IMPACT OF FDI ON EXCHANGE RATE IN NIGERIA: A COMBINED COINTEGRATION APPROACH

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ABSTRACT

This study examined the long-run nexus between foreign direct investment (FDI) inflows and exchange rate (EXC) in Nigeria using the Gregory-Hansen, and Bayer-Hanck cointegration approaches from 1980M01 to 2019M12. The result showed that there is presence of long-run association between FDI and exchange rate in Nigeria. The Dynamic Ordinary Least Square (DOLS) technique was employed to establish the impact of FDI on the exchange rate. A negative nexus was found between the two variables. This implies that an increase in FDI brings about an appreciation of the Naira and vice versa. The study recommended that the Nigerian Government should strive to engage in activities that will minimise the outward leakages of Naira by attracting foreign investors into businesses, primarily in the oil sector. This action could lead to massive dollar injection, like setting oil refineries against crude oil extraction and exportation, which gives lesser USD inflows into the economy.

K**eywords:** Bayer-Hancks; Cointegration; Exchange rate; FDI; Gregory-Hansen; Nigeria
JEL CLASSIFICATION: C10, F21, F31, G15

1. INTRODUCTION

The inflows of foreign investors into the Nigerian border could be traced back to the Atlantic slave trade era when there was direct trade with Europe from the fifteenth century. Financial inflows have been noticeable in most areas of the Nigerian economy, and a few studies have looked into some of the country's foreign direct investment opportunities (Ashakah & Ogbebor,2020; Yusuf, Shittu, Akanbi, Umar, & Abdulrahman, 2020; Adams & Opoku, 2015; Akinlo, 2004). At independence, Nigeria has been a leading exporter of agricultural produce, which accounted for 16 and 43 per cent of the world cocoa and palm oil production, respectively (United nation Conference on Trade and Development [UNCTAD], 2013). In 1956, 25 per cent of the companies duly registered in Nigeria were owned by foreign investors, while it rose to 70 per cent in 1963 (Kpoghul, Okpe & Anjanae, 2020; Ohiorhenuan, 1990), with most of these foreign direct investment (FDI) inflows coming from the middle-East and the United Kingdom, concentrated on commerce and cash crops (UNCTAD, 2013).

There has been an extensive array of literature replete with multiple studies on FDI inflows, while consensus is yet to be reached concerning its impact and relationships with the appreciation or depreciation on the domestic currency in the foreign exchange (FOREX) market. In developing

countries like Nigeria, where there is a wide range of deficiencies in the domestic source of capital financing engineered by the saving-investment gap, FDI is a significant source of capital to rescue and aid investments. Many factors contributed to Nigeria's sub-optimal investment ratio, including exchange rate volatility, persistent inflationary pressures, low domestic savings, insufficient physical and social infrastructure, fiscal and monetary policy slippages, a lack of indigenous technology, and political instability (Ahmad & Aworinde, 2020; Osinubi & Amaghionyeodiwe,2009). A significant factor was exchange rate instability, especially after discontinuing the exchange rate control policy. The high lending rate, low and unstable exchange rate of the domestic currency and the high rate of inflation made returns on investment negative in some cases and discouraging investment, predominantly when financed with loans. FDI could positively or negatively impact the domestic currency's exchange rate, depending on how these inflows are used (Rehman, Ahmed & Jaffri, 2020). When FDI is deployed to finance imports, the exchange rate is unaffected; but, when it is used to finance domestic non-tradable, the domestic currency appreciates (Korinek & Serven, 2016; Baffes, Elbadawi, & O'Connell, 1997).

However, massive financial inflows in FDI exert pressure on the domestic currency's exchange rate (Ghosh, 2010; De Paula, Ferrari-Filho, Gomes,2012: Nwosa & Amassoma,2014), lowering the economy's trade competitiveness. Such a drop in trade competitiveness can increase public internal and foreign debt, worsen the fiscal deficit, and potentially exacerbate the current account deficit (De Paula, et al., 2012; Rashid & Husain, 2013). Furthermore, FDI inflows also present a significant problem for economic managers when implementing macroeconomic policies. Efforts to control currency rate appreciation by tightening monetary policy may result in increased FDI inflows into the host economy, putting extra pressure on the exchange rate (Nwosa & Amassoma,2014). Meanwhile, the monetary authority's increase in domestic interest rates and large-scale sterilised foreign exchange market intervention to curb exchange depreciation from substantial financial inflows may lose their effectiveness or become increasingly costly (Caruana, 2011).

