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EXCHANGE RATE DYNAMICS AND THE EFFECT ON BALANCE OF PAYMENTS IN NIGERIA: EVIDENCE FROM MIXED DATA SAMPLING MODEL

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Abstract

This study used both annual and monthly data to investigate exchange rate dynamics and its pass-through effect on balance of payments (BOP) in Nigeria over a period of 1980-2023. Data on total trade (TTR) and balance of payment (BOP) were annual data while data on exchange rate (EXR) and inflation (INF) were quarterly and monthly data respectively. The data were analysed using the mixed data sampling (MIDAS) model**.** Findings show that appreciation of exchange rate could, at different times, have both positive and negative impacts on BOP. That is, the impact of EXR on BOP is positive in the first and third quarters but negative in the second and the fourth quarters. Hence, the study establishes that exchange rate across the quarters has expected signs and are statistically significant except for the second quarter. The result further shows that inflation has a negative impact on BOP for a period of twelve months of every year investigated. The result shows that inflation is a drag on the Nigerian balance of payments. TTR has a positive and significant impact on BOP both in the short run and in the long-run. However, in terms of the sizes of the estimated coefficients, the impact of total trade on BOP is higher in the short run than in the long run. Based on the finding, the study recommends that the CBN exchange rate regime should pursue a stable and sustained exchange rate because internal and external performance of the nation hovers around exchange rate stability.

Keywords: *exchange rate, balance of payments, MIDAS*
JEL Classification Codes: *F31, F32*

1. Introduction

In international economic transactions, exchange rate plays two major roles of defining the relationship between the currencies of trading partners as well as determining the price of one currency in terms of another. Defining the currency of one country in terms of another makes the exchange of goods and services easier between trading partners across the international borders. Also, using the price of one currency (foreign currency) is use to determine the price of another (domestic currency) could lead to some economic gains or losses for either the domestic or foreign economy. For example, a decrease in the value of domestic currency could makes

exports cheaper and import dearer and hence, increases demand for exports as well as improved the balance of payment (BOP) position of the domestic economy. However, this will depend on the elasticity of demand for exports. For example, if export is highly inelastic, decrease in the value of domestic currency may not increase demand for export by a reasonable amount necessary to make a surplus BOP (Sodersten, 2001).

On the other hand, the demand for export rises with a fall the value of domestic currency when export is highly elastic. Highly elastic exports implies that the exportable has close substitutes, and consumers can only demand for more of them only at a reduced price, otherwise, they run to other alternatives for any slight increase in the prices of such exportable. Thus, currency devaluation or reduction may not have significant impact on BOP. Instead, importing countries benefits from such devaluation measures than the exporting country. By implication exchange rate affects BOP through the export and the import pass-through channels. When the difference between the export and the import is positive, BOP is favourable but when the difference is negative, BOP is unfavourable (Alfa, 2019).

Apart from the export and the import channels, exchange rate could affect the balance of payment through the inflation expectation channel both in the domestic and the foreign economies. For domestic economy, an increase in the general price level discourages foreign investors. This means that the amount of foreign currency circulating in the economy will be reduced. This will increase the price of foreign currency relative to domestic currency and lowers the demand for it within the domestic economy and this could hamper BOP for the country. For foreign economy on the other hand, inflation works via the import channel. When inflated commodities are imported into a country, it creates a phenomenon of imported inflation in the economy and add to the cost of living of the people. The foregoing suggests that inflation may not be without its benefits, however, in any economy where it occurs, it is a disaster not only to that economy but also to her trading partners (Su, 2009).

The role of exchange rate in balance of payment equilibrium is also linked to the volume of total trade both within the domestic and the foreign economy. Total trade comprises the terms of trade (TOT) and the balance of trade (BOT). While the former measures the exports to import ratio, the later refer to the difference between exports and imports of only the visible item. When more capital is leaving the country than is entering into the country, then the country's TOT and BOT are less than 100%, signifying deficit in BOP. However, when the TOT and BOT are greater than 100%, the country is

accumulating more capital from exports than it is spending on imports, signifying a surplus BOP (Kopp, 2021).

The dynamics of exchange-rate is measured by the response of the exchange rate to economic shocks in a country operating a pure flexible exchange-rate regime. The changes in exchange rate as a result of economic shocks could have direct effect on the demand and the supply of goods, investment, employment as well as distribution of income and wealth. For example, when Nigeria started recording huge balance of payments deficits and very low level of foreign reserve in the 1980s, it was felt that depreciation of the naira would relieve pressures on the balance of payments. Consequently, the naira was devalued. What appears to standout, considering this policy is that the foreign trade structure did not satisfy the condition for a successful balance of payment policy. Perhaps this is due to the country's foreign structure, which is characterised by export of crude petroleum and agricultural produce whose prices are predetermined in the world market and low import and export price elasticity of demand.

In Nigeria, exchange rate regime has undergone series of changes over the years. In the early years of independence in 1960, the exchange rate regime was a fixed regime in which the value of domestic currency (Naira) was fixed and tied to other foreign currencies such as dollar and pounds. During the period, the value of Naira was relatively higher than dollar, as ₦0.5 was exchange for a dollar. However, the combined forces of demand and supply for naira within the forex market as well as government monetary policies over the years has led to deterioration of naira over time. Following the introduction of the Structural Adjustment Programme (SAP) in 1986, exchange rate regime in Nigeria shifted from a fixed regime to various types of the floating regime and pegging. This was intended to conform to the new SAP which ushers in an era of economic liberalization, free enterprise system and market-oriented price mechanism. With SAP in place, the fixed exchange rate regime was replaced with floating exchange rate regime. Under the floating exchange rate regime, exchange rate is determined by the interplay of the market forces of demand and supply though the monetary authorities tend to manage the floating of the exchange rate informally (Sakanko & David., 2017; Shabana, Khan & Ismail, 2012). In the floating exchange rate regime, the exchange rate is determined in the foreign exchange market.

