

Twin Deficits in Nigeria: Where Does the Exchange Rate Fit?

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Abstract

This study investigates the twin deficits hypothesis for Nigeria while accounting for the role of exchange rate. The study utilises annual data series spanning 1981 to 2019 and the ARDL modelling technique for the estimations. Among other findings, the study reveals the existence of a bi-directional causation between current account deficit and fiscal deficit. Similarly, a positive relationship was seen to exist between current account balance and fiscal balance in both the short-run and long-run during periods of exchange rate appreciation and depreciation, thus confirming the role of exchange rate in the twin deficit hypothesis in Nigeria. The study recommends the introduction of a debt ceiling for governments, an improvement in the efforts towards non-oil export promotion, minimising imports and improving revenue generation.

Keywords: Exchange Rate, Fiscal Deficit, Current Account Deficit

JEL Classification: F31, F32, H62

I. Introduction

Recent macroeconomic developments such as volatile exchange rate and higher rates of inflation in both developed and developing economies have rekindled interest in the relationship between fiscal and the current account balances, as well as the role played by the exchange rate in this relationship. The standard prediction, suggested by simple open-economy national income accounting, as well as more fully specified theoretical models, is that deficits in the government budget and the current account move together, though not necessarily in a one-to-one relationship: a scenario which is referred to as the “twin deficits” hypothesis. The relationship between fiscal and current account deficits has received much attention over the past few decades because persistent fiscal and current account deficits, if unattended, could extend beyond one country (or region) and lead to global financial instability or an economic crisis (Mendoza et al., 2007) with dire consequences on future generations. Moreover, this could deter prospective foreign investors and donors to the country as they paint a gloomy picture about the state of the economy, which eventually would affect its rate of growth. From this theoretical point of view, numerous models such as the Mundell-Fleming model suggest that a fiscal expansion could lead to a worsening of the current account and an appreciation of the real exchange rate. The prime empirical example of such a relation is usually argued to be the experience of the

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United States with "twin deficits" in the first half of the 1980s (Ogbonna, 2014). The standard Mundell-Fleming analysis argues that a deficit-financed expansionary fiscal policy will lead to an increased trade deficit through either stimulated income growth or exchange rate appreciation. This gives rise to twin deficits based on a positive co-movement and thus suggests the possibility of using the budget deficit as a means of influencing the current account deficit through the exchange rate.

By visual inspection of data for Nigeria, the relationship between current account deficits and fiscal deficits does not exhibit any clearly defined pattern. While the fiscal balance was mostly in deficit between 1981 and 2019 with exception of 1995 and 1996, the current account balance fluctuated between surplus and deficit within the same period. For instance, between 1981-1983, 1986-1988, and 1993-1994, the current account balance was in deficit alongside fiscal deficit. However, between 1989-1992 and 2003-2014, fiscal deficits were accompanied by current account surpluses. This conundrum – first, whether a significant relationship exists between current account deficit and fiscal deficit and second, the direction of such a relationship - remains unresolved as researchers have had varying positions (see Oladipo et al., 2012; Idowu et al., 2012; Amaghionye-diwe & Akinyemi, 2015; Akalper & Panshak, 2019). In addition, as suggested by the Mundell-Fleming hypothesis, the relationship between fiscal balance and the current account balance could be further inspired by the exchange rate regime, thus periods of exchange rate appreciation and depreciation might have some moderating effects on the twin deficits.

Exchange rate depreciation affects various components of the budget. In terms of foreign debt obligations, the value in domestic currency will rise. At the same time revenues from customs duties also rise as import rises. Transfers and subsidies from the budget can rise or fall depending on how much of the higher cost of importing is passed on to the public enterprises. Finally, the initial rise in overall prices affects the fiscal position if government spending and revenues do not adjust proportionately (Tanzi Effect). If expenditures adjust faster than revenues, the initial impact is an increase in the budget deficit. Furthermore, if price adjustments to exchange rate changes are lagged, the real exchange rate would depreciate, providing an incentive to exporters. If the economy is import oriented (as is the case in Nigeria) the higher export earnings would increase importing capacity, with a negative effect on the current account deficit. Investigating this assertion prompts the choice of exchange rate in this study.

It therefore becomes imperative to find out if the current account balance experienced by the Nigerian economy is as a result of the substantial increase in its budget deficit over the years in line with the twin deficit hypothesis, whether the reverse is the case, or, if indeed a bi-directional causality exists between fiscal

deficits and current account deficits in Nigeria. This thus raises important questions like – Is the twin deficit hypothesis applicable in Nigeria? Is there a long-run relationship between the twin deficits? What is the direction of causality? The objective of this paper is therefore to investigate the twin deficit hypothesis for Nigeria by taking into cognisance the role of the exchange rate, and to test the direction of causality between fiscal deficit and current account deficit in Nigeria. To achieve this objective, the ARDL methodology is employed with structural breaks to take into account the exchange rate changes. The rest of the paper is thus structured as follows: Section 2 of the paper contains the literature review, followed by the stylised facts in Section 3. Sections 4 and 5 contain the methodology, empirical analysis and discussion of findings, respectively, while Section 6 concludes the paper with practicable policy recommendations.

II. Literature Review

II.1 Theoretical Review

The Mundell-Fleming model of exchange rate and the Ricardian Equivalence Hypothesis approach are the major theories used to explain the causal relationship between the budget deficit and the current account deficits.

II.1.1 The Mundell-Fleming model

This model, also known as the IS-LM-BOP model was created by Robert Mundell (1968) and Marcus Fleming (1967). It is an extension of the IS-LM (Investment Savings – Liquidity preference Money supply) model. The IS-LM-BOP model describes a small open economy portraying the short-run relationship between an economy's nominal exchange rate, interest rate and output. According to Olga (2000), the model assumes a small open economy, full international capital mobility, and interest rate parity in the world economy, except in cases where capital controls exist. The model asserts that there exists a positive relationship between the budget deficit and current account deficit with causality flowing from budget deficit to current account deficit.

Mundell and Fleming argued that an increase in the budget deficit would cause an increase in domestic absorption, increase aggregate demand, and put upward pressure on domestic interest rate above the world rate. With higher interest rate, foreign capital flows into securities to take advantage of higher rates in the domestic market. Demand for domestic currency leads to an appreciation and as the currency appreciates, domestic goods become more expensive relative to foreign goods thereby leading citizens to increase imports thus increasing the trade deficit (Fleeger, 2006; Onafowokan & Owoye, 2006). Ultimately, higher import could worsen the current account balance.