In Nigeria, the Naira exchange rate was relatively stable when the country depended on the agricultural sector for its survival. It accounts for almost 70% of the country's GDP before 1970, likewise during the oil boom between 1973 and 1979. In 1980, as recorded in the CBN statistical bulletin, the country's exchange rate was ₦ 0.55k, with a single-digit inflation rate of 9.97% and a GDP of $64.2 Billion. However, due to the Nigerian Government's over-dependence on crude oil exploration and exportation cum import-dependence, global fluctuations in oil prices have affected the country's external reserve. The effect has dictated negatively on domestic performance, despite the FDI inflows recorded in the country from 2010 to 2019, ranging from ₦ 816,759,862.4 to ₦ 1,614,294,500 as captured by the Nigeria Bureau of statistics (NBS) and CBN. Although the exchange rate had a sporadic rise during these periods, depicting the insignificancy of the increase in the FDI inflows on exchange rate. The Nigerian exchange rate was averaged ₦150.2975 per dollar in 2010, against N 101.6973 in 2000, with depreciation against ₦ 8.038 recorded in 1990. Massive FDI inflows recorded from 2010 to 2019 could present a significant challenge for economic managers in regulating the exchange rate. While attempting to curb exchange rate appreciation may result in additional inflows into the domestic economy, higher interest differentials are signals for higher return, thereby pressurising the exchange rate (Nwosa & Amassoma, 2014).

Recent works have aided in this direction by devising numerous estimation techniques to estimate how FDI appreciates or depreciates domestic currency's exchange rate. The majority of these approaches employed some type of cointegration technique to establish a long-run link between the bilateral

exchange rate and macroeconomic fundamentals such as tradable sector productivity, trade liberalisation, foreign capital inflows, and a variety of other factors (Bashir, 2019; Edwards,1989; Montiel, 1997: Osinubi & Amaghionyeodiwe,2009). As a result, it becomes imperative for a study like this to unravel the connection and relationship between increasing FDI inflows and exchange rate depreciation or appreciation in the Nigerian economy. It also investigates the magnitude and direction of the effect of FDI inflows on the exchange rate. The study's findings will demonstrate the critical role of this FDI inflow in dictating exchange rate movements in Nigeria and expose the best ways to deal with such fluctuations.

The other sections of this article and the introductory portion are as follows: section 2 is the literature review, while section 3 discusses the methodology used in the paper. Analysis and results are discussed in section 4, while section five focuses on the conclusion and policy recommendations.

2. LITERATURE REVIEW

2.1. Conceptual Literature

The exchange rate is the relative price of one currency to another currency, i.e., the amount of foreign money that may be purchased for one unit of domestic currency, or the cost of purchasing one unit of foreign currency in domestic currency (Pilbeam, 1998). It is the rate at which one currency exchanges for the other, and it is used to characterise the international monetary system (Iyoha, 1996). Meanwhile, Anifowose (1994) described the foreign exchange as a monetary asset used daily to settle international transactions and finance deficits in a country's balance of payments. It is an essential component of a country's stock of external reserves. Other components include holding of monetary gold and Special Drawing Rights (SDRs).

Meanwhile, a country could acquire foreign exchange through exporting goods and services, direct investment inflow or external loans, aids, and grants to settle international obligations (Obaseki, 1991). When there is disequilibrium in the foreign exchange market due to an inadequate supply of foreign services, this may pressure foreign exchange reserves. If the foreign reserves are not adequate, this may deteriorate into the balance of payments problems. Exchange rate appreciation could be contractionary or deflationary, while a depreciating exchange rate could be expansionary and inflationary. Meanwhile, the exchange rate's level pilots a country's economy's cyclical position in the output gap and inflationary pressure.