Although, the Nigerian balance of current account has been rising and falling over the period of 1980 to 2021, there are sharp drops in current account balances in periods of deficits than there are rises in periods of surpluses. For example, between 1981 and 1983, Nigeria sustained a deficit in her trade account each year amounting to N1816.3

million, N2564.1 million and N1401.2 million for 1981, 1982 and 1983 respectively (Nwanosike, Uzoechina, Ebenyi & Ishiwu, 2017). This was attributed to the greatest economic mismanagement by the politicians as they returned to power after 13years of military rule. From 1984 –1997, Nigeria's trade balance ran back into surplus. By 1996, the trade surplus amounted to N 746916.8 million. Except for 1998 which recorded a deficit of N85562m, the periods 1999 –2006 recorded trade surpluses with an all-time high between 2003 and 2006. In 2003, N1007651.1 million was recorded while N2615736.2m, N3892729.9m and N3224661.7m were recorded for the years 2004, 2005 and 2006 respectively. However, since the situation got worsened in 2008 as a result of the global financial and economic meltdown coupled with the falling prices of crude oil in the international oil market, Nigeria balance of payments records have been deficits. In 2019, Nigeria has recorded a current account BOP deficit continuously for 9 consecutive quarters, since Q1 2019, summing up to a deficit of $33.35 billion in a little over two years.

Several factors have contributed to the growth of the deficit in Nigeria's BOP over the years. Among these are exchange rate instability, restrictions on trade, lower interest earnings from reduced overseas assets; higher interest payment abroad resulting from the growth and inflation. These factors have contributed to decline in investment in Nigeria. Interest rate is inversely related with investment. That is as interest rate increase, investment falls. In Nigeria, interest rate has been on the increase since the turn of 2016. This accounts for the sharp decline in the level of private investment in Nigeria. Exchange rate fluctuation has also contributed to low propensity to invest in Nigeria by the foreigners. This is because of low manufacturing of export goods. Therefore, instead of investing domestically the greater percentage of Nigerians prefer investing abroad where their money would be managed effectively. The poor level of stock of total trade has been as a result of low income which decreases domestic consumption and savings. Given the foregoing, it becomes necessary to examine exchange rate dynamics and its pass-through effect on balance of payment in Nigeria. The rest of the paper is structured as follows: section two reviews relevant literature while section three focuses on methodology of the study. Section four discusses the results of the analysis of data and section five consist of the conclusion and the recommendations.

2. Literature Review

Exchange Rate

Exchange rate is the price of one country's currency in terms of another (Adeneye, Otto & Cookey, 2021). In a more formal sense, exchange rate indicates the international value of money in terms of purchasing power, and

changes in exchange rate indicates changes in this value. The importance of exchange rate derives from the fact that it connects the price systems of two different countries making it possible for international trade to make direct comparison of traded goods. In other words, it links domestic prices with international prices. In order for currencies to trade in a common market, one currency must be expressed in terms of the other. An exchange rate is the price of one currency in terms of another (Mishkin & Eakins, 2009). They can either be direct or indirect whereby a direct quotation refers to how much of the home currency is required to buy a unit of the foreign currency while an indirect quotation refers to how much a unit of the foreign currency can be obtained for a unit of the home currency (Howells & Bain, 2007) (Kabura, 2014).

Mohagheghazadeh, Nasiri and Mohagheghazadeh (2014) describe exchange rate as one of the most important economic variables that can affect many of the basic variables. Both the demand side and the supply side will be influenced by exchange rate. The demand sector will be influenced by exchange rate through exports and imports as well as changing at reserves, and on the other hand the supply sector will be influenced by exchange rate through imported intermediate goods. Many economic researchers have focused on the changes in exchange rate due to its major role in the price of a set of economic variables, and the interplay of them.

Balance of Payment

According to Otaki (2015), balance of payments is a systematic record of all economic transactions, visible as well as invisible in a period between one country and the rest of the world. It shows the relationship between one country's total payments to all other countries and its total receipts from them. Furthermore, it provides historical data on import and export overtime and this could be used for planning purposes. It also provides statistics for the net foreign investment component of the national income (Afolabi, 2019).

It is also the periodic report that summarises the flow of all economic transactions (visible and nonvisible) consisting of imports and exports of goods, services and financial capital, as well as transfer payments such as foreign aid and remittances, between a country's individuals, companies and government bodies and individuals, companies and government bodies outside the country over a defined period of time, such as a quarter or a year (Kenton, 2017). Thus, the balance of payments includes all external visible and non-visible transactions of a country. The balance of payments is important because it provides a detailed information and signal concerning the demand and supply of a country's currency,

the potentials of a country as a business partner for the rest of the world, as well as the economic performance of a country based on international economic competition (Sakanko, Obilikwu & David, 2019). In the BOP accounts, all receipts from abroad or sources of fund for a nation (such as exports or the receipts of loans and investments) are recorded as credit or positive, while all payments made to abroad or use of funds (such as for imports or to invest in foreign countries) are recorded as debit or negative (Imoisi, 2012).