According to Kearney et al. (1990), Arize and Melindreras (2008), Idowu et al. (2012), Amaghionyeodiwe and Akinyemi (2015), Senadza and Aloryito (2016), the uni-directional causality from budget deficit to current account deficit may not always be the case given the effects of other economic developments which also influence the behaviour of aggregate demand. For instance, a change in expected inflation which affects investment decisions and capital flows could lead to currency appreciation/depreciation and changes in the current account position. Also, reverse causality could arise if excessive trade deficits cause an economic recession, leading to a financial or solvency crisis in which a large injection of public funds may be needed to rehabilitate the financial sector or to cushion the effect of the recession (Donggeum & Kim, 2006).

In the case of Nigeria, which depends on oil for most of her fiscal revenue, a change in the international price of oil, could affect the current account balance negatively, leading to a current account deficit. This change in the current account directly affects revenue earnings of the government thereby constituting a drag on fiscal finances and if not properly managed could result to a fiscal deficit. This cycle has repeatedly been observed during seasons of oil price shocks. However, the exchange rate sometimes distorts this observed relationship because when the exchange rate depreciates as a result of lower oil earnings, the dollar earnings from sale of crude oil translates to higher naira receipts thereby beefing up the fiscal coffers. The exchange rate in this case distorts the Mundell-Fleming Hypothesis.

Studies such as Anoruo and Ramchander (1998), Khalid and Guan (1999), Alkswani (2005), and Oladipo et al. (2012), reveal that bi-directional causality may exist between trade and budget deficits. Also, some studies revealed a negative relationship between the budget deficit and current account deficit, known as the twin divergence hypothesis. Economic boom and bust periods have also been said to strengthen the twin divergence hypothesis. Periods of economic decline are characterised by a fall in aggregate demand leading to a fall in investment sometimes stronger than a fall in savings. While budget deficit worsens in periods like this, the current account improves. However, a positive shock in aggregate demand can also have a negative relationship with the current account (Baxter, 1995).

II.1.2 Ricardian Equivalence Hypothesis (REH) approach

The Ricardian theory therefore assumes that individuals are rational and have all the information about present and future tax liabilities; hence, they do not need to change their current consumption. Individuals have infinite time planning horizon and are sure about future tax increases that will pay back the debt incurred by the government while financing its budget deficit. The Ricardian Equivalence Hypothesis approach attributed to the work of Barro (1989) asserts that taxpayers

do not perceive the purchase of government bonds as net wealth and do not have the ability to change their consumption pattern. This approach explains that the budget deficit has no effect on trade deficit. Accordingly, budget and trade deficits should be viewed as linked, but not as twins. Starting from the national income accounting identity for a small open economy, we have:

$$Y = C + I + G + NX \quad (1)$$

Income can only be disposed of by being taxed, saved or consumed:

$$Y = C + S + T \quad (2)$$

Combining these two equations, we get

$$C + S + T = Y = C + I + G + NX \quad (3)$$

Where Y is total income, product or output and equals the four types of expenditure: Consumption (C), investment (I), government purchases (G), and net exports (NX) and in terms of its usage, it can be taxed (T), saved (S) or consumed (C).

Cancelling out C on both sides and rearranging yields the following:

$$NX = (S - I) + (T - G) \quad (4)$$

Equation (4) shows that the current account balance denoted by net exports is the sum of net private savings (S-I) and net public savings (T-G) and that any change in net public savings (Fiscal Balance under the assumption that taxes are the main source of government revenue), while holding private savings constant will lead to an equivalent change in the current account balance denoted by NX. The implication of the Ricardian hypothesis then is that private savings will rise to offset any decrease in net public savings thereby leaving the current account balance unaffected.

Despite the theoretical underpinnings of the Mundell-Fleming, Chang and Hsu (2009) posits that budget deficits do not cause any interest and exchange rate changes and therefore have no effect on the current account balance. Gadong (2009) suggest that since households anticipate a future increase in taxes, given a tax cut now, accompanied by an increase in budget deficit, they will save more now, hence, no expansionary effect on household consumption. In other words, savings will respond positively to changes in budget deficit at an amount equal to expected increase in tax burden in future years without alterations to trade deficit (Arize & Melinderos, 2008). Thus, the absence of any Granger causality relationship between the two deficits supports the REH.

II.2 Empirical Review

Senadza and Aloryito (2016) study the co-movement in Ghanaian twin deficit over three decades. Using a Johansen Cointegration test for long-run relationship, and a granger causality test to identify the direction of causality between budget deficit and trade deficit, the study reveals a reverse causality. That is, a causality that runs from the current account deficit to the budget deficit. According to Arize and Melinderos (2008), there could be a reverse causality from the current account deficit to the budget deficit given a change in "expected inflation". Using a dataset covering 1995 to 2007, their study opined that a decrease in expected inflation would lead to currency appreciation and thus decrease net exports and increase trade deficits. This in turn would have the usual multiplier-type decrease in output and consequently in tax revenues. Also, Eregha et al. (2022) in their study validate the twin deficits hypothesis for selected African oil producing countries.

Studies such as Anoruo and Ramchander (1998), Khalid and Guan (1999) and Alkswani (2005) reveal that bi-directional causality may exist between trade and budget deficits, hence, the existence of significant reaction may cause causality between the two variables to run in both directions. Opoku (2010) argues that monetary policy regimes affect the relationship between budget deficit and current account deficit. Analysing within an Investment–Savings / Monetary–Policy model which shows short-run fluxes in the interest rate, inflation and output, the study found that "rules-based monetary policy" most importantly, inflation targeting, improves capital mobility, changing the association between a country's budget deficit and current account deficit. These changes according to the study is based on how efficient the monetary policy is in controlling the effects of inflation expectations.

Amaghionyeodiwe and Akinyemi (2015) examine the long-run relationship between the twin deficits in an oil-dependent open economy using a multivariate Granger causality test within the vector error correction framework for the period 1970 to 2010. The study confirms the existence of a long-run relationship between the budget and current account deficit in Nigeria, thus supporting the Mundell-Fleming theory. However, causality flowed from current account deficit to budget deficit. Similarly, Idowu et al. (2012) confirm the existence of twin deficit relationships in Nigeria using the granger causality and vector auto regression techniques with the direction of flow from the current account to fiscal balance. This finding further establishes the proposition that Nigeria's economic challenges arise more from external disequilibrium than from internal imbalances thereby confirming the overbearing influence of the external sector on the economy.