The bilateral real exchange rate has been used in examining the price of domestics goods in terms of partners' goods (Gour & Mohammad, 2011; Opoku-Afari, 2004) against the real effective exchange rate (REER) that measures the prices of domestic goods in terms of a basket of foreign goods. Hence, this study employed the bilateral real exchange rate in its analysis.

Foreign Direct Investment (FDI) can be viewed from the perspective of the Balance of Payments and International Investment Position (IIP), both of which have conceptual similarities extracted from the International Monetary Fund (IMF). The IIP compiles the value of each financial asset and liability stock as defined in the standard components of the Balance of Payments for a specific date, such as the end of a year. In contrast, the Balance of Payments serves as the statistical statement that systematically summarises the economic activities and transactions of a country with the rest of the world for a specific period. The IMF's Balance of Payments Manual (BPM) (5th Edition, 1993) and the Organisation for Economic Co-operation and Development (OECD) 's benchmark definition of Foreign Direct Investment provided an overview of FDI definitions, concepts, as both offer operational guidance as well as precise international standards for tracking FDI flows and stocks.

2.1.2. Stylized Facts about Exchange rate and FDI in Nigeria

Agricultural exports have accounted for a considerable stake of Nigerian exports in the 1960s and 1970s, and it was a significant source of foreign exchange stabilisation before the oil boom of 1972. Nigeria was a major exporter of groundnuts, cocoa, rubber, and other agricultural products. The constant nature of exchange rate fluctuations significantly impacts the revenues projected from export proceeds during this period. The variations in exchange rates postulated a significant impact on the country's export sector's performance (Owuru & Farayibi, 2016). During this period, the Nigeria pounds was 0.71 shillings as the average exchange rate to USD from 1960 to 1972 (see figure 1). The Nigerian pounds and shillings were dropped for the Nigerian Naira by 1st January 1973, keeping the appreciation of the former fiat currency, which was maintained on an average of 0.66 kobo to USD from 1972 to 1985. During these periods, the fixed exchange rate regime was adopted, sustaining the appreciation of the domestic currency stabilised to an average of 0.62 kobo in 1975, with an average depreciation to 0.0.63 and 0.64 kobo in 1976 and 1977 respectively. The favourable fixed exchange rate regime was sustained until 1985 with an average exchange rate of 0.89 kobo.

