

## **EXCHANGE RATE MISALIGNMENT AND BALANCE OF PAYMENT ADJUSTMENT IN NIGERIA**

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### **Abstract**

This study analyses the relationship between exchange rate misalignment and balance of payments (BOP) mal-adjustment in Nigeria over the sample period of 1973 through to 2012 using the vector error correction econometric modelling technique. The most germane result of the study is the fact that exchange rate misalignment exhibited a positive impact on the Nigerian's balance of payments position. In addition to the VECM estimates, the Granger pair-wise causality test results also indicated a unidirectional causality running from exchange rate misalignment to balance of payments adjustment in Nigeria at the 1% level. Indeed, the study found BOP effects of exchange rate appreciation for the Nigerian economy. The policy implication is simple; the Nigerian government should implement economic policies that could enhance the appreciation of the Naira-US\$ exchange rate for possible favourable balance of payments effects.

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**Keywords:** Exchange rate misalignment, Balance of payments mal-adjustment, VECM, Nigeria, Naira-US\$ exchange rate

### **Research Problem**

The topic of exchange rate and how it relates to and affects the balance of payments position has been the concern of economists and policy makers and has been subjected to extensive empirical research. Exchange rate policy is a fundamental macroeconomic policy that guides domestic investors on the best way to strike a balance between their trading

partners abroad (Balassa, 1964; 1973, Edison and Klovlan, 1987; Hsieh, 1982; Marston, 1987). Hence, in examining the relationship that exist between exchange rate misalignment<sup>4</sup> and balance of payments adjustment, there is need to recall that exchange rate is the price of one currency in terms of another, while balance of payments is a country's state of affairs in international trade (Beatrice, 2001). The relationship is therefore established since there cannot be international trade if a country's currency is not priced in another country so as to allow trade across boarder (Takaendesa, 2006).

When Nigeria started recording huge balance of payments deficits and very low level of foreign reserve in the 1980s, it was felt that a depreciation of the naira would relieve pressures on the balance of payments. Consequently, the naira was devalued. The irony of this policy instrument is that our foreign trade structure did not satisfy the *Marshall-Lerner* condition for a favourable balance of payment adjustment (Umoru and Eboime, 2013). The Nigerian foreign structure is characterized by export of crude petroleum whose prices are pre determined in the world market. This is in addition to low import and export price elasticity's of demand. Based on this, the study is desirous at examining the relationship between exchange rate misalignment and balance of payments mal-adjustment. The research question to be asked then is "how has exchange rate misalignment impacted the Nigeria's balance of payment position?" Following this section, are the overview of the exchange rate policy and the dynamics of balance of payments adjustment in Nigeria. The next section is the review of previous studies. Subsequent to that is the specification of the model, the methodology of the study, estimation with results and conclusion.

### **Overview Of The Exchange Rate Policy<sup>5</sup> And Balance Of Payments Adjustment In Nigeria**

#### **Exchange Rate Policy in Nigeria**

Nigeria has practiced both fixed and flexible exchange rate polices. From the period of 1967 through to 1970, Nigeria experienced a civil war. This adversely affected the fixed exchange rate regime which was in place at the time. The fixed exchange rate regime was accompanied by strict controls and regulations which ultimately resulted in the overvaluation of the exchange rate. This had negative implications for the economy as it encouraged the importation of finished goods which created more competition for the domestic producers.

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<sup>4</sup> Exchange rate misalignment refers to the swings or fluctuations in the exchange rates over a period of time or the deviations from a benchmark or equilibrium exchange rate (Mordi, 2006).

<sup>5</sup> The objectives of exchange rate policy are achievement of favourable balance of payments position, diversification of the export base, checking and balancing the incidence of capital flight, elimination of payments overdue, encouraging local production of imports (CBN, 2012).

Besides, the balance of payments position and the country's external reserves level were both compromised by the overvalued exchange rate (Sanusi, 2004, Sanni, 2006). In 1980 Nigeria was an oil-exporting country faced with high capital inflows which resulted in the appreciation of the naira. The oil boom came to an end by 1983 and the prevailing currency appreciation distorted the growth of the economy. In 1986, Nigeria implemented the *IMF-World Bank* imposed *Structural Adjustment Program (SAP)* which emphasised a market oriented approach to exchange rate determination (Mordi, 2006). However, the exchange rate depreciated throughout the 1980s. This decision was informed by the compromised balance of payments position as well as the country's declining external reserves level. Both the nominal and the real exchange rate were depreciated so as to align them to their equilibrium levels (Obadan, 1994; Mordi, 2006).

