970 and 2018 respectively.

The descriptive information for the Pre-SAP period has reported that the trade balance ratio averaged 1.17 units with its minimum and maximum value reported at 0.74 and 2.15 units in year 1970 and 1985 respectively. The exchange rate of naira to one US dollar averaged at N0.67 to $1, while reporting N0.55 and N0.89 to $1 as minimum and maximum values in the year 1980 and 1985 respectively. The Domestic Income given as a proxy for the Gross Domestic Product measured in billions of US dollars averaged N54.6billion, while the minimum and

maximum value reported at $9.2billion and $164.5billion for year 1971 and 1981 respectively. The Foreign Income of US Gross Domestic Product at current dollar prices averaged $2,407.9billion with the Minimum value represented at $1,073.3billion and the Maximum value placed at $4,338.9billion for the year 1970 and 1985 respectively.

The Post-SAP statistics have reported an averaged Trade balance for Nigeria at 1.56 units with minimum Value of 0.8units for the year 2016, and 2.82units as maximum value for the year 1989. Over this 33-observation period, nominal exchange rate to a dollar averaged at N101.8 to $1, while minimum value of the exchange rate records in the year 1986 at N1.75 to $1 and the maximum exchange rate value records in the year 2018 at N306.08 to $1. The statistics for domestic Income represented by the Gross domestic Product at billions of current US dollars reported an averaged value of $195.9billion over 1986 to 2018, while its minimum and maximum values was placed at $27.8billion and N568.5billion for year 1993 and 2014 respectively. The Foreign Income, which the USA Gross Domestic Product serves as a proxy has reported an average of $11,514.7billion over 1986 to 2018. The minimum value within this period has it at $4,579.6billion with a maximum of $20,544.3billion for the year 1986 and 2018 respectively.

Unit Root Test

The ADF and KPSS methods of determining the existence of unit root, is adapted with the results adequately reported on Table2. The ADF and KPSS are a mirror test for unit root, thus justifying their selection to test the variables for unit root. These results show that Unit Roots of mixed order of integration of I (0) and I (1) reported for the period 1970 to 2018, while for the Pre-SAP period, which is from 1970 to 1985, all the variables have reported integration of order 1 except for XRATE, whose initial results reported I (2). Further investigation revealed a break point date in 1984, whose removal and subsequent re-examination revealed I (1) for the XRATE within this period of analysis.

Further Unit root test analysis as contained on table 2 for the period 1986 to 2018 show a mixed order of integration at I(0) and I(1). The reportage of mixed order of integration has further laid credence to the use of the ARDL methodology for parameter estimation.

Table 2: ADF and KPSS Unit Root Test		
a)Overall Unit Root Test(1970-2018)		
ADF	**KPSS**	**Order of Integ**

									ratio n
Variables	**Level s**	**1st Diff.**	**2nd Diff.**	**5% Critical Statistics**	**Level s**	**1st Diff.**	**2nd Diff.**	**5% Critical Statistics**	
LTB	4.15*	6.23*		2.923	0.266*	0.371*		0.463	(0)
LXRATE	0.19	5.56*		2.923	0.874	0.143*		0.463	(1)
LDY	1.13	5.53*		2.923	0.730	0.103*		0.463	(1)
LFY	8.61*	2.84*		2.923	0.906	0.111*		0.463	(1)
b) Pre-SAP Unit Root Test (1970-1985)									
LTB	2.03	4.49*		3.081	0.572*	0.500*		0.739	(1)
LXRATE	.39	1.68	4.80*	-3.081				0.739	I(2)
LXRATE	2.44	6.14*			0.202*	0.437*			I(1)
LDY	1.13	3.13*		-3.081	0.562*	0.153*		0.739	I(I)
LFY	0.72	4.64*		-3.081	0.519*	0.152*		0.739	I(1)
C) Post-SAP Unit Root Test (1986-2018)									
LTB	3.41*	8.35*		-2.957	0.419*	0.378*		0.463	I(0)
LXRATE	2.75	5.84*		-2.957	0.726	0.370*		0.463	(1)
LDY	0.14	4.45*		-2.957	0.586	0.236*		0.463	(1)
LFY	1.83	3.04*		-2.957	0.664	0.085*		0.463	(1)
Note: *Prob. < 0.05 to indicate absence of Unit Root. **Source: Author's Compilation from e-views 10 output**									

The sine-quo-non for considering the ARDL methodology ensures the selection of the ideal lag structure. This will ensure that the model is not over fitted. The Akaike Information Criterion (AIC) is used to enable the selection of optimal lags, while restricting the maximum lag length to 2. This produced the following ARDL representations for the Non-asymmetry and Asymmetry models. For the overall period of 1970 to 2018 as ARDL (1 2 1 0) and NARDL (1 2 2 1 0); for Pre-SAP (1970 to 1985) as ARDL (1 1 0 1) and NARDL (1 1 0 0 1); for Post-SAP

(1985 to 2018) as ARDL (1 1 0 2) and NARDL (1 2 0 2 2) respectively. The application of the Lag order to the ARDL and NARDL models, have reported the Bounds Cointegration results, whose interpretation is based on the F- statistics been reported on table 3.