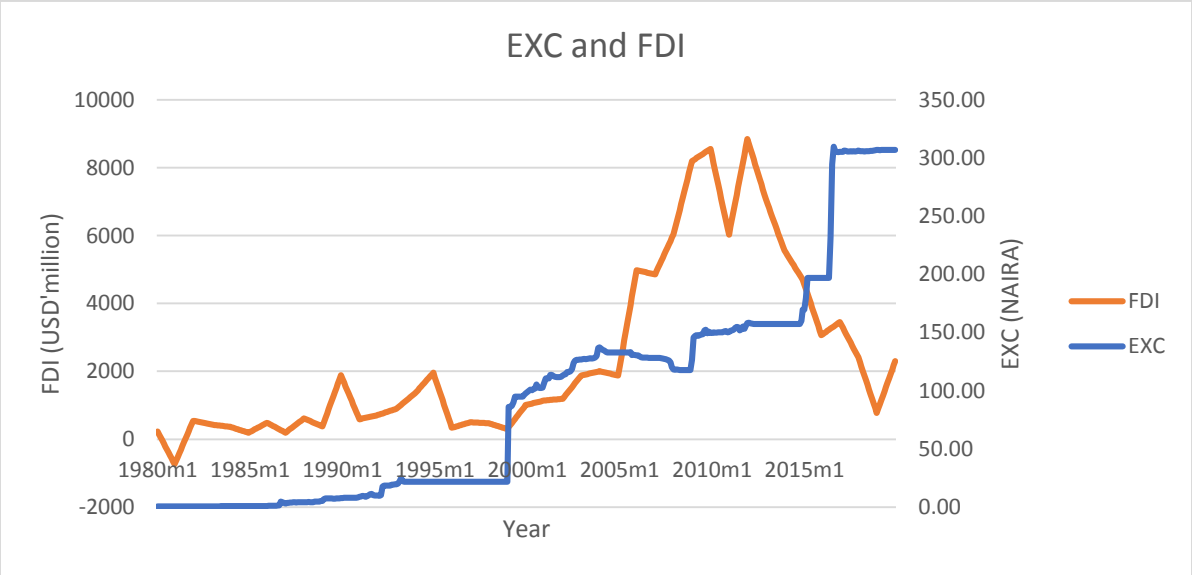

Figure 1.: Nigeria Exchange rate and net FDI inflows
Source: Authors' computation from CBN and WDI

However, there was a shift from the fixed exchange rate regime utilised in the economy to the flexible exchange rate regime due to the introduction of the Structural Adjustment Programme (SAP) in 1986, leading to unpredictable volatilities in the exchange rate market for the Nigerian Naira, coupled with the fluctuating oil prices and commodity prices leading to low profitability from exported agricultural products with a lean balance of payment and foreign reserve (Owuru & Farayibi, 2016). Furthermore, the fluctuations witnessed under the flexible regimes commence the journey into the naira depreciation against the dollar, as its volatility doing the fixed regime was appreciative (Nwachukwu *et al*., 2016). The forex was rationally priced during the flexible regime, leading to genuine or frivolous demand resulting in a persistent depreciation as Naira was exchanged at N1.32 and N3.61 on the average per USD in the third and fourth quarters of 1986, respectively. This depreciation continued at 40.99% depreciation rate at the end of 1988 fourth-quarter closing at N5.09 exchange rate, with a further 29.6% depreciation rate in the first quarter of 1989 as Naira was exchanged at N7.23 per USD due to the inter-bank-foreign exchange market arising from the merger of the autonomies and official foreign exchange

markets. To address the instability and negative volatilities experienced, the CBN, through the Dutch Auction System (DAS), modified the inter-bank foreign-exchange procedure in 1990, with the model Weighted Average System (WAS) introduced by August 1991 (Nwachukwu *et al.*, 2016).

The stabilisation processes embarked by CBN in 1990 and 1991 could not curtail the naira exchange rate fluctuations, as the average rate in 1990 and 1991 was recorded to be N8.04 and N9.91, respectively, leading to the adoption of deregulating the exchange rate system in March 1992. This deregulation further bastardised the upward increase in the exchange rate, as it recorded an unprecedented ₦18.47 and ₦19.50 per USD immediately after the deregulation in the second and fourth quarters of 1992, respectively, with a yearly average of ₦17.03 in 1992. The stabilisation system of the CBN yielded a meaningful result as the exchange rate was stable from 1993 through 1994 with ₦22.00 per USD, as it was pegged in 1994. The fixed regime adopted coupled with the introduction of the Autonomous Foreign Exchange Market (AFEM) in 1995 further created sanity into the foreign exchange market to increase the productive sectors of the economy, as it appreciated by 0.45% on the average in 1995 to 21.9 and further 0.50% from 1996 to 1998 with an average exchange rate of N21.89.

The stabilisation and sanity enjoyed in the foreign exchange market were short-lived at the verge of democracy inception in the country by 1999, as an unprecedented exchange rate of ₦ 92.34 was recorded on the average, which was a 321.84% depreciation cum the first-ever triple digits depreciation witnessed throughout the country existence, it further increased by 10.14% in 2000, closing at ₦ 101.7 per USD being the first triple exchange rate recorded in the country. On average, from 2001 to 2010, the exchange rate was ₦129.74 on a decade average. In contrast, there was depreciation in the first quarter of the decade (2001-2004), while the next quarter witnessed an apprehensive naira appreciation, as exchange rate contracted at the last two years of the decade. The period between 2001-2004 could be called the naira exchange rate trough period, while the second phase of 2005 to 2008 could be tagged the naira exchange rate expansion phase. The exchange rate fluctuations and depreciation continue subsequently, as it ranged averagely between ₦ 153.86 and ₦ 306.08 per USD from 2011 to 2019. In 2020, the exchange rate depreciated officially on the average by 16.91%, equivalent to ₦358.8 per USD, while as at 27 July 2021, it was exchanged at ₦ 410.16 per USD.