The institutional agenda in place in 1986 was the *Second-Tier Foreign Exchange Market (SFEM)*. The objective of the *SFEM* was to attain a realistic exchange rate through a series of exchange rate devaluations. *SFEM* implemented a dual exchange rate system and in 1987, the two rates merged at the rate of 3.74 *Naira-US\$* for one US dollar. A *Dutch Auction System (DAS)* was introduced in 1987 in order to improve the level of efficiency in the bidding system. The *SFEM and DAS* were then replaced by the *Foreign Exchange Market (FEM)* before in 1987 in an attempt to reduce the replications in the Nigerian exchange rate system, as well as ensure the depreciation of the Nigerian Naira. In 1989, the *Bureau de change and the Inter-bank Foreign Exchange Market (IFEM)* were initiated in order to cater for the needs of small end-users (Obadan, 1994). In 1990, the *IFEM* was re-organized to accommodate the re-enunciation of the *DAS*. The reduction in arbitrage opportunities in the oil marketing sectors combined with stronger controls in foreign exchange practices led to a noticeable moderation in foreign exchange net demand (Obadan, 2006). The volatility in the official rates, however, was limited with the coefficient of variation being 1.28 per cent for the year as a whole compared to 0.32 per cent in 2010. From 1992 to 1993 the exchange rate system in Nigeria was deregulated and this was further enhanced by realigning the official exchange rate with the exchange rate in the parallel market (Ogiogio, 1996). In 1994 the *Autonomous Foreign Exchange Market (AFEM)* replaced the *IFEM* to ensure that foreign exchange rate was sold at a market determined price, by authorised dealers. Although the exchange rate became relatively stable in the mid-1990s, the exchange rate was further depreciated and at the close of 1995, the *Naira-US\$* exchange rate became eighty-two Naira in the autonomous part of the market. This however widened the gap between the parallel and official exchange rate (Odusola, 2006). The further devaluation of the Naira fostered a

market-oriented exchange rate arrangement which led to a fall in the premiums being captured in the parallel market and therefore narrowed the gap between the official and parallel market exchange rates. In 1999 the *IFEM* was reintroduced in order to improve inter-bank activities in the market. The exchange rate continued to depreciate and in 2001, the *Naira-US\$* exchange rate stood at one hundred and eleven Naira. According to the *CBN* report, *CBN (2010)*, 2001 was also marked by large oil revenues as well as an improvement in the macroeconomic performance of the economy due to the banking sector reform. In early 2009, the Naira depreciated to the extent that the *Naira-US\$* exchange rate stood at N170. Thereafter, the exchange rate of the Naira appreciated to one hundred and fifty Naira in 2012 (*CBN, 2011*). Presently (2013), the *Naira-US\$* exchange rate is one-hundred and sixty Naira. While some have attributed the recent depreciation to the decline in the nation's foreign exchange reserves, others argued that the activities of speculators and banks are responsible for the recent decline in the value of the naira. In addition, the quest for higher profits in the face of the global economic meltdown is forcing some banks to engage in *round-tripping* <sup>6</sup>(Mordi, 2006, Obadna, 2006, Odusola, 2006).

#### **Dynamics of BOP Adjustment in Nigeria**

From 1956 to 1965, Nigeria had a persistent merchandise trade deficit, which changed to a surplus in the period between 1966 and 1977 with petroleum's rapid growth as the major export commodity. In late 1977 and 1978, demand for Nigeria's low-sulphur crude decreased as oil became available from the North Sea, Alaska, and Mexico, and as global oil companies reacted to the less favourable participation terms offered by the Nigerian government (Ogiogio, 1996). Except for the period from 1979 to 1980, when oil shortages and prices increased, demand for Nigerian crude became sluggish until 1990. From 1978 through 1983 the trade deficit persisted. In early 1984, the Nigerian government closed Nigeria's land borders and international airports for several days, replaced all old naira notes with new currency bills, and introduced stricter exchange-control regulations designed to reduce the repatriation of Nigerian Naira smuggled abroad and prevent future convertibility to other currencies (Ogiogio, 1996; *CBN, 2010*). The negative price shock in the world market in the early 1980s resulted in a substantial reduction in export earnings that accrued to government. The outcome of this was huge and recurring fiscal deficits, balance of payments and debt crises, due to unsustainable huge public sector expenditure and lack of alternative source of export earnings (*CBN, 2010; 2011*). Therefore, 1980s witnessed deficits in current accounts