Table 3: Bounds Cointegration Test for Non-Asymmetry and Asymmetry Models Over the Break Points Selected for Analysis.

Time	Model Type	F-Test Stats	Sig Level	Bounds Critical Values		Remarks
				I(0)	I(1)	
Overall period 1970-2018	ARDL	5.43	5%	2.79	3.67	LRF
	NARDL	4.17		2.56	3.49	LRF
Pre- SAP 1970-1985	ARDL	4.81	5%	2.79	3.67	LRF
	NARDL	5.49		2.56	3.49	LRF
Post- SAP 1986-2018	ARDL	9.57	5%	2.79	3.67	LRF
	NARDL	12.26		2.56	3.49	LRF

Source: Author's Compilation from e-views 10

On table 3, the F-test statistics at 5% level of significance are above the I(1) critical values in all models for the break periods selected for this work as such there exist a Long Run Form(LRF) or Cointegration amongst the variables selected for this study in all instances. This connotes the presence of long run and short run models across the three periods and six models elicited for analysis. The error correction term (ECM) on table 4, 5 and 6 has further provided evidence to the existence of long run relationship amongst the variables of interest in the six models elicited for analysis, given that the coefficients are negative and statistically significant at 1%.

Find also the robustness test for all the six models on table 4, 5 and 6 to include the F-stats for joint significance of the explanatory variables, Breusch-Godfrey (BG) Autocorrelation test, Breusch-Pagan-Godfrey (BPG) test for Heteroskedasticity, Ramsey RESET test model misspecification and Jarque-Bera (JB) test for Normality. These results for all six models revealed joint import of the regressors, absence of serial correlation, presence of Homoskedasticity of the variances, absence of model mis-specification and normality of the data respectively. This information elicits appropriateness of the models estimated. The stability test as applied was the Cusum and Cusum squared test to highlight that all the models estimated are stable, given that the residuals trend within the bounded level of significance. Except for the Cusum squared reportage of the Pre-SAP period, which slightly trended out of its bounded line but its character depict somewhat stability of the parameter variances. The estimated coefficients for the overall period, Pre-SAP and Post-SAP periods are presented on table 4, 5 and 6 respectively.

Overall Analysis

Table 4a: Overall Long and Short Run Results for ARDL or Non-Asymmetry Model				
DV: LTB	Variables	Coeff.	T	P>|t|
Long- Run	Lxrate	-0.15	-1.39	0.17
	LDY	-0.15	-1.17	0.25
	LFY	0.62	1.58	0.12
Short- Run	D(Lxrate)	0.06	0.42	0.68
	D(Lxrate(-1))	0.39	2.58	0.01
	D(LDY)	0.19	1.18	0.24
	Ecm(-1)	-0.71	-5.47	0.00
F- Statistics	BG-Test	JB-Test	BPG-Test	RESET Test
3.23(0.008)	0.08(0.923)	0.44(0.799)	0.98(0.458)	0.07(0.940)
Table 4b: Overall Long and Short Run Results for NARDL or Asymmetry Model				
Long-Run	$Lxrate^{+}$	0.01	0.05	0.95
	$Lxrate^{-}$	-3.07	-0.82	0.42
	LDY	-0.14	-0.85	0.40
	LFY	-0.21	-0.24	0.81
Short-Run	$D(Lxrate^{+})$	0.21	1.55	0.13
	$D(Lxrate^{+}(-1))$	0.32	2.23	0.03
	$D(Lxrate^{-})$	-6.37	-2.96	0.00
	$D(Lxrate^{-}(-1))$	6.49	3.21	0.00
	D(LDY)	0.28	1.49	0.15
	Ecm(-1)	-0.63	-5.35	0.00
F- Statistics	BG-Test	JB-Test	BPG-Test	RESET Test	Wald Asy. Test
3.24(0.004)	0.24(0.787)	2.85(0.240)	0.59(0.805)	1.62(0.115)	2.24(0.03)
Source: Author's Compilation from e-views 10					

A cursory observation of the Non-asymmetry results on table 4a show the potential for J-curve given that the theoretical sign show a negative relationship between exchange rate and trade balance in the long run with its concomitant positive relationship in the short run. However, these results do not connote statistical significance as such it can be concluded that the validating of the J-Curve hypothesis cannot be confirmed. Again, the coefficient of exchange rate is inelastic as such invalidating the existence of the Marshall-Lerner condition within this period of study. However, it is of import that the contemporaneous estimate of exchange rate

do exhibit the right sign and it is statistically significant in influencing trade balance in the short run.