On the other hand, after Egypt and Ethiopia, Nigeria is Africa's third-largest FDI recipient, as the country is one of Africa's most promising growth poles, attracting a slew of investors in the hydrocarbon, energy, and construction sectors. The repercussions of the oil counter-shock are felt throughout the country. FDI inflows to Nigeria totalled USD 3.3 billion in 2019, a decrease of 48.5% from the USD 6.4 billion in 2018 (figure 2) due to the effects of austerity measures (UNCTAD,2020). In 2019, the overall stock of FDI was anticipated to be USD 98,6 billion. The United States, China, the United Kingdom, the Netherlands, and France are among the most influential investors in Nigeria.

Nigeria intends to diversify its economy away from oil by building a competitive manufacturing sector, which should facilitate integration into global value chains and boost productivity. Some of the country's main advantages are a partially privatised economy, a sound taxation system, significant natural resources, and low labour costs. Widespread corruption, political instability, a lack of transparency, and insufficient infrastructure, on the other hand, hinder the country's FDI prospects. Foreign investment is also hampered by a high level of bureaucracy. When MTN spent $285 million on a GSM license that allowed it to enter Nigeria in 2001, Nigerian telecommunications saw unprecedented FDI inflows. Following that, the introduction of Etisalat (2008) and the acquisition of

Zain by Bharti Airtel (2012) brought in more dollar-denominated investment, resulting in the Nigerian telecommunications sector's rapid expansion.

Nigeria's commitment to efficiently coordinate across these three critical areas to strengthen its trading and investment environment is shown in the recent merger of trade, industry, and investment under the auspices of the Federal Ministry of Industry, Trade, and Investment. Furthermore, the World Bank's 2020 report on Doing business ranked Nigeria 131st for the ease of doing business, representing a climb of the ladder by 15 steps away from the 146th 2019 ranking. Nigeria has been attracting solid inflows from American companies in transportation and telecommunication, with China investing mainly in the textile, automotive, rail transportation, and aerospace industries (World Bank, 2020).

2.2. Theoretical Literature

Nyoni (1998) asserted a theoretical link between financial inflows (using foreign aid which is a form of financial inflows as FDI) and real exchange rate, linking the theoretical bound that aid inflows have an inverse relationship with the real exchange rate using the theory of equilibrium real exchange rate, which postulated that net financial inflows, exchange & trade controls and government consumption of non-tradeable would cause an appreciation of real exchange rate. The term of trade shock on the equilibrium real exchange rate is said to be determined on how the income effects supersede the substitution effect will result to an equilibrium real depreciation due to the worsening terms of trade (Nyoni, 1998). Meanwhile, the technical progress has an impact on the real exchange rate, as it could cause real exchange rate appreciation depending on which sector the progress comes from and the relative strength of demand and supply of the technological progress (Edwards, 1989). Meanwhile, Stockman (1987) built on a simple core equilibrium exchange rate model in line with what was previously developed in 1980 aided with assumptions in clarifying the exposition. It was asserted that there is only one time period, abetted by two countries dealing with two commodities that could be consumed by households. Meanwhile, Ajevskis, Rimgailaite, Rutkaste, and Tkačevs (2014) posited the direct and structural approach to equilibrium real exchange rate theory. The direct approach is obtained by estimating the reduced-form equation specifying real exchange rate as a function of fundamental determinants.

$$q_t = \beta_1' Z_{1t} + \beta_2' Z_{2t} + \tau' T_t + \varepsilon_t \quad (1)$$

Where Z_{1t} connotes vectors of economic fundamentals having an effect on the exchange rate in the long run, Z_{2t} are vectors of such fundamental economic variables that have medium-term effect on exchange rate, T_t represent transitory short-term components, ε_t the random disturbance and the vectors of the reduced-form coefficient are β_1, β_2 and τ. The direct approach captures short-term movements in real effective exchange rate (REER) as it includes behavioural factors affecting REER in the model specification (Ajevskis et al., 2014)