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<sup>6</sup> A situation in which commercial banks procure foreign exchange from the CBN and sell to parallel market operators at prices other than the official prices. These practices put together lead to exchange rate fluctuations and misalignment.

and the deficit-GDP ratio rose to 12 percent in 1982 from four percent in 1980. Low oil prices and the banking crisis in the country resulted in budget deficits of 4.4 percent of *GDP* in 2009 and 5.7 percent of *GDP* in 2010 (CBN, 2012). In recent times, the savings gap widened and the total debt-*GDP* ratio is on the increase.

### **Prior Studies**

Numerous studies have in the past examined the effects of exchange rate misalignment on balance of payment maladjustment. The literature can indeed be divided into two different schools of thought. The studies that supported the *BOP* effects of exchange rate overvaluation include Agene (1991), Ogiogo (1996), Olisadebe (1996), Aron et al. (1997), Abeysinghe and Yeok (1998), MacDonald (1998), Chowdhury (1999), Anietie et al. (2004), Enrique and Nagayasu (2004), Annsofie (2005), Speller (2006), Yu (2006), Cheung, Chinn and Fujii (2007), Balogun (2007), Frankel (2007), Antonia et al. (2008), Dubas (2009), etc. Agene (1991)'s results support overvaluation of the exchange rate. Ogiogo (1996) found substantial deterioration in the balance of payments position of developing countries is caused among other factors as, worsening terms of trade, excessive imports and over valuation of the currencies. Olisadebe (1996) favoured exchange rate appreciation as a means of attaining favourable balance of payments position. To Cheung, Chinn and Fujii (2007), overvaluation of the exchange rate enhances deficits in the balance of payments position through the current and capital accounts. Dubas (2009) findings suggest that overvaluation will improve the current account without significant import liberation.

The studies that favoured exchange rate devaluation as a panacea to favourable balance of payments position include, Connolly (1972), Cooper (1976), Khan and Lizonda (1987), Obadan and Ihimodu (1980), Onoh (1982), Anifowose (1994), Dufrenot and Yehoue (2005) etc. Connolly (1972) in their study of balance of payments and domestic credit creation opined that as the rate of devaluation increases, the reserve position will also increase. Cooper (1976) found that devaluation leads to higher exports and lower imports, which improves the balance of payments position of a country. Khan and Lizonda (1987), countries experiencing balance of payments problems should embark on currency devaluation to effect a change on the payments problems since exchange rate devaluation impact significantly on international capital movement. Obadan and Ihimodu (1980) hold that the exchange controls are significant determinants of favourable balance of payments. The empirical results of Onoh (1982) hold that devaluation is a flexible device for correcting disequilibrium in a country's balance of payments position. In his estimates, exchange rate devaluation is a stimulant to the export sector of a deficit economy. Anifowose's (1994)

results favoured exchange rate devaluation as a significant remedy to finance deficits in a country's balance of payments. Dufrenot and Yehoue (2005) found that exchange rate devaluation influence significantly balance of payments. Their results show that improvements in the reserve position of the devaluing countries. In effect, improvement on the reserve position constitutes an improvement on the balance of payments position.