On the other hand, the Asymmetry model captured on table 4b for the overall period has shown results similar to the Non-asymmetry model on table 4a. However, the results via statistical significance has invalidated the existence of a J-Curve, but theoretical indicators show its potentiality given the concomitant movement of the correct and significant sign of depreciation of contemporaneous exchange rate{D(Lxrate$^-$(-1))} in the short run, with the correct sign but insignificant statistic of depreciation (Lxrate$^-$)in the long run. Given this scenario, the potential also exist for the Marshall-Lerner condition to hold with the elastic coefficient of exchange rate depreciation in the long run.

The foregoing analysis from table 4a and 4b connotes that the J-Curve hypothesis is not confirmed for the period of analysis but that the potential exist for the Marshall-Lerner condition to hold to enable its occurrence. The asymmetry multiplier on fig 1a showing an N-shaped curve further buttress this comment.

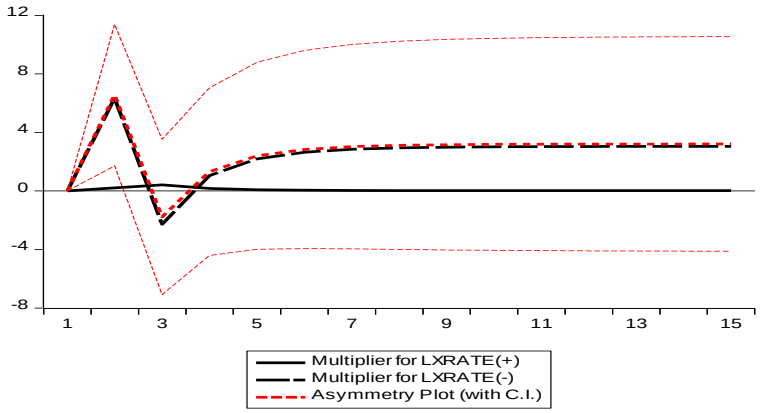

Fig 1a: Overall Asymmetry Plot of Exchange Rate Impulses.

The significant statistic of the Wald test as reported on table 4b signifies the existence of asymmetry relationship, which authenticates the decision that the size, sign and significance criteria of the asymmetry variable, in this case exchange rate, is at variance with the non-asymmetry model. This connotes the existence of asymmetry as represented in fig 1a showing the asymmetry plot of exchange rate impulses. The plot reveals that negative multipliers of exchange rate or currency depreciation (indicated by the dotted black line), contributes more to exchange rate movements (dotted red line) in Nigeria. This is as against the currency appreciation or positive exchange rate multipliers depicted by the un-dotted black line. This further shows the potential for the existence of a J-Curve given that currency depreciation affects trade balance negatively but in the long-run, the trade balance improves. Fig 1b and 1c

further substantiates the constancy of the parameter estimates to validate these findings as highlighted earlier in this work.