In a similar study using Nigerian time-series data between 1970 and 2008, Oladipo et al. (2012) assert that there exists a bidirectional causality between budget deficit and trade deficits in Nigeria. This supports the Keynesian opinion that there exists a

strong link between budget deficit and trade deficit. The authors recommend that appropriate policy measures to reduce budget deficits could play an important role in driving down trade deficit especially if complemented with budget cut policies. Akalpler and Panshak (2019) study the dynamic relationship between budget deficit and current account deficit in Nigeria. Using annual time series data spanning 1980–2016 and utilising autoregressive distributed lag (ARDL) technique and traditional Granger causality tests; the study reveals the presence of twin deficit hypothesis for Nigeria and discards not only the Ricardian equivalence proposition but also the reverse and bi-directional causality hypotheses. The study concludes that the source of the country's current account deficit problems could be traced to the mounting fiscal imbalances. Baxter (1995) argues that output fluctuations and an investment crowding out effect can have a major impact on budget balance and current account. According to the study, in an investment crowding out scenario, an increase in budget deficit would cause domestic interest rate to crowd out private investment, hence resulting in improved private savings, which implies a fall in aggregate demand which will improve current account, hence a negative or inverse relationship with budget deficit.

Helmy (2018), employs a new approach to the twin deficit hypothesis aimed at enhancing policymaking in Egypt – an oil-producing country. The study tracks the causal link between Egypt's merchandise trade deficit and the budget deficit by examining the conventional twin deficit hypothesis using a VAR model and checking for the existence of cointegration between the budget deficit and the merchandise trade deficit from 1990 to 2017. The study hence refutes the twin deficit hypothesis in favour of the current account targeting hypothesis. Similarly, Adeleke and Dada (2015) used fixed effect panel regression analysis to investigate the twin deficit hypothesis in Sub Saharan Africa (SSA) using annual data from 1970-2010. The result of their study shows that a positive and significant unidirectional relationship exists between fiscal deficits and current account deficits, with the direction of causality flowing from the current account deficit to the fiscal deficit. This signifies that the developments in the external sector of SSA have implications on their internal balance. Aragaw (2021) investigates twin deficit and economic growth in selected African countries. Using the bootstrap panel Granger causality test, the findings confirm that out of 27 countries, results of 16 countries support the Ricardian equivalence hypothesis which shows that there is no Granger causality running from budget deficit to current account deficit and vice versa.

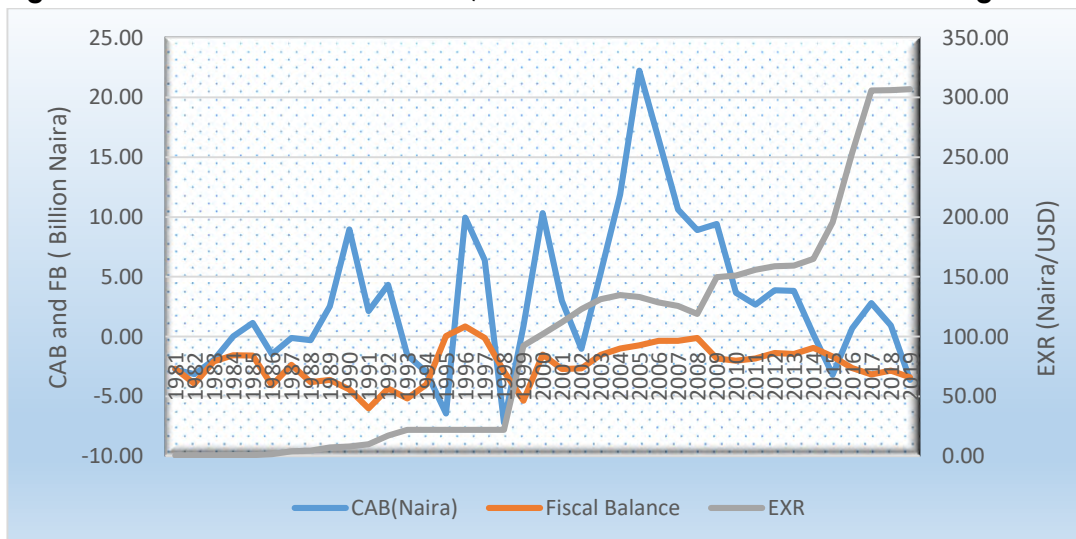
Notwithstanding the findings of the reviewed studies, it is imperative to revisit the validity of the twin deficit hypothesis for Nigeria. An important contribution of this study is the introduction of two periods of exchange rate changes: periods of exchange rate appreciation and depreciation in the model, to account for the role of exchange rate in Fiscal Balance and by extension, the twin deficit. The study also

covers a longer period of time. This current study will inculcate the above to improve upon existing literature.

III. Developments in Fiscal Balance, Current Account Balance and Exchange Rate in Nigeria

The trend of fiscal balance, current account balance and exchange rate has shown a series of fluctuations with causal factors ranging from policy changes to internal and external shocks. While the current account balance witnessed surpluses relative to the fiscal account, the exchange rate has witnessed relatively less fluctuations than the aforementioned balances. For example, prior to 2003, the current account balance fluctuated, while the fiscal balance continued to maintain a downward trend. The periods from 2003 showed a current account surplus following the increase in the price of crude oil which led to a boost in exports relative to imports.