Following the work of Elbadawi (1993), Elbadawi and Soto (1994) extended Edwards (1988) by endogenizing private absorption as a function of net capital inflows and the expected real exchange rate depreciation thus:

$$\frac{A}{Y} = \left(\frac{NFI}{Y}, \left[{}_t e_{t+1} - e_t \right] \right) \quad (2)$$

NKI are the net financial inflows, ${}_t e_{t+1}$ is the expected real exchange rate. Therefore, the equilibrium exchange rate theory is modelled as:

$$e = v\left(\frac{A}{Y}, TOT, t_X, t_M, g_N\right) \quad (3)$$

Where TOT is terms of trade, A is the absorption Y is income, g_N represents proportion of government expenditure to income

Furthermore, another theory employed to link FDI to exchange rate it the Purchasing power parity (PPP) theory. In the argument of Pibleam (2006), the Purchasing power parity (PPP) theory of exchange rate is the underlying assumptions of many models incorporating exchange rates, as it is built on the law of one price, which theoretically states transaction cost is the same globally irrespective of the geographical location of both seller and buyer. The PPP theory was previously tested by McNown and Wallace (1989) for Argentina, Brazil, Chile and Israel, where the theory was validated. In contrast, transaction costs differ across goods, making the speed at which price differentials vary across goods and capital market, and statistical problems have been notable drawbacks for the theory (Chen & Engel, 2005; Pibleam, 2006).

Meanwhile in terms of FDI, the elective hypothesis developed by Dunning (1988) consisting three separate theories has been previously employed to explain FDI-exchange rate relationship. It tries to explain why a company would want to produce in a foreign country rather than export or enter into a licensing agreement with a local company. Ownership advantage, location, and internalization are some of these theories (OLI model). Language and culture, availability to inputs, legal system, and tax regime are examples of variables that help enterprises to overcome handicaps in an alien environment. It refers to intangible assets that belong only to a company and can be transferred at a cheap cost inside Multinational Corporations (MNCs) to enhance income or cut costs (Denisia, 2010). Superior technological, managerial, and marketing abilities are examples of ownership advantages that provide a firm a competitive advantage over other local businesses. In this case, location refers to the host country in which MNCs may choose to place its overseas subsidiary. Rather than exporting to the area, it is more advantageous to start a new business there due to variables such as low labour costs, abundant raw materials, and a vast market. Denisia (2010) goes on to say that cross-border production and internalization encourages firms to prefer producing in the host country over granting franchises or offering rights under licenses. According to Aveh et al. (2013), OLI is firm-specific and is influenced by the economic, political, and social climate of the host country in which the firm operates.

Based on the argument of the Nyoni (1998**),** Ajevskis, *et at.* (2014), coupled with the variability and adjustment given by Elbadawi and Soto (1994) on the FDI bound exchange rate theoretical links through the equilibrium real exchange rate theory, this study is built on the equilibrium real exchange rate theory.

2.3 Empirical Literature

The surge in FDI over the past three decades has renewed interest in understanding how it affects the macroeconomy of the recipient countries. The relationship between FDI and exchange rate has been studied more extensively in industrialised countries and emerging markets economies, with little study in Nigeria. Meanwhile, several studies have investigated how exchange rates are affected by FDI in recipient economies since FDI inflows deliver various benefits to the host country, including technological know-how, financial resources, financial flows for long-term investment, and corporate expansion. The connexion between FDI and exchange rate is becoming increasingly significant (Qamruzzaman, Mehta, Khalid, Serfraz, A.& Saleem, 2021: Imoughele, 2020). FDI inflows aided

effective reallocation of economic resources, allowing for tremendous output potential in the home and host countries.