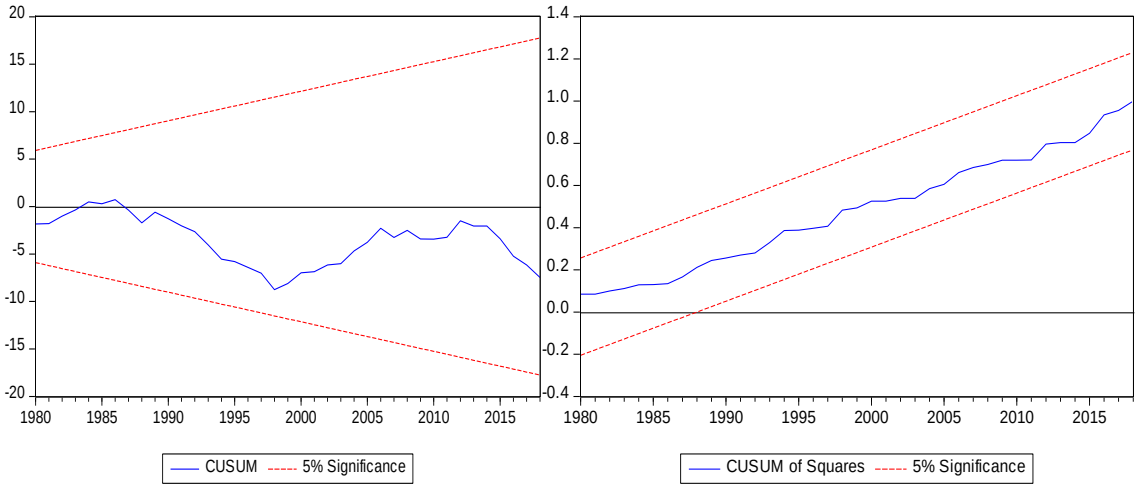

Fig 1b: Stability Test for the Non-Asymmetry ARDL Model

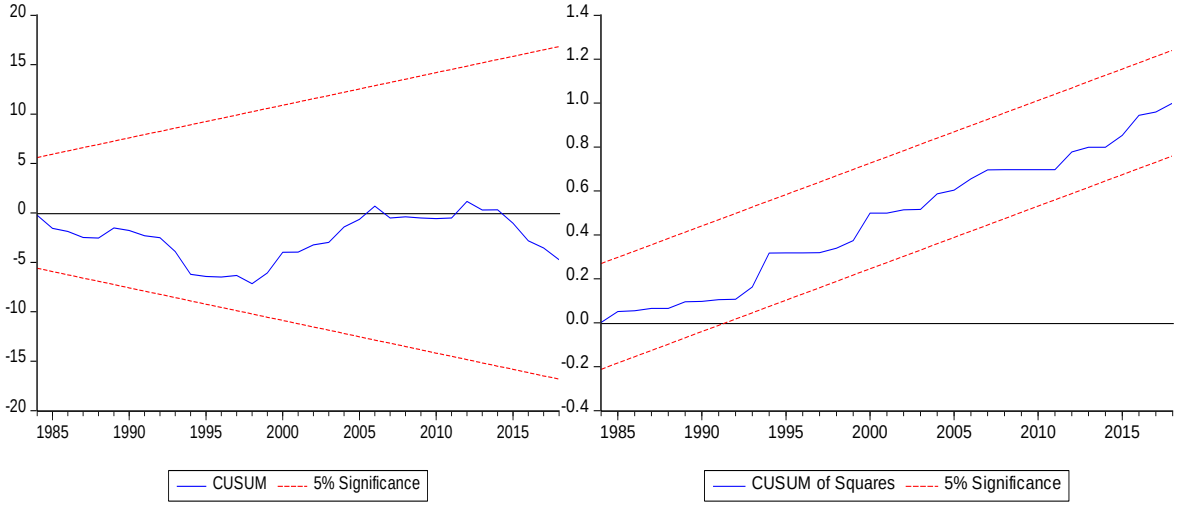

Fig 1c: Stability Test for the Asymmetry ARDL Model

Pre-SAP Analysis: The Pre-SAP results estimated is reflective on table 5a and 5b.

Table 5a: Pre-SAP Long and Short Run Results for ARDL or Non-Asymmetry Model				
DV: LTB	Variables	Coeff.	T	P>|t|
Long- Run	Lxrate	3.67	1.69	0.13
	LDY	0.08	0.18	0.86
	LFY	0.62	0.84	0.43
Short- Run	D(Lxrate)	-2.32	-3.01	0.02
	D(LDY)	0.49	2.59	0.03

	Ecm(-1)	-0.96	-6.01	0.00
F- Statistics BG-Test JB-Test BPG-Test RESET Test				
3.23(0.008) 3.04(0.122) 0.29(0.864) 1.39(0.323) 0.35(0.733)				
Table 5b: Pre-SAP Long and Short Results Run for NARDL or Asymmetry Model				
Long-Run	$Lxrate^{+}$	5.57	1.90	0.11
	$Lxrate^{-}$	-0.95	-0.31	0.76
	LDY	0.01	0.02	0.98
	LFY	-0.14	-0.20	0.85
Short-Run	$D(Lxrate^{+})$	-9.28	-6.45	0.00
	D(LDY)	0.28	1.49	0.15
	Ecm(-1)	-1.14	-7.76	0.00
F- Statistics BG-Test JB-Test BPG-Test RESET Test Wald Asy. Test				
3.23(0.008) 3.30(0.129) 2.06(0.356) 0.501(0.806) 0.753(0.486) 2.51(0.05)				
Source: Author's Compilation from e-views 10				

A cursory analysis of table 5a and 5b, which is a reportage of the Non-asymmetry and Asymmetry models for the Pre-SAP period, has revealed an inverted J-shaped, exchange rate-trade balance nexus relationship, for the non-asymmetry and asymmetry models. Given the significant value of Wald test statistic, which suggest that there exist a long run asymmetry of the exchange rate impulses on trade balance. To this end, exchange rate appreciation is what significantly contributed to the dynamics of exchange rate movements, which increases the trade balance in the short run. That is, a unit percent increase in exchange rate appreciation leads to a short run increase in the trade balance of 2.32% and 9.28% for the Non-asymmetry and asymmetry models respectively. However, in the long run, despite the statistical insignificance of currency appreciation, which is the greater contributor to exchange rate movements as revealed by the asymmetry plot observed in fig 2a, there exist the potential based on theoretical relationship of currency appreciation leading to a decrease in trade balance. The interaction of the long run and short run relationship dynamics reveals an inverted J-Curve. Substantiating evidence to the results on table 5a and 5b is reflective on the asymmetry plot presented as fig 2a.