Figure 1: The Trend of Fiscal Balance, Current Account Balance and Exchange Rate



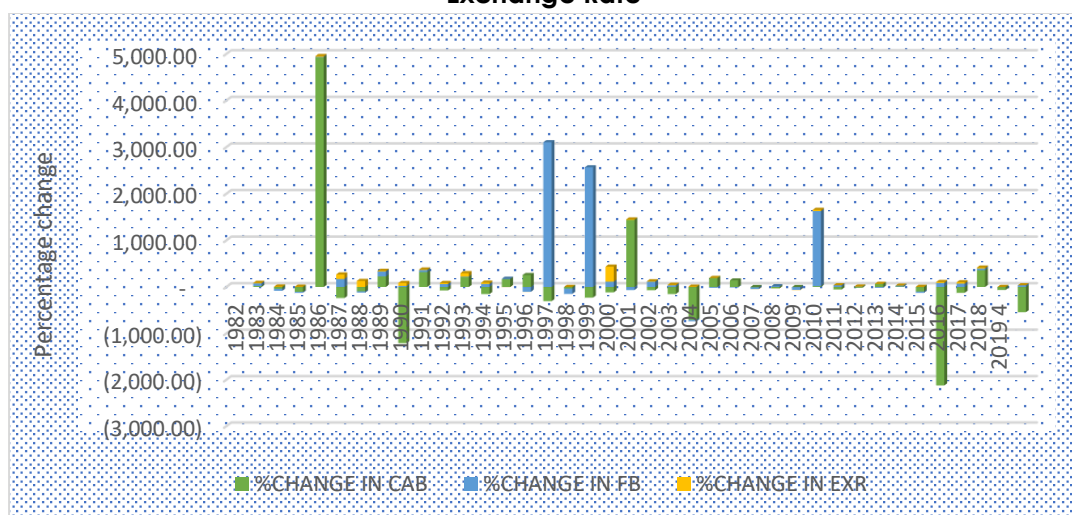
Source: CBN.

In value terms, as captured in the primary axis of Figure 1, a current account surplus ranging from US\$7.01 billion in 2000 to US\$1.28 billion in 2014 was recorded owing to growing export over import. Though with a deficit of US\$15.44 billion in 2015, it later rebounded to a surplus of US\$2.72 billion in 2016 as a result of the reduction in deficit in the income account, while falling back to deficit in 2018 and 2019, respectively. The reduction in surplus and recurring deficits in the current account balance over the years have been a function of the increasing import bills, especially for machineries and raw materials, and higher payments for services import. Within the same period, the inter-bank exchange rate depreciated from ₦131.00/US\$ to ₦396.00/US\$, with the fiscal deficit also maintaining a downward trend.

Furthermore, the argument of co-movement between the fiscal and current account balances was evidenced in the periods prior to the introduction of the Structural Adjustment Programme (SAP) in 1986 as depicted in Figure 1, after which both accounts moved in opposite directions as deficits in the fiscal account were followed by current account surpluses (though increasing at a decreasing rate). The depreciation of the exchange rate from 2015 occasioned by the fluctuations in crude oil price occurred at the time when both the fiscal and current account balances were in deficit.

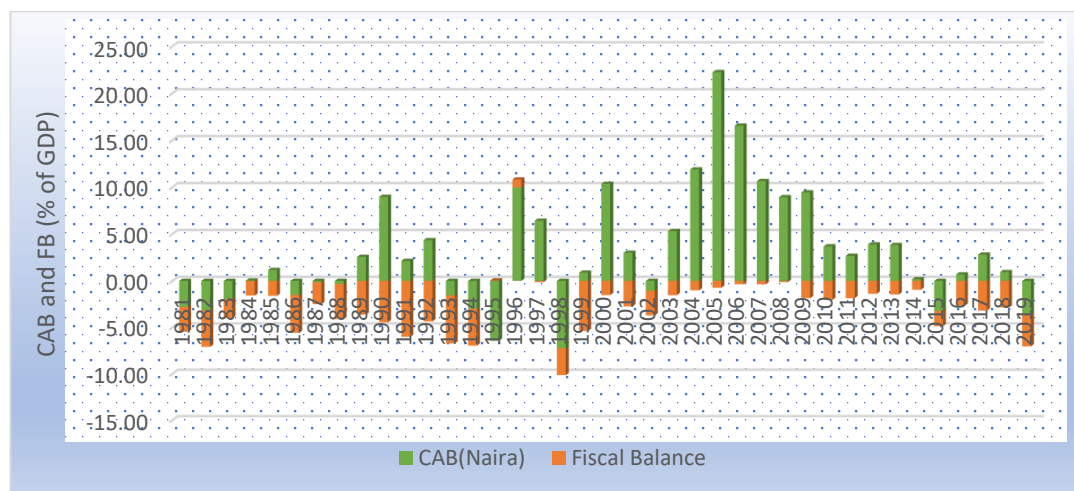
Analysing the percentage changes in the fiscal and current account balances and the exchange rate, Figure 2 shows that over the years, changes in these variables have remained relatively stable. While changes in the current account balance were significant especially in periods of shocks, changes in the fiscal balance and the exchange rate have remained relatively insignificant showing a higher degree of pass-through from economic shocks to current account balances overtime.

Figure 2: Percentage Changes in Fiscal Balance, Current Account Balance and Exchange Rate



Source: CBN.

Nigeria's fiscal and current account balances as percentages of the GDP have also exhibited a fluctuating trend within the period under study. While the current account balances (as percentage of the GDP) maintained positive in most periods, the fiscal balances (as percentage of the GDP) maintained negative for the most part of the periods owing to continued fiscal deficits experienced in Nigeria.

Figure 3: Fiscal and Current Account Balance (as Percentage of GDP)

Source: CBN.

In value terms, the percentage contribution of the current account balance to GDP ranged from 5.3 per cent in 2003 to 10.6 per cent in 2007 after which it declined to 8.9 per cent in 2008. Owing to the Global financial crisis of 2008/9, it declined further to 3.7 per cent in 2010 and 0.2 per cent in 2014, -3.2 per cent in 2015 and -3.6 per cent in 2019. Conversely, the fiscal balance as a percentage of GDP have remained in the negative region from 1997 to 2019, ranging from -0.1 per cent to -3.4 per cent.

IV Methodology

IV.1 Theoretical Framework

The main objective of this paper is to re-examine the twin deficit hypothesis for Nigeria, while accounting for the role of exchange rate. In line with this, this section uses the Mundell-Fleming model as the framework for the examination of twin deficit hypothesis in Nigeria.

Current account balance (CAB) is the difference between exports of goods and services and imports of goods and services plus net income from abroad. That is:

$$CAB = X - M + NA \quad (i)$$

Where: NA represents net factor income from abroad.

An open economy's national saving (S) can be defined as:

$$S = I + CA \quad (ii)$$

Saving in equation (ii) can either be private saving (S_p) or government saving (S_g). Private saving is equal to households' income minus taxes and consumption spending and can be expressed as:

$$Sp = Y - T - C \quad (\text{iii})$$

Government saving, on the other hand is the excess of tax revenue receipts over expenses on goods and services and transfer payment:

$$Sg = T - G - R \quad (\text{iv})$$

Where T is taxes, G is government expenditure and R is transfer payment.