Theoretical Review

This study is anchored on the Official currency area (OCA) theory of exchange rate. The theory was developed by Mundell (1961) and McKinnon (1963). This literature focuses on trade, and stabilization of the business cycle. It is based on concepts of the symmetry of shocks, the degree of openness, and labour market mobility. According to the theory, a fixed exchange rate regime can increase trade and output growth by reducing exchange rate uncertainty and thus the cost of hedging, and also encourage investment by lowering currency premium from interest rates. However, on the other hand it can also reduce trade and output growth by stopping, delaying or slowing the necessary relative price adjustment process.

Later theories focused on financial market stabilisation of speculative financial behaviour as it relates particularly to emerging economies. According to the theory, a fixed regime can increase trade and output growth by providing a nominal anchor and the often-needed credibility for monetary policy by avoiding competitive depreciation, and enhancing the development of financial markets (Barro & Gordon, 1983; Calvo & Vegh, 2004; Edwards & Savastano, 2000; Eichengreen, et al., 1999; Frankel, 2003). On the other hand, the theory also suggests that a fixed regime can also delay the necessary relative price adjustments and often lead to speculative attacks. Therefore, many developing and emerging economies suffer from a fear of floating (Calvo & Reinhart, 2002). However, their fixed regimes also often end in crashes when there is a 'sudden stop' of foreign investment (Calvo, 2003), and capital flight follows, as was evident in the East Asian and Latin American crises and some sub-Saharan African countries. Not surprisingly, there is little theoretical consensus on this question of regime choice and subsequent economic growth in the development economics literature as well. While the role of a nominal anchor is often emphasized, factors ranging from market depth (or the lack of it), political economy, institutions and so on often lead to inclusive suggestions as to which exchange rate regime is appropriate for a developing country (Frankel, et al., 2001; Montiel, 2003; Montiel & Ostry, 1991).

Empirical Review

Osisanwo, Tella and Adesoye (2019) employed ARDL bound testing approach to investigate the impact of monetary policy and exchange rate on balance of payments (BOP) adjustment in Nigeria within the periods, of 1980 to 2015. The results indicate the presence of significant cointegrating (long-run) relationship between balance of payment and Monetary policy variables (money supply exchange rate, trade balance, inflation and GDP). Amongst others, the authors discovered the presence of insignificant and negative long-run relationship between Nigerian balance of payments and the exchange rate, as well as a significant negative (deficit) effect of exchange rate depreciation on the Nigerian balance of payments. Furthermore, Limbore and Moore (2019) examined the effect of exchange rates on balance of payments using secondary data from the RBI (Central Bank of India) covering the period of 2001 to 2018. Variables employed are export, import, trade account balance, current account balance and overall balance data which were analysed using descriptive method. The study found that exchange rate was highly unstable which negatively influenced balance of payments.

Nwanekezie and Onyiro (2018) also employed the Error Correction Model (ECM) and Johansen cointegration technique to investigate the impact of exchange rate volatility on balance of payments in Nigeria using data from 1981 to 2016. The authors discovered that, using the Johansen cointegration technique, there exist a cointegrating (long-run) relationship between exchange rate (volatility), balance of payments and associated variables. In addition, the results also show the presence of a significant negative (deficit) effect of exchange rate depreciation on the Nigerian balance of payments. Also, Aidi, Suleiman and Saidu (2018) adopted the Ordinary Least Squares (OLS) multiple regression and the Johansen cointegration techniques to investigate the relationship between exchange rate, inflation and balance of payment in Nigeria. Using annual time series data spanning from 1986 to 2015, the results indicate the presence of cointegrating (long-run) relationship between exchange rate, balance of payments and associated variables. In addition, the results also show the presence of statistically significant negative (deficit) impact of exchange rate on the Nigerian balance of payments.

Gatawa, Elijah and Umar (2018) also used Vector Error Correction Model (VECM), Johansen cointegration and Granger causality techniques to empirically investigate the impact of floating exchange rate on balance of payment in Nigeria from 1986 to 2016. The results of the analysis show the presence of a statistically significant positive (surplus) effect of exchange rate depreciation on the

Nigerian balance of payments. Oghenebrume (2018) used the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) volatility technique to examine the effect of exchange rate volatility on the Nigerian balance of payments from 1980 to 2016. The results indicate that exchange rate volatility have a statistically significant positive (surplus) impact on the Nigerian balance of payments.

Gebremariam, Batu and Tola (2018) employed the Johansen cointegration and the cointegrated Vector Autoregressive (VAR) techniques to investigate the relationship between real effective exchange rate and Ethiopian balance of payment using annual data spanning the period of 1976 to 2015. The Johansen cointegration result indicate the presence of cointegrating (long-run) relationship between current account balance and real effective exchange rate (and real gross domestic product, budget deficit, interest rate and inflation rate). The authors also discovered that the appreciation of the real effective exchange rate have a significant positive (surplus) effect on the Ethiopian current account balance, both in the short-run and long-run.

Oluseyi, Olasehinde, Gamaliel and Eweke (2017) uses unrestricted mixed data frequency (U-MIDAS) and ARDL model to investigate the long and short run relationships between broad money supply and GDP in Nigeria from 1981 to 2015. The U-MIDAS results affirm the existence of a long and short-run relationship between yearly real GDP and quarterly broad money supply at different season while the ARDL result affirm that money supply impacted significantly on real GDP in the long run only. The study concluded that the disequilibrium correction terms from the two analytical approaches showed the evidence that there is a tendency for growth targeting in Nigeria which is one of the major objectives of Nigeria economy though at a slower rate.