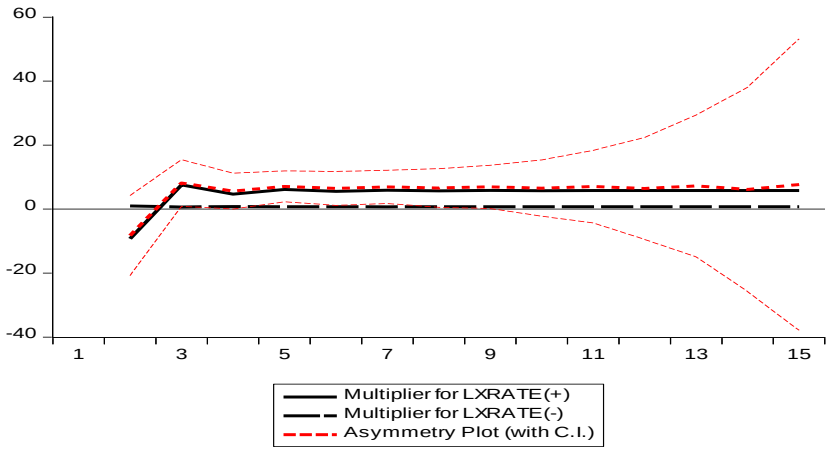

Fig 2a: Pre-SAP Asymmetry Plot of Exchange Rate Impulses.

The asymmetry plot depicted by the broad red dotted line, which is bounded within 95% confidence interval shown by the narrow red dotted line, has as its closest co-movement the exchange rate appreciation (unbroken black line) with exchange rate depreciation(broken black line) exhibiting a variance from the cumulative exchange rate asymmetry plot. This confirms the Wald asymmetry test of the existence of asymmetry of the exchange rate in explaining trade balance phenomenon. Fig 2b and 2c reflects substantiating information on the parameter stability of the residuals, which is somewhat stable as alluded to in some part of an earlier presentation in this work.