Substituting equations (iii) and (iv) into equation (ii), we have:

$$S = Sp + Sg = Y - T - C + (T - G - R) = I + CA \quad (\text{v})$$

Substituting $sg = T - G - R$ in equation v, we have:

$$Sp + (T - G - R) = I + CA \quad (\text{vi})$$

Making CAB subject of formula equation (vi) becomes:

$$CAB = Sp - I + (T - G - R) \quad (\text{vii})$$

Equation (vii) shows that the current account balance is dependent on the difference between private saving, S_p , and investment plus fiscal imbalance, FI , which represents the imbalance between government revenue and expenditure on goods and services and transfer payment.

Since $FI = (T - G - R)$, equation (vii) then making:

$$CAB = Sp - I + FI \quad (\text{viii})$$

IV.2 Data

Annual data spanning 1981 to 2019 were used in the study. The choice of this period was predicated upon the exchange rate regime changes witnessed within the period. The variables selected for the study include, current account balance as a percentage of GDP (CAB), log of nominal exchange rate (LEXR), log of oil price (LOP). To account for the impact of exchange rate changes on fiscal balance, we derived fiscal balance during periods of exchange rate appreciation (FB1), and its variant during periods of exchange rate depreciation (FB2) by adopting a dummy variable as illustrated below:

$$\text{Dummy, } I = \begin{cases} 1 & \text{if } \Delta \text{LEXR} > 0 \\ 0 & \text{if } \Delta \text{LEXR} \leq 0 \end{cases}$$

Therefore FB1 = Fiscal balance * I

$$\text{FB2} = \text{Fiscal balance} * (1-I)$$

The inclusion of oil price in the model is necessitated by the fact that it plays a significant role in Nigeria's fiscal position, export value and foreign exchange earnings. We used change in exchange rate to split fiscal balance into two periods to account for the cyclical movements in fiscal balance.

Data on current account balance, fiscal balance and exchange rate were sourced from the Statistical Bulletin of the Central Bank of Nigeria (CBN), while data on oil price was sourced from the Reuters data bank.

IV.3 Methodology and Model Specification

The ARDL model allows the estimation of short- and long-run relationships and coefficients among co-integrated variables of mixed orders of integration (Engel & Granger, 1987; Johansen, 1988, 1991; Johansen-Juselius, 1990; Phillips & Hansen, 1990). Preliminary investigation reveals that the data utilised for this study were integrated of I (0) and I (1), hence, the appropriateness of the ARDL approach. The approach allows for a sufficient lags selection to capture the data generating process (DGP) in a general-to-specific modelling framework (Laurenceson & Chai, 2003).

Following the theoretical literature and methodologies applied by previous studies, our model specification adapted a modified form of the work of Samotu and Orisadare (2020) to include exchange rate (which breaks the fiscal balance series to capture periods of depreciation and appreciation of exchange rate in Nigeria). Thus, the model specification is as shown below:

$$CAB_t = FB1_t, FB2_t, LEXR_t, LOP_t \quad (ix)$$

The explicit form of the model showing the relationship can be expressed as follows:

$$CAB_t = \beta_0 + \beta_1 FB1_t + \beta_2 FB2_t + \beta_3 LEXR_t + \beta_4 LOP_t + \varepsilon_t \quad (x)$$

In line with the Mundell-Fleming model as adopted by the study, the a priori expectation is as follows:

$\beta_1 - \beta_2 > 0$ while, $\beta_3 - \beta_4 > or < 0$... a priori expectation

Where: $CAB, FB1, FB2, LEXR, LOP$ represents current account balance as a per cent of Gross Domestic Product (GDP), fiscal balance as a per cent of GDP during exchange rate appreciation, fiscal balance as a per cent of GDP during exchange rate depreciation, log of exchange rate, and log of oil price, respectively. $\beta_1 - \beta_4$ are the coefficients. $\beta_1 - \beta_2$ are expected to be positive since it is assumed that a twin deficit exists between the current account and fiscal balance. $\beta_3 - \beta_4$ can

take a positive or negative value. Since exchange rate is the number of units of domestic currency per US dollar, an increase in the exchange rate means a depreciation of the domestic currency, raising the value of the foreign assets in terms of domestic currency (Ahmed & Aworinde, 2015). Similarly, oil price can rise and fall, in different periods. β_0 represents the intercept and ε_t is the error term.

The four steps involved in estimating an ARDL model include:

1. Examination for the presence of cointegration, using the bounds test procedure (Pesaran & Pesaran, 1997; Pesaran et al., 2001);
2. Estimation of the coefficient of the long-run relationships identified;
3. Estimation of the short-run coefficient; and
4. Testing for the stability of the model, using the cumulative sum of recursive residuals (CUSUM).

The ARDL model relates the dependent variable to its lagged value and the lagged values of the independent variable. Therefore, the ARDL representation of the model above is presented thus:

$$CAB_t = \beta_0 + \beta_1 \sum_{i=1}^p CAB_{t-i} + \beta_2 \sum_{i=0}^q FB1_{t-i} + \beta_3 \sum_{i=0}^r FB2_{t-i} + \beta_4 \sum_{i=0}^s LEXR_{t-i} + \beta_5 \sum_{i=0}^t LOP_{t-i} + \varepsilon_t \quad (\text{xi})$$

Where: the variables are as defined in equation (X) and $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are the coefficients for $CAB_{t-i}, FB1_{t-i}, FB2_{t-i}, LEXR_{t-i}$ and LOP_{t-i} respectively.

The reliability of the model was judged by the strength of the estimates and diagnostics test using serial correlation test and heteroscedasticity test. The long-run cointegration test was judged using the bounds test by Pesaran et al. (2001) to determine the existence or otherwise of long-run cointegration, the F-statistics was compared to the upper and lower bounds. Where the F-statistics lies above the upper bound, a long-run cointegration is assumed; where it lies below the lower bound, it is assumed no long-run co-integration exists and in event of the F-statistics lying between the upper and lower bounds, an inconclusive result is assumed.