3. Methodology

Model Specification

This study used the mixed data sampling (MIDAS) model to estimate the impact of exchange rate n balance of payments in Nigeria. The model is adopted from the work of However, adapting the work of Oluseyi, Olasehinde, Gamaliel and Eweke (2017). The model is a direct forecasting regression model that relates future low-frequency data with current and lagged high-frequency indicators, and yield different forecasting models for each forecast horizon. A major advantage of MIDAS over the traditional VAR and the ARDL model is that it allowed data of both the low and the high frequencies to be modelled together without the need for idiosyncratic variables. This solves the problems of losing potentially useful information and including mis-specification

currencies. The specification rule is that the independent variable should be a higher frequency variable than the dependent variable. Following Ghysels, Santa-Clara and Valkanov (2006), the general specification of the model is given as:

$$\mathbf{Yt = \beta 0 + \beta_1 B(L^{1/m}; \theta) x_t^{(m)} + \mu^{(m)}} \qquad \mathbf{(3.1)}$$

Where; *Yt* = is the dependent variable of low frequency (annual data); *x* = Regressor; *m* = frequency of the variables (monthly data in this study); $B(L^{1/m}; \theta)$ = Beta function or the Almon Lag distribution component and equal to

$$\sum_{k=1}^{k} b(k;\Theta)L^{k-1/m}$$

The MIDAS in (3.1) is a long-run specification. For a short–run specification, the fundamental MIDAS model for a single explanatory variable and step ahead forecasting horizon can be described as:

$$\mathbf{Y_t = \beta_0 + \beta_1 B(L^{1/m};\Theta) x^m_{t-n} + \upsilon\, ECMt + \varepsilon} \qquad \mathbf{(3.2)}$$

Where, $B(L^{1/m};\Theta)$ is as defined earlier; υ = coefficient of ECMt term representing the speed of adjustment from short run disequilibrium to long run equilibrium; ε = stochastic error residual for short run model.

The MIDAS expression in its parametrized distribution is given as a functional restriction specify as:

$$\mathbf{h(k-1;\Theta)} = \frac{\exp(\theta_1 k + \theta 2 k^2)x}{\sum_{k=1}\exp(\theta_1 k + \theta_2 K^2)} \qquad \mathbf{(3.3)}$$

Note that x is added for simplicity and is equal to $k-1$, x is the independent variable, m is the frequency, h is the forecasting horizon, lower case k is the high frequency lag order, and upper case K is the maximum amount of high frequency. For example, if the dependent variable is quarterly and the explanatory variables are monthly, $m = 3$ as there are three monthly observations for every quarter $(k; \theta)$. By construction, the θ_1 and θ_2 parameters in equation 3 cannot be negative and are normalized to sum to 1. The θ parameters impose the structural form that the high frequency independent variables take and are the estimated output of the MIDAS.

Suppose that the value of x is available for the first two months of the quarter being forecasted. This can be represented in the MIDAS framework simply by setting $h = 1/3$. This then indicates that 2/3 of the current quarter's monthly information is known. Algebraically, this can be represented by

$$\boldsymbol{Yt=\beta 0+ \beta 1\ B(L^{1/3};\Theta)\ x\ 3t-3+\varepsilon t} \qquad \mathbf{(3.4)}$$

where *h* (in equation 3.3) is now less than one (Clements and Galvao, 2008).

Source of Data

The study used annual data on total trade (TTR) and balance of payment (BOP), quarterly data on exchange rate (EXR) and monthly data on inflation (INF). While EXR and INF are quarterly and monthly data respectively, total trade (TTR) and balance of payments (BOP) are both annual data. The

choice of data of different frequencies for the variables of the study meets the necessary condition for the use of mixed data sampling (MIDAS) model. Data for BOP was obtained from the Balance of Payments Statistics Yearbook, while data on EXR, INF and TTR were obtained from International Financial Statistics data files (2023). Balance of payment (BOP) was used as the dependent variable while exchange rate (EXR), inflation rate (INF) and volume of total trade (TTR) were the independent variables. In this study current account balance was used as proxy for BOP. Current account balance is the sum of net exports of goods and services, net primary income, and net secondary income. Data on current account used in this study is measured in current U.S. dollars. Exchange rate is measured by the annual average exchange rate of Naira currency to the U.S. dollar based on quarterly averages. This is in line with previous studies (Sakanko, Obilikwu & David, 2019; Sakanko & David, 2017). Inflation in this study is measured as a monthly average percentage of consumer price index. Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. It is expressed as a percentage of RGDP. Total trade, as used in this study, is the sum of exports and imports of goods and services, measured as a share of gross domestic product.