### Model Specification

The theoretical framework for the study is based on the exchange rate pass-through effect of Athukorala and Menon (1994). This requires the specification of a vector error correction model (*VECM*). The *VECM* ( $p$ ) model is specified as:

$$\Delta BOP_t = \theta + \Pi BOP_{t-1} + \dots + \sum_{i=1}^{S-1} \Phi_i^* \Delta BOP_{t-i} + \zeta_t \quad (3.1)$$

$$\Delta EXM_t = \eta + \Pi EXM_{t-1} + \dots + \sum_{i=1}^{S-1} \Phi_i^* \Delta EXM_{t-i} + \mathfrak{Z}_t \quad (3.2)$$

The vector error correction model (*VECM*) that is equivalent to the VAR ( $p$ ) representation is thus specified here below:

$$BOP_t = \theta + (I_K + \Pi + \Phi_i^*) BOP_{t-1} + \sum_{i=2}^{S-1} (\Phi_i^* - \Phi_{i-1}^*) BOP_{t-i} - \Phi_{p-1}^* BOP_{t-p} + \sum_{i=0}^{S-1} \alpha \Delta EXM_{t-i} + \partial ecm_{t-1} + \zeta_t \quad (3.3)$$

$$EXM_t = \eta + (I_K + \Pi + \Phi_i^*) EXM_{t-1} + \sum_{i=2}^{S-1} (\Phi_i^* - \Phi_{i-1}^*) EXM_{t-i} - \Phi_{p-1}^* EXM_{t-p} + \sum_{i=0}^{S-1} \vartheta_i \Delta BOP_{t-i} + ecm_{2t-1} + \mathfrak{Z}_t \quad (3.4)$$

Where  $BOP$  is the balance of payments,  $EXM$  is the Naira-US\$ exchange rate misalignment,  $\Delta$  is the differencing operator, such that  $\Delta BOP_t = BOP_t - BOP_{t-1}$ ,  $\Delta EXM_t = EXM_t - EXM_{t-1}$ ,  $S$  indicates the number of lags in the *VECM* equation,  $\Pi$  is the co-integration rank,  $\zeta$  and  $\mathfrak{Z}$  are the stochastic error terms and  $ecm_{(t-1)}$  is the one-year lagged error correction term. A negative and significant coefficient of the one-year lagged error correction term indicates that any short-term divergence between the variables in the study will give rise to a stable long run relationship between the variables. The sample consists of 35 annual data from 1973 through to 2012. Data set was obtained from *Central Bank of Nigeria (CBN) Statistical Report* website. The data on exchange rate is valued in rate

while data on *BOP* is valued in level. All data are thus converted into log-level and level log for time series processing.

### Methodology

The study employed the Augmented Dickey Fuller and the Phillips-Peron statistical test, to test for the existence or otherwise of unit root on the basis of the hypothesis:

$$H_0 : \alpha = 1, I(1) \text{ vs. } H_1 : \alpha < 1, I(0)$$

We indeed simulated the paths of two random walks without drift with independently generated standard normal white noises,  $\varepsilon_{1t}$  and  $\varepsilon_{2t}$  using these equations:

$$Z_{1t} = \delta Z_{1t-1} + \varepsilon_{1t} \text{ vs. } Z_{2t} = \delta Z_{2t-1} + \varepsilon_{2t} \quad (3.5)$$

On estimating equations (3.5) the order of integration and hence the stationarity of the variables is established. Co-integration is established once there is a linear combination of the stationary variables. If co-integration has been detected between series we know that there exists a long-term equilibrium relationship between them so we apply *VECM* in order to evaluate the short run properties of the co-integrated series. In case of no co-integration *VECM* is no longer required and we directly precede to Granger causality tests to establish causal links between variables (Engle and gRnager, 1987). The paper employs the *Johansen and Juselius* co-integration test methodology. Under the method, two statistical tests are utilized to determine the number of co-integration vectors. These include the “*Maximum Eigenvalue*” statistic and the “*Trace*” statistic. The “*Maximum Eigenvalue*” statistic tests the null hypothesis of  $r$  co-integrating relations against the alternative of  $r+1$  co-integrating relations for  $r = 0, 1, 2, \dots, n-1$ . This “*Maximum Eigenvalue*” test statistics are computable from the following equation:

$$LR(r/n+1) = -N^* \text{Log}(1 - \hat{\lambda}) \quad (3.6)$$

Trace statistic investigates the null hypothesis of  $r$  co-integrating relations against the alternative of  $n$  co-integrating relations, where  $n$  is the number of variables in the system for  $r = 0, 1, 2, \dots, n-1$ . The trace test statistics are computed by on the basis of the following relation:

$$-N \sum_{i=r+1}^k \text{Log}(1 - \lambda_i) \quad (3.7)$$

Where  $N$  is the accessible number of observations, that is, the length of the time series and  $\lambda$  is the “maximum eigenvalue” statistic. The co-integration test hypothesis can be stated as below:

$H_0 : rank = 0$  vs.  $H_1 : rank > 0$

Where  $H_0$  and  $H_1$  are the null and alternative hypotheses respectively. In *VECM* the co-integration rank shows the number of co-integrating vectors. Accordingly, a rank of three indicates that three linearly independent combinations of the non-stationary variables will be stationary. Economic theory posits Granger causality in at least one direction between economic variables. The paper further tested for Granger pair-wise causality. So, the bivariate causality performed in this study is done on estimation of the following equations:

$$EXM_t = \varphi_1 + \varphi_2 EXM_{(t-1)} + \dots + \varphi_i EXM_{t-i} + \delta_1 BOP_{(t-1)} + \dots + \delta_i BOP_{t-i} + \mu_{1t} \quad (3.8)$$

$$BOP_t = \omega_1 + \omega_2 BOP_{(t-1)} + \dots + \omega_i BOP_{t-i} + \phi_1 EXM_{(t-1)} + \dots + \phi_i EXM_{t-i} + \mu_{2t} \quad (3.9)$$

Where  $\mu_{1t}$ ,  $\mu_{2t}$  are white noise disturbances. Based on the estimated chi-square and the ensuing probability values, a unidirectional or a bi-directional causation can be envisaged between exchange rate misalignment and balance of payments adjustment in Nigeria.

### Estimation And Results

The stationarity test results are presented in Appendix 1. The two variables in the study are stationary at first difference and hence are integrated of order one, that is,  $I(1)$ . In the core therefore, the null hypothesis of no unit root for exchange rate misalignment and balance of payments are rejected at level but accepted at first difference. This is made evident by the fact that the ADF and PP test statistics having differenced the series exceeded the critical values at the 1% level. Co-integration test results based on the Johansen's maximum likelihood estimators for the *CI rank (R)* are as presented in Appendix 2. Given that the value of  $r$  is the number of co-integrating relations between variables, the first row tests the hypotheses that the number of co-integrating relations are  $H_0: r = 0$  against  $H_1: r > 0$ ; the second row tests  $H_0: r = 1$  against  $H_1: r > 1$  and so on. The test results indicate one co-integrating vector, that is, both exchange rate misalignment and balance of payments adjustment are co-integrated with one rank but with three lags. Hence, we specified the *ECM* option with one rank and three lags. In order to normalize the value of the co-integrated vector, we specified the normalized variables with the Johansen's normalization restriction imposed. The results are as shown in Appendix 3. The *ECM* option produces the estimates of the long-run parameter  $\beta$  and the adjustment coefficient  $\alpha$ . Dummy 1 indicates the first column of the  $\alpha$  and  $\beta$  matrices. Since the co-integration rank is 1 in the bivariate system,  $\alpha$



and  $\beta$  are two-dimensional vectors. The estimated co-integrating vector is  $\hat{\beta} = (1, -1.9537)'$ . Indeed, the long-run relationship between balance of payments and exchange rate misalignment is  $BOP = 1.9537EXM$ . The first element of  $\beta$  is one since and  $BOP$  is specified as the normalized variable. In what follows, we proceed to estimate the vector error correction model (*VECM*).

Appendix 4 presents the Granger causality results based on the chi-square statistics with probability values constructed under the null hypothesis of no causality between exchange rate misalignment and balance of payments in Nigeria. The bivariate causality results indicate a unidirectional causality running from exchange rate misalignment to balance of payments position in Nigeria at the one percent level. What this means in effect is that past values of exchange rate appreciation have predictive effects on present balance of payments position. The vector error correction model results are shown in Appendix 5. The results show parameter estimates of one-year difference lagged, two-year difference lagged and three-year difference lagged coefficients of exchange rate misalignment and balance of payments adjustment in Nigeria. In all, the coefficients of exchange rate at the different lags are all positive and statistically significant at the one percent level. The result is quite instructive. This shows that exchange rate misalignment in the form of appreciation adversely affect balance of payments position in Nigeria. This is because an appreciation in the Naira-US\$ exchange rate leads to overvaluation. Overvaluation in turn makes imports artificially cheaper while exports become relatively expensive, thereby reducing the international competitiveness of domestic economy which culminates into current account problems.