When the existence of long-run relationship is established, an error correction specification of the model becomes necessary to incorporate the speed of adjustment to the long-run. To satisfy the conditions of the existence of short-run adjustment to long-run equilibrium, the λ must be negative and statistically significant. See equation xii below:

$$\Delta CAB_t = \beta_0 + \theta_1^1 \sum_{i=1}^p \Delta CAB_{t-i} + \theta_2^2 \sum_{i=0}^q \Delta FB1_{t-i} + \theta_3^3 \sum_{i=0}^r \Delta FB2_{t-i} + \theta_4^4 \sum_{i=0}^s \Delta LEXR_{t-i} + \theta_5^5 \sum_{i=0}^t \Delta LOP_{t-i} + \lambda(CAB_{t-1} - a_0 - b_1 FB1_{t-1} - b_2 FB2_{t-1} - b_3 LEXR_{t-1} - b_4 LOP_{t-1}) + \varepsilon_t \quad (\text{xii})$$

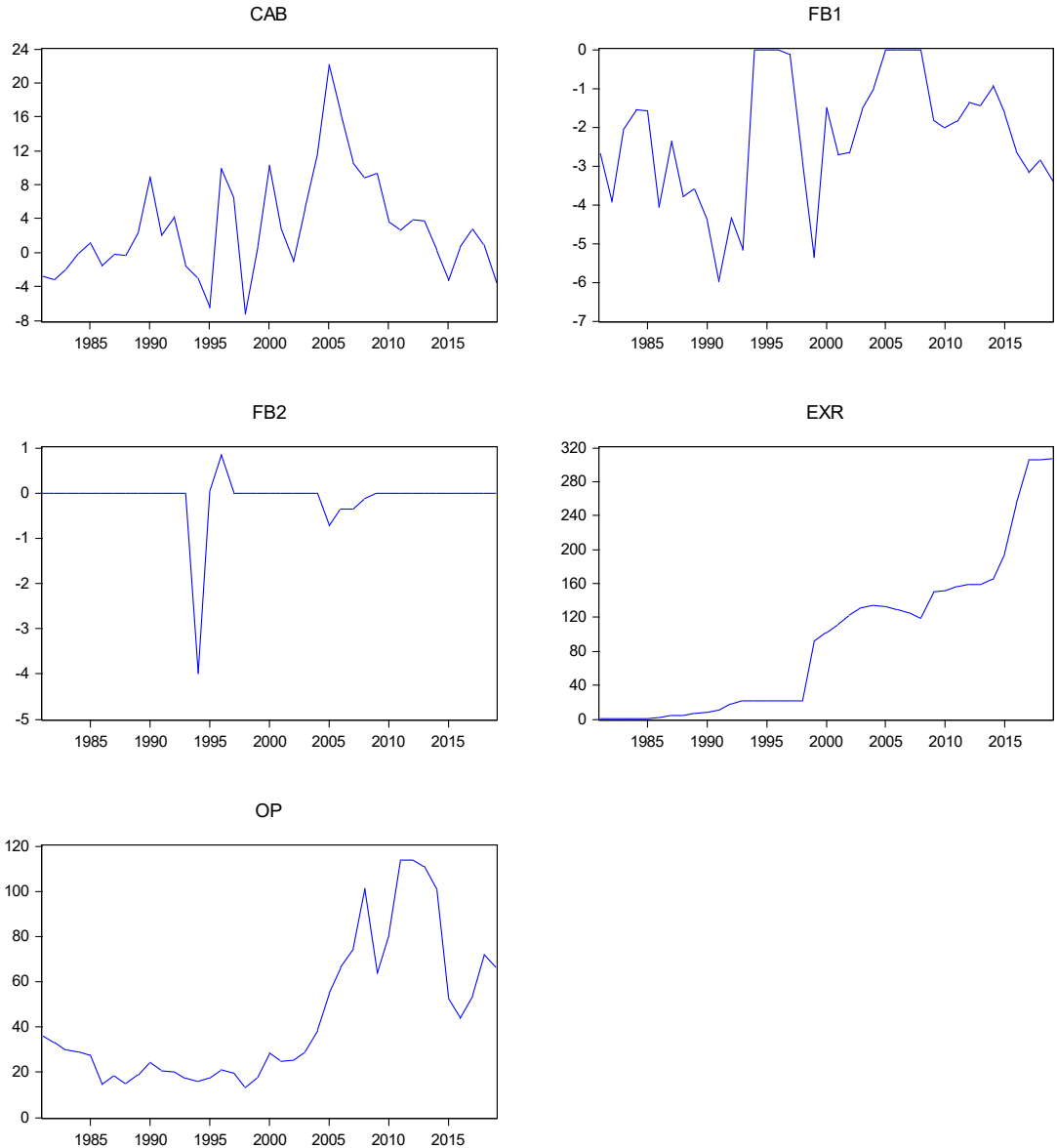
Where: λ represents the speed of adjustment, Δ , the difference operator, θ are the short-run coefficients, $a_0, b_2 - b_4$ are the long-run coefficients.

V Pre-Estimation Analysis

V.1 Graphical Presentation

The graphical presentation of the data in levels as shown below suggests that the series are volatile over the period of study. On inspection, of all the variables appear stationary over time except EXR and OP with a reverting mean. EXR, however, exhibited an upward slope with minor upward break around 1998 and again in 2016, which could be as a result of the shift to a more flexible exchange rate regime. A significant drop in crude oil price was experienced in 2015.

Figure 4: Graphical Presentation of the Variables



Source: Authors' compilations.

V.2 Descriptive Statistics

The Jarque-Bera statistic indicates that not all the series are normal. The standard deviation used to measure the spread or dispersion of the data showed that CAB and OP are the most widely dispersed variables. Further analysis revealed that only FB1 and EXR appeared normally distributed while CAB, FB2 and OP were not. In terms of skewness which measures the degree of asymmetry of the series, CAB, OP and EXR appeared positively skewed, while FB1 and FB2 exhibited a negative

skewness. The kurtosis, which measures the sharpness of the peak of a frequency distribution of a series showed that FB1 was platykurtic, EXR and OP were mesokurtic while CAB and FB2 were leptokurtic.

Table 1: Descriptive Statistics

	CAB	FB1	FB2	EXR	OP
Mean	3.0110	-2.2199	-0.1194	94.8023	44.2634
Maximum	22.2306	0.0000	0.8481	306.9208	8113.767
Minimum	-7.2222	-5.9987	-3.9863	0.6177	13.250
Std. Dev.	6.1647	1.6471	0.6658	93.2311	31.1870
Skewness	0.9744	-0.3616	-5.1577	0.7875	1.0257
Kurtosis	4.0634	2.3967	30.8669	2.7919	2.8027
Jarque-Bera	8.0086 ^b	1.4412	1434.83 ^a	4.1016	6.9017 ^b

Source: Authors' compilations.

Note: ^a & ^b denote 1% and 5% level of statistical significance, respectively.