4. Results And Discussions of Findings

Trend Analysis

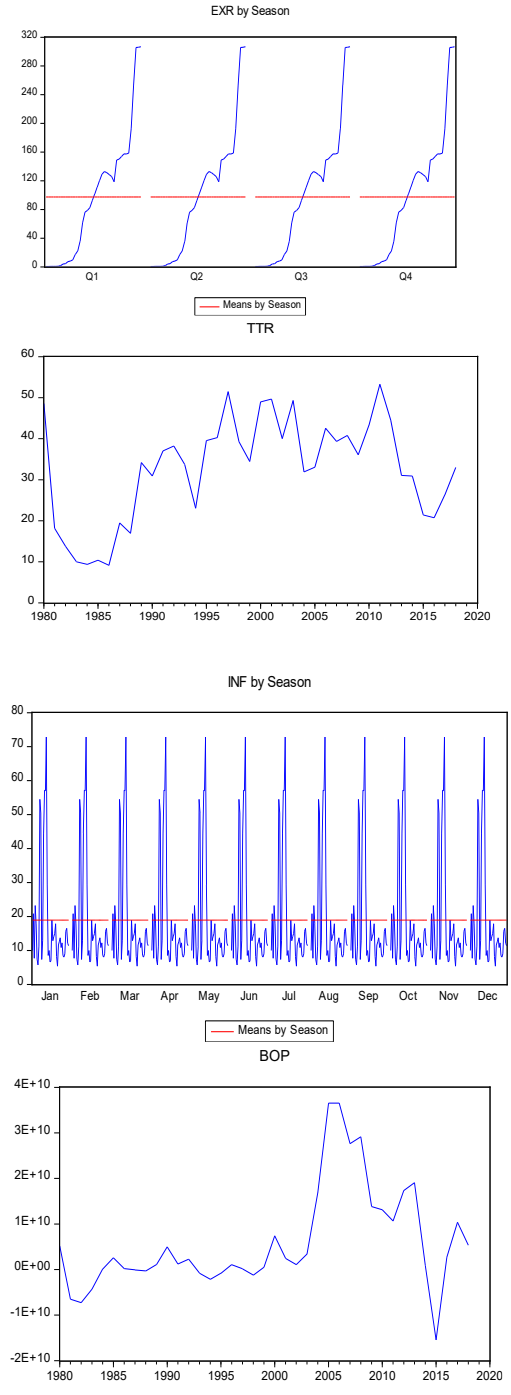


Figure 4.1: Trend of Exchange Rate, Inflation rate, total trade and balance of payments in Nigeria
Source: Author's Computation Using E-views 10

Figure 4.1 shows the trend analyses of the variables of this study. Exchange rate (EXR) (a quarterly frequency data) and inflation rate (INF) (a monthly frequency data) were plotted, taking into account how their movements were affected by seasonality. This is on the basis that exchange rates are subject to seasonal influences that arise from a number of sources, including differences in the fiscal calendars of trading partners, seasonal swings in the demand and the supply pattern of industries, and financial effects such as the repatriation of overseas earnings ahead of a financial year end. Also, for inflation, seasonal adjustments need to be made to the data in order to remove the effects of seasonality on price information and to achieve a clearer picture of price movements without anomalies.

From the result in figure 4.1, the mean line in EXR plot (represented by red line) measures the average deviation of exchange rate from its trend in each quarter while mean line in INF plot (represented by red line) measures the average deviation of inflation from its trend in each month over the period of study. The trend of exchange rate is upward and similar across the four quarters of every year, beginning from a low rate, rising slowly before reaching the seasonal threshold and then rapidly over the seasonal mean point. The upward trend of EXR suggests that it has a predictable pattern and less affected by seasonal influence. The rising behaviour of EXR may be attributable to factors such as current account deficits in Nigeria over the period of study. A deficit in the current account shows that Nigeria is spending more on foreign trade than it is earning, and that she is borrowing capital from foreign sources to make up the deficit. In other words, the country requires more foreign currency than it receives through sales of exports and this increase demand for foreign currency.

Unlike exchange rate, the trend of inflation rate (INF) clusters along the seasonal mean point, suggesting that it is well affected by seasonal influences. This is true of a monthly computed CPI which utilizes a process of seasonal adjustment to factor out seasonal effects on the price data gathered each month to gauge increases or decreases to inflation. This is necessary given that seasonality could produce relatively wide and volatile gaps between the unadjusted inflation and its counterpart.

The result in Figure 4.1 shows that both TTR and BOP have similar pattern, falling from a high level in the 1980 to a relatively lower level in 1985. From 185, BOP was relatively stable at low rate until 2004 when it rises slowly, and then falls sharply into 2015. However, from 2017, BOP exhibit an upward trend unlike TTR whose trend is downward from 2017 to 2020.

Table 4.1 Summary Result of KPSS Unit Root Test of Stationarity;

Variables	KPSS Levels	KPSS Difference	Remarks
TTR	0.352906 [ ]**	----------	**I (0)**
BOP	0.533222 [ ]	0.102055 [ ]**	**I (1)**

KPSS Critical Value at 5% = 0.463000

[ ] indicate that the test is conducted from general to specific

*** denote significant at 5%*

Source: Author's Computation Using E-views 10

Table 4.1 shows the result of KPSS test conducted to ascertain the stationarity status of TTR and BOP. The results show that, at levels, TRR is stationary because its calculated value is less than the critical values at 5%. However, BOP is not stationary at levels but at first difference Hence, TRR is said to be integrated of order zero while BOP is integrated of order one [I (1)]. Thus, the presence of a unit root in at least one of the variables suggests that it is necessary to test for co-integration relationship.

Table 4.2: Result of Canova-Hansen Unit Root Test of Stationarity, Seasonality and Stability

H_0: EXR is Stationary at Quarterly Frequency Data

Frequencies	LM Statistic	Critical values (D.F.)	1%	5%
4 quarters per cycle	0.478561	2.0	1.070	0.749
2 quarters per cycle	0.446701	1.0	0.748	0.470
Joint test	0.489594	3.0	1.350	1.010

H_0: Seasonal influence in EXR is stable

Seasonal Intercept	LM Statistical	Critical values (D.F.)	1%	5%
1	0.324635	1.0	0.748	0.470
2	2.600955	1.0	0.748	0.470
3	2.600955	1.0	0.748	0.470
4	2.600955	1.0	0.748	0.470