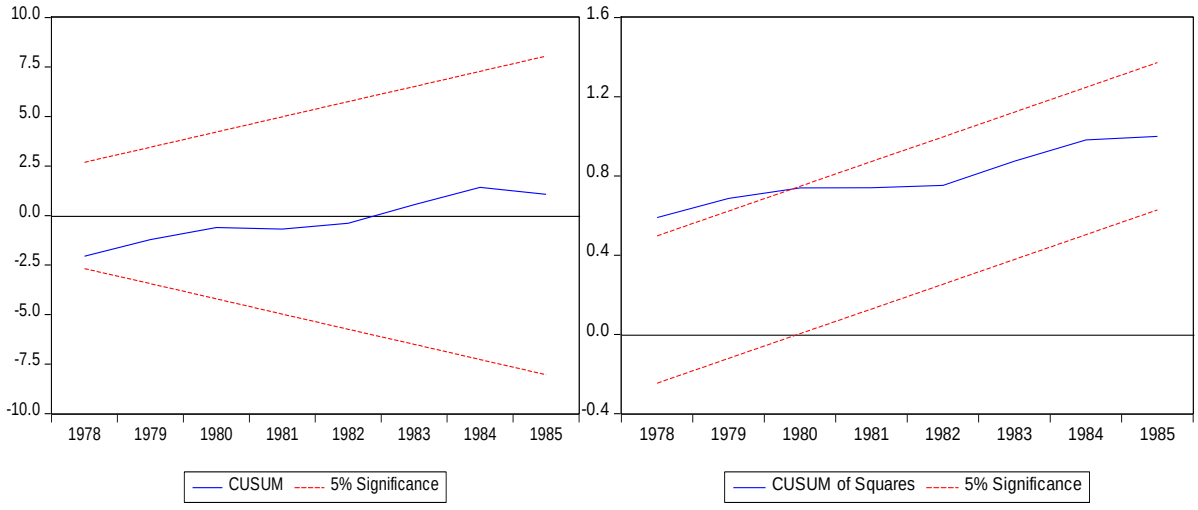

Fig 2b: Pre-SAP Stability Test for the Non-Asymmetry ARDL Model

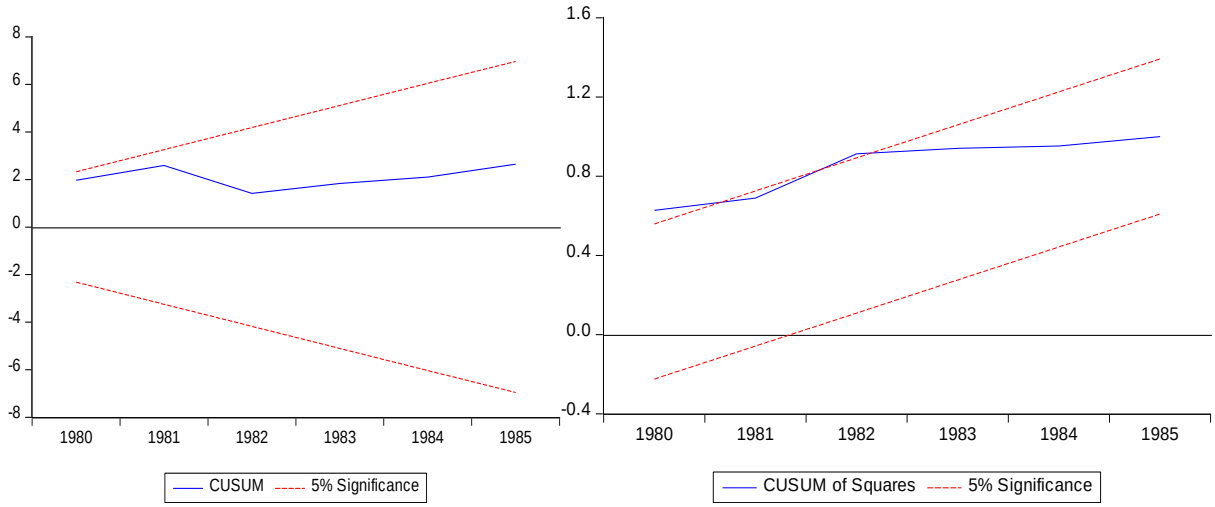

Fig 2c: Pre-SAP Stability Test for the Asymmetry ARDL Model

Post-SAP Analysis

Table 6a and 6b posit the post-SAP analytical frame for Long and Short run of the Non-Asymmetry and asymmetry models estimated for this work. A quick outlook shows that all the variables of interest captured in the models reveal statistical significance at 10% in both the long run and short run for the Non-asymmetry and Asymmetry models, except for the contemporaneous value of foreign income in the non-asymmetry short run model.

Table 6a: Post-SAP Long and Short Run Results for ARDL or Non-Asymmetry Model				
DV: LTB	Variables	Coeff.	t	P>|t|
Long- Run	Lxrate	0.55	5.08	0.00
	LDY	0.69	6.51	0.00
	LFY	-3.33	-6.73	0.00
Short- Run	D(Lxrate)	0.43	-3.53	0.00
	D(LFY)	-0.17	-0.08	0.94
	D(LFY(-1))	7.00	2.51	0.02
	Ecm(-1)	-1.29	-7.49	0.00
F- Statistics	BG-Test	JB-Test	BPG-Test	RESET Test
7.95(0.000)	0.28(0.762)	1.27(0.53)	0.68(0.685)	1.57(0.129)

Table 6b: Post-SAP Long and Short Run Results for NARDL or Asymmetry Model				
Long-Run	$Lxrate^{+}$	0.61	4.10	0.00
	$Lxrate^{-}$	-39.45	-1.88	0.08
	LDY	0.54	4.54	0.00
	LFY	-3.74	6.14	0.00
Short-Run	$D(Lxrate^{+})$	0.53	5.22	0.00
	$D(Lxrate^{+}(-1))$	0.22	2.21	0.04
	D(LDY)	1.02	5.93	0.00
	D(LDY(-1))	0.44	2.53	0.02
	D(LFY)	3.22	1.83	0.08
	D(LFY(-1))	7.32	3.17	0.01
	Ecm(-1)	-1.29	-9.69	0.00

F- Statistics	BG-Test	JB-Test	BPG-Test	RESET Test	Wald Asy. Test
9.19(0.000)	3.11(0.07)	2.09(0.351)	0.62(0.789)	0.59(0.562)	2.16(0.04)

Source: Author's Compilation from e-views 10

However, the results projected in table 6a shows that in the short run and long run exchange rate movement has the capacity to significantly deteriorate trade balance, which confirms J-curve hypothesis for only the short run, which is not transitory to the long run dynamics, as such the non-confirmation of the J-Curve hypothesis. This scenario might be attributable to fall in Nigeria's exports with her trading partners. This has the capacity to cause a deficit in trade balance, given the over-riding impact observed of exports on imports within the period of study. Further observations show that the import substitution efforts by the government has yielded a positive and significant influence of 0.69% on trade balance. The over-riding mechanics of deteriorating exports, which has mitigated the positive impact of reduced imports is evidenced from the significant and negative relationship of trade balance and foreign income depicted by the 3.33% changes observed in the former given a unit change in the latter for the long run.