Following the summary statistics, the data was further subjected to various tests of stationarity and unit root, as well as the ADF structural break test.

V.3 Unit Root Tests

Table 2: ADF and PP Unit Root Tests

Variable	ADF			Phillips-Perron		Remarks
	Level	1 st Difference	Remarks	Level	1 st Difference	
CAB	-3.1347 ^{c*}	-7.1597 ^{a*}	I(0)	-2.9849 ^{c*}	-7.1597 ^{a*}	I(0)
	-3.0270 ^{**}	-7.2024 ^{a**}		-2.8651 ^{**}	-7.2024 ^{a**}	
FB1	-3.118 ^{b*}	-7.5511 ^{a*}	I(0)	-3.1020 ^{b*}	-7.5868 ^{a*}	I(0)
	-3.1606 ^{**}	-7.4992 ^{a**}		-3.1656 ^{**}	-7.5404 ^{a**}	
FB2	-6.0914 ^{a*}	-7.5218 ^{a*}	I(0)	-6.3107 ^{a*}	-29.3087 ^{a*}	I(0)
	-6.0197 ^{a*}	-7.4124 ^{a*}		-6.2417 ^{a*}	-29.4632 ^{a*}	
EXR	1.4259 [*]	-4.2922 ^{a*}	I(1)	1.3509 [*]	-4.2501 ^{a*}	I(1)
	-2.0306 ^{**}	-4.5508 ^{b**}		-1.4476 ^{**}	-4.3193 ^{b**}	
OP	-1.309 [*]	-5.5094 ^{a*}	I(1)	-1.3091 [*]	-5.4811 ^{a*}	I(1)
	-2.1791 ^{**}	-5.4316 ^{a**}		-2.1791 ^{**}	-5.3962 ^{a**}	

Source: Authors' compilations.

Note: ^a^b^c indicates that the variables are significant at 1%, 5% and 10% level of significance, respectively.

* & ** represents intercept and trend & intercept, respectively.

Results from the unit root test conducted using Augmented Dickey Fuller and Phillips-Perron test is shown in Table 2. Analysis of the results showed the acceptance of the null of unit root for EXR and OP at levels, as they became stationary after first difference I (1), while CAB, FB1 and FB2 were stationary at level, that is I (0). The combination of both I (0) and I(1) series informed the adoption of ARDL model in estimating the equation. The Schwartz Information Criteria (SIC) was used to determine the best model because of its parsimonious nature.

V. 4 ARDL Bounds Test

The Bounds test approach is used to test for the existence of long-run equilibrium regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. This approach is used in this study also because it is encouraged to be used alongside the ARDL method (Narayan & Narayan, 2003) to check whether there is a long-run relationship between the dependent and independent variables using the ARDL long-run Form and Bounds test statistics. Pesaran et al. (2001) provides bounds (lower and upper bounds) on the critical values for the asymptotic distribution of the test statistic. The decision rule is stated as follows:

1. If the computed test-statistic falls below the lower bound, it implies that there is no cointegration;
2. If the test statistic exceeds the upper bound, then, there is cointegration;
3. However, if the test statistic falls between the bounds, the test is inconclusive.

Table 3: ARDL Bounds Test

	F-Statistics	Lower bound I(0)	Upper bound I(1)	Remark
Model	8.26	3.74	5.06	Long-run exist at 1 per cent

Source: Authors' compilations.

Result of the bounds test shows that the F-statistics of 8.26 lies above the upper critical bound in the model across all levels even at 1.0 per cent level of significance. This necessitated rejection of the null hypothesis of no long-run relationships at 1.0 per cent level of significance indicating that long-run relationship exist among the variables in the model.

The speed of adjustment to the long-run parameter (λ) was estimated as presented in Table 4 and is negative and statistically significant confirming the existence of long-run relationship between current account balance and fiscal balance.

V.5 Short- and long-run Estimates

Table 4: ARDL result

Short-run (4,3,4,4,3)		Long-run (4,3,4,4,3)	
Variables	Coefficients	Variables	Coefficients
FB1	1.2880 ^b (0.5884)	FB1	0.7124 (1.4643)
FB2	2.7358 ^a (1.0541)	FB2	27.1014 ^c (13.8767)
EXR	0.1887 ^a (0.0493)	EXR	0.0989 ^b (0.0439)
OP	0.1605 ^a (0.0475)	OP	-0.2750 ^c (0.1318)
λ	-0.4679 ^a (0.0631)	-	-
Control Variables	Yes	Control Variables	Yes
Post Estimation			
R^2	0.9435	F-stat	9.1054 ^a
AIC	4.9153	Q-stat(5)	8.1269
Breusch-Godfrey LM Test:	2.1376	ARCH Test:	2.3317

Source: Authors' compilation.

Note: ^a^b^c indicates that the variables are significant at 1%, 5% and 10% level of significance, respectively, λ represents the error correction term (ECT), while values in parenthesis represent the standard errors.

1. The regression result revealed a positive relationship between current account balance and fiscal balance during period of exchange rate appreciation and depreciation in the short- and long-run, respectively. This implies that changes in exchange rate contribute significantly to fiscal balance-external balance nexus.
2. In the long-run, a positive but insignificant relationship exist between current account balance and fiscal balance during period of exchange rate appreciation at 1.0 per cent level of significance, while a positive and significant relationship was established during periods of exchange rate depreciation at 10.0 per cent level of significance. This further confirms the existence of the twin deficit in Nigeria and consistent with the Mundell-Fleming Hypothesis as evidenced in the studies of Amaghionyeodiwe and Akinyemi (2015) and Idowu et al. (2012). This is also in line with the argument that as budget deficit increases, current account deficit increases. These increases will be experienced in terms of domestic prices and exchange rate almost instantaneously.
3. Specifically, a unit increase in fiscal imbalances during periods of exchange rate appreciation led to 1.29 and 0.71 units increase in current account imbalances in the short-run and long-run, respectively. During periods of exchange rate depreciation, a unit increase in fiscal imbalances led to 2.74