H_0: INF is stationary at Monthly frequency Data

Frequencies	LM Statistical	Critical values (D.F.)	1%	5%
12 months per cycle	0.044963	2.0	1.070	0.749
6 months per cycle	0.083036	2.0	1.070	0.749
4 months per cycle	0.044880	2.0	1.070	0.749
3 months per cycle	0.074009	2.0	1.070	0.749

2.4 months per cycle	0.044199	2.0	1.070	0.749
2 months per cycle	0.040667	1.0	0.748	0.470
Joint test	0.207656	11.0	3.270	2.750

H_0: seasonal influence on INF is stable

Seasonal Intercept	LM Statistical	Critical values (D.F.)	5%
1	0.044754	1.0	0.470
2	0.596272	1.0	0.470
3	0.596272	1.0	0.470
4	0.596272	1.0	0.470
5	0.596272	1.0	0.470
6	0.596272	1.0	0.470
7	0.596272	1.0	0.470
8	0.596272	1.0	0.470
9	0.596272	1.0	0.470
10	0.596272	1.0	0.470
11	0.596272	1.0	0.470
12	0.596272	1.0	0.470

Source: Author's Computation Using E-views 10

Table 4.2 shows the result of Canova - Hansen unit root test of stationarity and seasonality. The test was conducted using the Tukey-Hanning Kernel for autocorrelation and heteroscedasticity. The Tukey-Hanning Kernel option is necessary especially when the data for the variables of the study were not transformed into logarithm, which exposes them to the problem of heteroscedasticity. However, the Tukey-Hanning Kernel automatically corrects for autocorrelation and heteroscedasticity if found in the error residuals of the data.

The results in Table 4.2 shows that, for exchange rate (EXR), the langrage multiplier (LM) statistic of frequencies for 4 quarters per cycle (0.478561), 2 quarters per cycle (0.446701) and joint test (0.489594) are less than their critical values at both 1% and 5%. Therefore, the null hypothesis that EXR is stationary cannot be rejected. In other word, exchange rate is stationary for every quarter of every year that spanned 1980 – 2020. Like EXR, INF is also stationary. This is because the LM statistic of frequencies for all the months per cycle are less than their critical values but only 1% level of significant. At 5% level however, only frequency for 6 months per cycle is not significant because its LM statistic is greater than its critical value. In general, however, the null hypothesis that INF is stationary cannot be rejected at 1% level of significant. Therefore, INF is stationary for every month of every year that spanned 1980 – 2020.

Table 4.2 also shows that the LM statistic for the seasonal intercept of EXR for the season 1 is 0.324635 and is less than both the 1% and 5% critical values. However, the LM statistic of the seasonal intercept for season 2, season

3 and season 4 are greater than their critical values both at 1% and 5%. This led to the acceptance of stability of EXR for only season 1 and the rejection of seasonal stability of EXR in season 2, 3 and 4. In other word, EXR is seasonally stable in Nigeria in the first quarter but unstable for the last three quarters of every year from 1980 to 2020. However, inflation being a higher frequency data is tested only at 5% level of significant. The result shows that, for INF, the LM statistic for season 1 (first month) is less than the critical value at 5%. From season 2 to season 12, however, the LM statistics are greater than the critical value at 5%. This leads to the acceptance of stability of INF for only season 1 and the rejection of seasonal stability of INF from season 2 to season 12. In other words, INF is seasonally stable in Nigeria in the first month but unstable for the last eleven months of every year from 1980 to 2020.

Table 4.3: Result of Augmented Phillips-Oularis Co-integration Test

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
BOP	-2.544899	0.6653	-11.65658	0.6396
EXR	-0.509623	0.9971	-2.202781	0.9948
INF	-9.192051	0.0458	-36.92507	0.0010
TTR	-3.094465	0.4024	-14.33693	0.4623

*MacKinnon (1996) p-values.

Source: Author's Computation Using E-views 10

Table 4.3 shows the result of augmented Phillips-Oularis co-integration test. The result shows that the probability values of tau statistic and z-statistic for INF inflation are significant at 5 per cent. This suggests the existence of one co-integrating vector in the system, implying that the null hypothesis of absence of co-integration is rejected. In other words, there is long-run equilibrium and co-movement among the variables of the study. The implication of this finding is that one of the variables in the pair could be predicted from the others in the series. The result further provides empirical evidence that BOP, INF, TTR and EXR, as used in this study, do not represent separate or independent policy variables; instead, they form part of one integrated system in an economy with a common determination process. Therefore, policymakers, while using one the variables in policy decision, must also consider its impact on the other variables. Granger and Weiss (1983) demonstrated that if a set of variables are co-integrated, they could be regarded as being generated by an Error Correction Model, called the Granger representation Theorem. Hence, it is also necessary to model an error correction that describe the dynamic path of the variables in the short run as well the speed of adjustment towards the long run equilibrium.