### **Conclusion**

The key finding in this study is the fact that exchange rate misalignment exhibited a positive correlation with balance of payments adjustment in Nigeria. The study thus found *BOP* effects of exchange rate appreciation for the Nigerian economy. Such *BOP* effect is favourable because appreciation of the Naira-US\$ exchange rate could enable a developing giant of Africa, Nigeria to import the much needed machinery and technological know-how cheaply for the purpose of industrialization. The policy implication is simple; the Nigerian government should implement economic policies that could enhance the appreciation of the Naira-US\$ exchange rate. This is against the devaluation policy which most often results in high cost of importing raw materials and capital goods, raises the cost of production and reduces the profits of the importing firms. In order to cushion the effects of high cost of production, the firms would pass it on to the consumers in form of higher prices, and thereby

production declines and unemployment rises. These in turn results in export declines, accumulation of trade deficits and deterioration of balance of payments.

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## Appendices

**Appendix 1: Stationarity Test Results**

Series	Augmented Dickey-Fuller		Phillips-Peron		Remark
	Difference	Critical values	Difference	Critical values	
EXM	-5.34567***	-3.99255	-11.3472***	-5.25667	I(1)
BOP	-7.23592***	-3.99255	-13.5346***	-5.25667	I(1)

Note: \*\*\* signifies first difference stationary series @ 1% level of significance

**Appendix 2: Co-integration Rank Test**

Maximum Rank	Eigenvalues	Max-eigen	Trace	5% Critical values
0	0.5537	35.352	85.352	35.23
1	0.5222	33.236	63.236	29.59
2	0.2596	45.756	55.756	22.35
3	0.3392	23.679	43.679	25.99
4	0.2282	19.993	21.993	23.93
5	0.2153	17.235	19.935	22.47
6	0.1392	15.522	17.522	21.33

**Appendix 3: Johansen’s Normalization Long-Run Results for the VECM**

Model Type	VECM
Estimation Method	Method of Moments
Co-integration Rank	01
<i>Long-run Parameter, ( <math>\beta</math> ) Estimates</i>	
Variables	Dummy 1
BOP	1.0000
EXM	-1.9537
<i>Adjustment Coefficient, ( <math>\alpha</math> ) Estimates</i>	
Variables	Dummy 1
BOP	-0.5293
EXM	1.0355

**Appendix 4: Granger Causality Test Results**

Null Hypothesis	Chi-Square Statistic	Statistical Decision
ERM does not Granger-cause BOP	9.223***	Reject
BOP does not Granger-cause EXM	0.000	Accept

Note: \*\*\* signifies significance @ 1% level

**Appendix 5: Short-Run Coefficient Estimates of the Vector Error Correction Model**

DIF_Lag	Variables	BOP Equation	EXM Equation
0	D(BOP)	1.0000	
	D(EXM <sub>t</sub> )		1.000
1	D(EXM <sub>t</sub> )	-0.4568*** (-3.7599)	
	D(BOP <sub>t</sub> )		-1.532** (-2.035)
	ECM <sub>(t-1)</sub>	-0.5593 (-5.922)***	-0.8326*** (-11.378)
2	D(EXM <sub>t</sub> )	-1.103*** (-5.359)	
	D(BOP <sub>t</sub> )		-1.293*** (-10.355)
3	D(ERM <sub>t</sub> )	-0.562** (-2.1395)	
	D(BOP <sub>t</sub> )		-1.0523 (-1.0355)
<b>Diagnostic Statistics</b>			
Un-adjusted R <sup>2</sup> (Adjusted R <sup>2</sup> )		0.593(0.665)	0.739(0.655)
F-statistic		55.32 [0.000]	35.59 [0.975]
Normality		1.033[0.893]	1.369 [0.856]
LM Serial correlation		1.665 [0.685]	1.285 [0.593]

Note: \*\*\* (\*\*\*) signifies significance @ 1% (5%) respectively level