- and 27.10 units increase in current account imbalances in the short-run and long-run, respectively. Within the context of the objective of this study, this implies that periods of exchange rate depreciation worsen the twin deficits phenomenon for Nigeria.
4. Exchange rate in the estimation revealed a positive and significant relationship in both short- and long-run at 1.0 per cent and 5.0 per cent levels of significance, respectively. This means that the role exchange rate plays in the deficits (current account and fiscal deficits) cannot be ignored as it is key to determining the movement of the balances. A unit increase in exchange rate, results in 0.16 and 0.09 units increase in current account balance in the short- and long-run, at 1.0 per cent and 5.0 per cent level of significance, respectively.
 5. The oil price component in the model appeared to have positive and significant effect on current account balance in the short-run at 1.0 per cent level of significance. While in the long-run, a negative and significant relationship was observed at 10.0 per cent level of significance. The coefficient explains that a unit change in oil price, results in 0.16 unit increase and 0.27 units decrease in current account balance in the short- and long-run, respectively. This emphasises that fluctuations in crude oil price at the international market, especially in the short-run, increases the deficits in the current account.
 6. The (λ) exhibited an appropriate statistic i.e the sign is negative and statistically significant at 1.0 per cent. The (λ) of -0.47 reaffirms the presence of cointegration in the relationship, while its negative sign shows the speed of adjustment will be corrected in less than 1 year (about 5 months).
 7. Results from the pairwise granger causality test show that there is bi-directional causality between the current account balance and fiscal balance both during periods of exchange rate appreciation and depreciation. This means that irrespective of variation in the exchange rate, a bidirectional causality exists, which further confirms the Mundell-Fleming hypothesis which captures the mediating effect of variables such as interest rates and exchange rates and shows that the transmission mechanism from the fiscal balance to the current account balance or vice versa is through the exchange rate and the interest rates.

V.6 Post estimation diagnostics

Recommended post diagnostic tests including stability test, serial correlation and heteroscedasticity tests were carried out after the estimation. Results as presented in Appendix III shows that the model employed is stable and reliable as the graph

was found within the line bounds. Also, the test for the existence of serial correlation and heteroscedasticity were found to conform to the norm as correlation coefficients were within the benchmark of 0.8, while the variables were found to be homoscedastic.

VI. Conclusion and Policy Recommendations

The paper sought to determine the role of exchange rate in the already determined twin deficit hypothesis by previous studies. The results obtained from the analysis re-confirmed that the twin deficit hypothesis holds for Nigeria and that the exchange rate plays a role in determining the movement of the current and fiscal accounts balances. The exchange rate was introduced into the model by interacting the changes in exchange rate (appreciation and depreciation periods) with the fiscal balance such that the fiscal balance is split into periods of exchange rate appreciation and depreciation.

Having carried out the preliminary analysis and required estimation, it was discovered that during the review period, a percentage increase in the fiscal balance during periods of exchange rate appreciation leads to about 1.3 per cent and 0.7 per cent increase in the current account balance in the short- and long-run, respectively. While in periods of exchange rate depreciation, increase in fiscal balance results in 2.7 per cent and 27.1 per cent increase in the short- and long-run, respectively. Additionally, any disequilibrium between the current account balance and the exchange rate is adjusted in the course of the year. Accounting for the role of exchange rate variation in the twin deficit cannot be overlooked when modelling the nexus between current account and fiscal balance.

In view of the above result, it thus becomes imperative to ensure adherence to principles of fiscal management by operating within the approved budget and reducing fiscal deficits to ensure a sustainable current account balance. Consequently, the following policy recommendations are proffered.

1. Given the positive relationship between fiscal deficit and current account deficit, it is recommended that the Federal government should consolidate on its fiscal reforms, so as to reduce government expenditure, boost the internally generated revenue, and create more fiscal space.
2. Since it was observed that current account and fiscal deficits are reduced during periods of exchange rate appreciation, the study recommends implementation of stronger policies aimed at improving the maintaining exchange rate stability.

3. Since it was observed that oil price plays a significant role in Nigeria's fiscal and current account balance, efforts towards oil price sterilisation is encouraged, as this would mitigate the effect of oil price fluctuations on both accounts.

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Appendices
Appendix I

Pairwise Granger Causality Tests

Null Hypothesis	F-Statistics
FB1 does not granger cause CAB	0.1755
CAB does not granger cause FB1	0.2431
FB2 does not granger cause CAB	5.8294
CAB does not granger cause FB2	0.4485
EXR does not granger cause CAB	0.1386
CAB does not Granger Cause EXR	3.9816 ^c
EXR does not Granger Cause FB1	0.2668
FB1 does not Granger Cause EXR	1.2489
EXR does not Granger Cause FB1	0.1514
FB1 does not Granger Cause EXR	0.1063

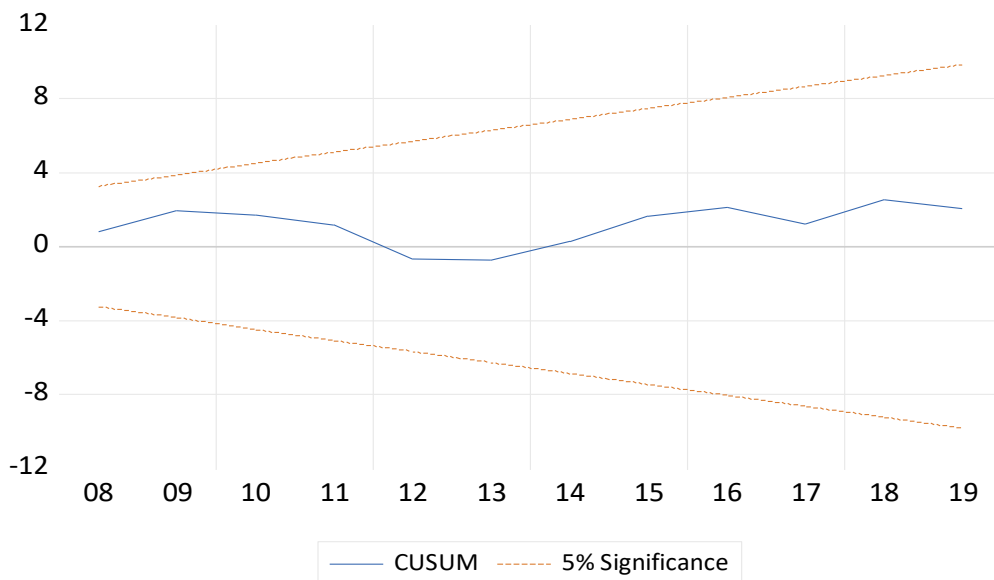
Source: Authors' compilations.

Note: a, b and c denote 1%, 5% and 10% level of statistical significance, respectively.

Appendix II

CUSUM Test for stability Analysis in the long run.

Model 1



Source: Authors' compilations.