Table 4.4: Result of MIDAS Long-Run Estimated Coefficient

Dependent variable: BOP

	Mixed Frequency Variables	Coefficients	Standard Error	t-Value	Prob.
	Q1_EXR	0.015812	0.00201	7.86667	0.0000
Section A	***Q2_EXR***	-0.119890	0.00297	0.40408	0.2130
	Q3_EXR	0.028246	0.00721	3.91761	0.0127
	Q4_EXR	-0.032960	-0.00258	12.7706	0.0000
	M01_INF	-0.107987	-0.02507	4.30742	0.0026
	M02_INF	-0.096505	-0.03693	2.61319	0.0399
	M03_INF	-0.085472	-0.02791	3.06241	0.0292
	M04_INF	-0.074889	-0.02507	2.98719	0.0267
	M05_INF	-0.064754	-0.19971	0.32420	0.2213
	M06_INF	-0.055068	-0.02128	2.58778	0.0401
Section B	***M07_INF***	-0.045831	-0.00507	9.03964	0.0000
	M08_INF	-0.037043	-1.50029	0.02469	1.3219
	M09_INF	-0.028704	-0.00981	2.92599	0.0252
	M10_INF	-0.020815	-0.00299	6.96154	0.0000
	M11_INF	-0.013374	-0.00611	2.18887	0.0299
	M12_INF	-0.063821	-0.02198	2.90355	0.0265
Section C	***Y_TTR***	0.032960	0.01090	3.02385	0.0277

a. Q1_EXR to Q4_EXR = EXR from first quarter to fourth quarter

b. M01_INF to M12_INF = INF from January to December

c. Y_TTR = TTR is a yearly data.

Source: Author's Computation Using E-views 10

Table 4.4 shows the MIDAS estimated result for long-run coefficients. From the result, exchange rate (EXR) (being a quarterly data) is estimated in four quarters as shown in section A, while inflation (INF) (being a monthly data) is estimated in 12 months. Total trade is estimated on annual basis as shown in section C. The result in section A of Table 4 shows that exchange rate in the first and third quarters have positive and significant impacts on BOP, but in the second and fourth quarters, the impacts of EXR on BOP was negative and significant in the fourth quarter but insignificant in the second quarter.

The result also shows that appreciation of EXR by 1 per cent increases BOP by 1.58% in the first quarter and by 2.83% in the third quarter. These results conform to the apriori expectation. This is because when exchange rate (foreign currency) appreciates, the value of domestic currency falls. A fall in the value of domestic currency is synonymous to devaluation of domestic currency. This makes exports cheaper relative to import, increase demand for exports, increases export revenue and then add to balance of current account. However, this finding agrees with Oghenebrume (2018), Priyatharsiny (2017),

Oladipupo and Onotaniyohuwo (2011) but disagrees with Nwanosike, Uzoechina, Ebenyi and Ishiwu (2017) that depreciation of Nigeria's currency has a deficit impact on balance of payment.

However, in the second and fourth quarters, EXR has negative impacts on BOP. The result indicates that appreciation of EXR by 1% decrease BOP by 11.9% in the second quarter and by 3.3% in the fourth quarter. These results also conform to the apriori expectation. The logical idea behind the negative impact of EXR appreciation is that it makes import dearer. Hence, it becomes costlier for domestic firms to import the raw materials required for production. By implication, the volume of import may be reduced but expenditures on imports (outflows) increases. When expenditure on imports rises more than revenue form exports, it creates balance of payment deficit. This finding agrees with Abdullahi, Fakunmoju, Abubarkar and Giwa (2018), Nwanosike, Uzoechina, Ebenyi and Ishiwu (2017), Nwaolisa (2017) and Osisanwo, Tella and Adesoye (2019).

The result in section B of table 4.4 reveals that inflation (INF) has negative impact on BOP over the period of twelve months of every year from 1980 -2020. The result shows that a percentage increase in inflation in the first, second, third, fourth, fifth, sixth, seventh, eighth, nineth tenth, eleventh and twelfth months, decreases BOP by 10.8%, 9.7%, 8.5%, 7.5%, 6.5%, 5.5%, 4.6%, 3.7%, 2.9%, 2.1%, 1.3%, and 6.4% respectively. All the estimates, except for the fifth and the eighth months, are statistically significant. What could be inferred from this finding is that, inflation is detrimental to balance of payment. If domestic economy is inflated, the demand for export is reduced, all other things being equal. This is judged from the simple demand theory that less of a commodity is demanded when its price rises, all other things being equal. A fall in the demand for export reduces export revenue thereby impacting negatively on balance of payments. Thus, finding agrees with Oladapo and Oloyede (2014) but disagrees with Udoye (2009).

Furthermore, the estimated results for total trade (TTR) in section C of table 4.4 shows a positive and significant impact on BOP. The result shows that a 1% increase in TTR increases BOP by 3.3%. Thus, conforms to the apriori expectation. Trade breaks down domestic monopolies as it makes the domestic firms face competition from more efficient foreign firms. Increase in the volume of total trade increases competition and lowers world prices, which provides benefits to consumers by raising the purchasing power of their income as well as consumer surplus. Because domestic firms now face completion form foreign firms, they improved the quality of their output in order to lose customers to

competitors. The overall multiplier effect is sales, revenue and these enhanced the capacity of the economy to improve on her balance of payment position. This finding agrees with Mbanasor and Obioma (2017).

Table 4.5: Result of MIDAS Short-Run Error Correction Model
Dependent variable: BOP

Mixed Frequency Variables	Coefficients	Standard Error	t-Value	Prob.
D(Q_EXR)	0.271657	0.097663	2.781561	0.0101
D(Y_TTR)	0.168632	0.094073	1.792567	0.0852
D(M_INF)	-0.001659	0.000661	-2.511799	0.0188
ECM(-1)	-0.780472	0.133717	-5.836754	0.0000

a. Q_EXR = quarterly data
b. M_INF = monthly data
c. Y_TTR = TTR is a yearly data.