The rendition of the presence of asymmetry is provided by the 5% level of significance given by the Wald asymmetry test statistic of 2.16, presented on table 6b. To this connection, currency depreciation contributes more to exchange rate impulses than currency appreciation as substantiated by the plot asymmetry on fig 3a. Insofar, as Marshall-Lerner condition is met in the long run, authenticated by the elastic coefficient of 4.45% of currency depreciation ($Lxrate^{-}$). This is significant at 10% and with the correct sign to affect trade balance towards a positive trajectory. Further observations reveal that the concomitant movement in the short run of currency depreciation, which should have led to deteriorating trade balance, so that the trade balance- exchange rate nexus exhibits a J-curve, cannot be validated. Nevertheless, the potential for the occurrence of the J-Curve exist as traced to the post-SAP asymmetry plot of exchange

rate impulses on trade balance reflected on fig 3a, which shows an N-shaped curve. The reasons for this behavioral dynamics are not far-fetched from those ascribed to the non-asymmetry model of the post-SAP framework.

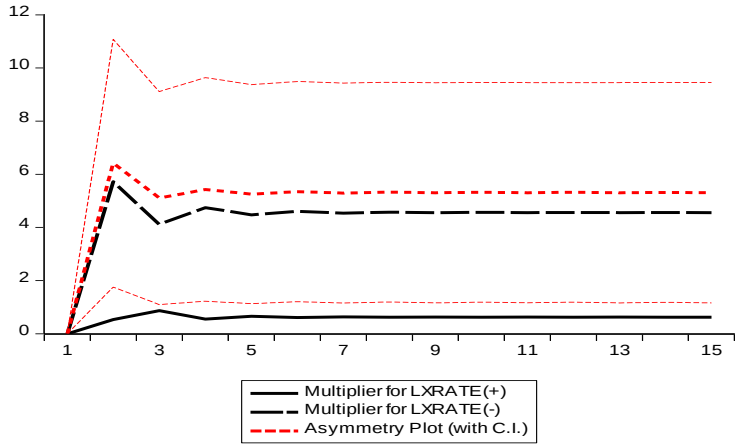

Fig 3a: Post-SAP Asymmetry Plot of Exchange Rate Impulses.