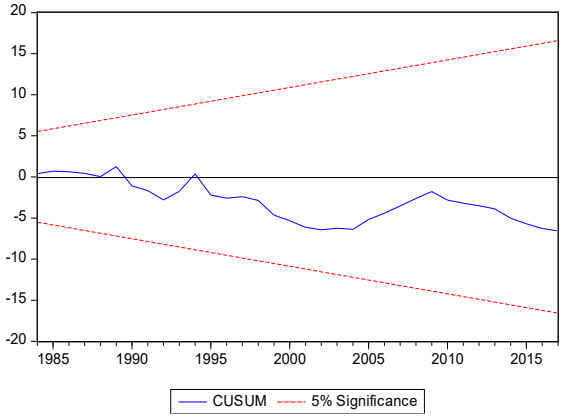
Source: Author's Computation Using E-views 10

The result of short run MIDAS error correction is presented in Table 4.5. The result of the error correction term reveals that there is speed of adjustment among the macroeconomic variables with a negative sign and significant value of 0.780472. This implies that balance of payments adjusts back to equilibrium at speed of 78% in every year with respect to total trade, every quarter with respect to exchange rate and in every month with respect to inflation. Also, in the short run it is revealed that exchange rate has positive and significant impact on balance of payments. A 1 per cent increase in EXR increase BOP by 27.2% in every quarter. This result agrees with the result of first and third quarters of long run result presented earlier. Similarly, the result shows that total trade exerts positive impact on balance of payments. However, the estimate is significant only at 10%. The result shows that a 1 per cent increase in TTR increases BOP by 16.9, this conforms to the apriori expectation. However, inflation rate has negative but significant impact on balance of payment in the short run. The result suggests that as inflation increases by 1%, BOP falls by 0.17%. This also conforms to the apriori expectation.

Table 4.6: Result of Post estimation Diagnostic

Serial Correlation Test;			
F-statistic	0.148478	Prob. F(2,32)	0.8626
Obs*R-squared	0.349392	Prob. Chi-Square(2)	0.8397
Heteroskedasticity Test;			
F-statistic	7.713713	Prob. F(1,32)	0.1015
Obs*R-squared	8.349554	Prob. Chi-Square(1)	0.1022

Source: Author's Computation using eviews 10



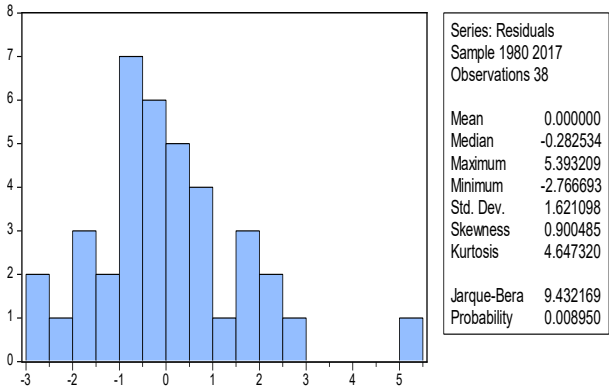


Figure 4.2: CUSUM plot

Figure 4.3: Normality Plot

Source: Author's Computation using e-views 10

Table 4.6, Figure 4.2 and Figure 4.3 show the post estimations statistics. The serial correlation LM test has a probability value of 0.1015 which is greater than 0.05. This suggests that the null hypothesis of absence of autocorrelation in the model cannot be rejected. Similarly, the probability value for the test of heteroskedasticity is 0.1015 implying that the null hypothesis of absence of heteroskedasticity in the model cannot be rejected. Furthermore, the stability plot reported in figure 4.2 shows that the residuals of the data are stable. This is because the CUSUM plot reported in figure 4.2 does not cross either of the 5% critical lines. Therefore, it could be concluded that the estimated parameters for the study are stable for the period under investigation. However, the result failed the test of normality. This is because the probability value of the Jarque-Bera is about 0.008 which is less than 5%. Hence, the null hypothesis that the error terms of the data used in the study are normally distributed cannot be accepted.

5. Discussion of Findings, Conclusion and Recommendations

Findings from this study reveal that in Nigeria, exchange rate, total trade and inflation rate affect balance of payments in Nigeria. Exchange rate has a double-edge impacts on balance of payments. That is appreciation of exchange rate could, at different times, have both positive and negative impacts on BOP. This evident from the result of long run MIDAS long run in which the impact of EXR on BOP is positive in the first and third quarters but negative in the second and the fourth quarters. Furthermore, inflation has a negative impact on BOP for a period of twelve months of every year investigated. The result shows that inflation is a drag on the Nigerian balance of payments. All the estimated results, except for the month of May and August, are statically

significant. However, unlike inflation, total trade has a positive and significant impact on BOP both in the short run and in the long-run. Given the findings of this study, it was concluded that exchange rate has the potentials of promoting balance of payments in Nigeria at one time and deterring it at another. The implications of this result is that a stable exchange rate would strengthen the value of domestic currency, promote exportation of local goods, makes the importation of foreign goods dearer and enhances domestic investment and foreign investment which ultimately contribute positively to balance of payments.

Therefore, the study recommends that the CBN exchange rate regime should pursue a stable and sustained exchange rate vigorously because internal and external performance of the nation hovers around exchange rate stability. Government should ensure the effective and efficient management of the exchange rate in order to reduce exchange rate fluctuation and instability. Government should embark on policies that would make trade openness work in favour of Nigeria through the diversification of the economy to other sectors like agriculture, tourism and manufacturing amongst others. In other words, there is need for export diversification and promotion, import substitution as well as restriction of frivolous imports. The government should put in place policies that reduce inflation and exchange rate fluctuations. Furthermore, the monetary authorities should also find ways of determining the rate at which interest should be maintained to encourage borrowing for investment purposes and exchange rate policies should consider the necessity of price and interest rate stability.

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