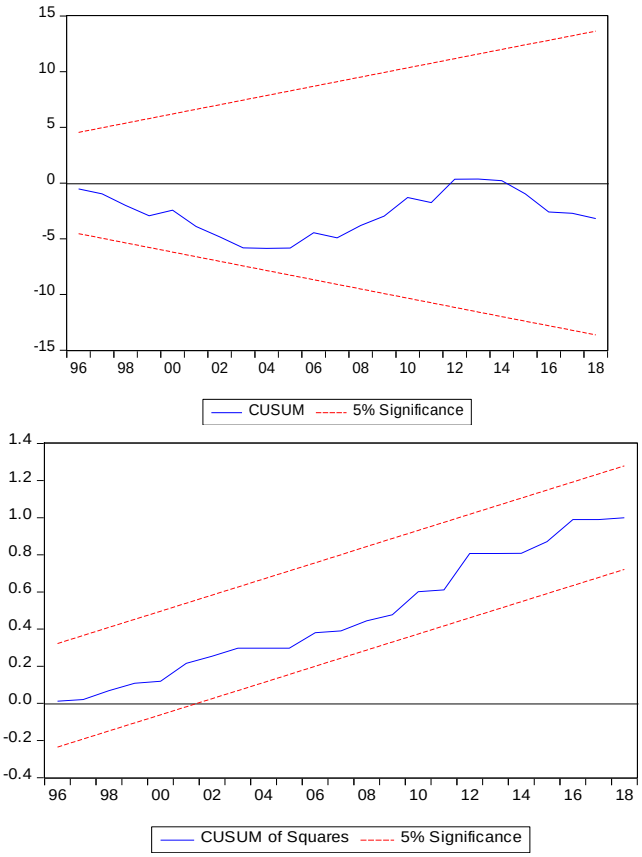

Fig 3b: Post-SAP Stability Test for the Asymmetry ARDL Model

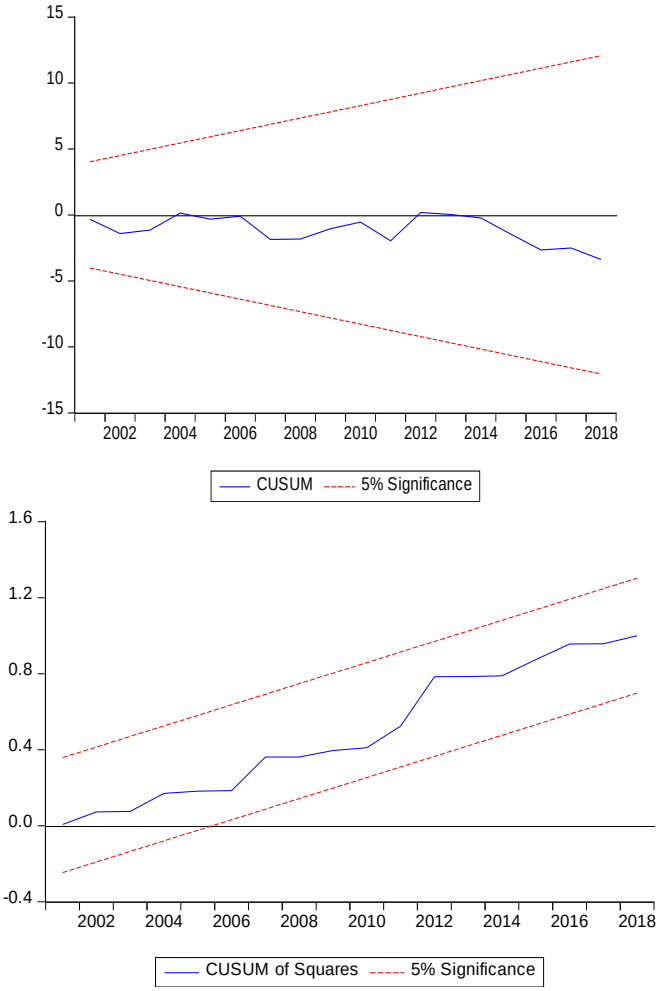

Fig 3c: Post-SAP Stability Test for the Asymmetry ARDL Model

A review analysis show that the J-curve hypothesis is not validated for the overall period, neither in the Pre and Post-SAP break periods. Nevertheless, the potential for its occurrence is evidenced in the Overall period as well as in the Post-SAP frame by the shape of the N-curve. However, this potentiality is non-existent in the Pre-SAP frame given the inverted J-shape curve. This connote that indeed structural break matter, as such a contending issue, in evaluating the shape of the J-Curve in Nigeria.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The J-Curve hypothesis seeks to draw attention to the policy maker that to stimulate economic growth, the policy maker needs to tinker with her exchange rate, which in the short run will

deteriorate trade balance, because of adjustment lags, sticky nature of prices and technological replacements. However, after sorting out these issues, the benefits associated with exchange rate movement will trickle in to set the country on an upward growth trajectory path. To this end, this work seeks to complement the existing discourse on the evidence of the J-Curve in Nigeria, while drawing in the perspective of structural break, by using the fiscal initiative of 1986 Structural Adjustment Program as the break point, to enable analysis, given data points from 1970 to 2018. Summarily, this study shows, whether structural break matters, in form of major policy shift, towards shaping the J-Curve, which is a composite interaction of the trade balance and exchange rate movement. The study adopted the ARDL and NARDL to reveal the absence of J-Curve within the period of analysis. Nevertheless, the study showed great potentials for the occurrence of J-Curve in the overall period of 1970 to 2018 as well as the Post-SAP period of 1986 to 2018 given the N-shaped curve, unlike the Pre-SAP period of 1970 t0 1985, which exhibits the inverted or Reverse J-Curve. This means that major policy shifts of government, in addition to the asymmetric effect of exchange rate, has the capacity of affecting the outcome of the Trade Balance- Exchange rate nexus in resolving the presence of J-Curve, reverse J-Curve or other curve typologies noticed in literature. For Nigeria, foreign income plays a more dominant role than domestic income in affecting the country's trade balance, which has negative implications on economic growth attributable to imports exceeding exports. In essence, deficit trade balance will precipitate high demand for foreign currency against its supply, which spirals domestic currency depreciation or devaluation.

To this end the study suggest that policy makers pay due attention in articulating development policies as they indirectly bear on the trade balance-exchange rate interaction. Furthermore, to stem the upward trajectory of exchange rate depreciation or devaluation, government should strive towards diversification of the economy to spur greater exports, which has the capacity to enable trade balance surplus and increasing Nigeria's foreign reserves.

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