Numerous research works have established the positive association between exchange rate and FDI. Dey, Datta, Amin, Roy, and Ali (2021), while investigating the response of GDP, exchange rate, and inflation rate to FDI inflows in Bangladesh from 2000 to 2019 employing the OLS technique, established a positive and statistically significant relationship between FDI and exchange rate. This shows that FDI causes *Dutch diseases* syndrome in Bangladesh during their study, as the FDI inflows cough out more Bangladesh Taka in exchange for USD. Ellahi (2011) observed that exchange rate volatility negatively influenced foreign direct inflow in the short run, while exchange rate volatility positively influenced foreign direct investment in Pakistan from 1980 to 2010 in the long run. Ellahi's submission supported Ebhotemhen, (2020), Dhakal, Nag, Pradhan, and Upadhyaya (2010) and Del and Chiara (2009) significant positive relationship between exchange rate volatility and foreign direct investment. Furthermore, Qamruzzaman *et al.* (2021), while examining FDI on exchange rate volatility in some South Asian countries from 1980 to 2017, recorded an asymmetric effect between FDI inflows and exchange rate volatility, thereby concluding that the two series move together, exhibiting a causal relationship.

Meanwhile, Latief and Lefen. (2018), using the TGARCH and the fixed effect model, concluded that FDI inflows were adversely affected by the exchange rate volatility in China. Ezeji, Fezi and Chigbu (2021) examined the effect of FDI on exchange rate of Naira in Nigeria from 1990 to 2016 using the OLS and Granger causality test revealed that there is a positive and significant effect of FDI inflows on building and construction, mining, and quarrying and transportation and communication on real exchange rate. Abdul (2009) examined the effects of capital inflows on nominal and real effective exchange rate volatilities in Pakistan from 1991M1 to 2007M12 using the Granger causality test. This study submitted a significant causal relationship between FDI and exchange rate volatility. Furthermore, Chege (2009) and Barrell, Gottschalk, and Hall (2004) (in Ifeakachukwu & Ditimi, 2014) also observed a negative relationship between exchange rate volatility and inward foreign direct investment**.**

Osigwe and Uzonwanne (2015) scrutinised the Granger causality of foreign reserves, exchange rate (EXR), and foreign direct investment (FDI) in Nigeria. Their study revealed cointegration among the employed variable, while the Granger causality indicted unidirectional causality from EXR to FDI. Meanwhile, a study on the influence of FDI on exchange rate and domestic investment in Sub-Sahara Africa (SSA) was engineered from 1999-2015 by Ugwu and Udeh (2018), where the negative relationship between FDI and exchange was established for Ghana and Nigeria. Whereas the negative equivalence to an increase in the demand for the two countries' currencies makes the exchange rate fall, a fall in exchange rate means appreciation of a domestic currency concerning a foreign currency. The assertion of Ugwu and Udeh (2018) was also upheld by Adejumo and Ikhide (2019) when their examination of the effect of remittances inflows on exchange rate in Nigeria was carried out, with FDI as one of the control variables. The FDI inflow was reported to negatively influence exchange rate, implying that high FDI inflows exerted appreciating pressure on the country's currency**.** Osinubi and Amaghionyeodiwe (2009) examined the effect of exchange rate volatility on foreign direct investment (FDI) in Nigeria from 1970 to 2004, employing the OLS and the ECM estimation techniques. Their study revealed a significant positive relationship between real inward FDI and exchange rate in Del and Chiara (2009) study. Meanwhile, Ogunleye (2008) examined the relationship between exchange rate volatility and FDI in Nigeria and South Africa. The study observed that exchange rate volatility influenced FDI inflows negatively, as FDI inflows spurred exchange rate volatility in both countries**.**

3. METHODOLOGY

3.1. Theoretical Framework

The study is hinged on the equilibrium real exchange rate theory as extended by Elbadawi and Soto (1994), where net financial inflow is expected to depict an inverse relationship with exchange rate , leading to the appreciation of the host country exchange rate. This study adapt the model in Elbadawi and Soto (1994) by modifying it in favour of FDI which is a form of financial inflows thus:

$$\log e_t = \alpha_0 + \alpha_1 LFDI \tag{4}$$

Where e_t represents exchange rate, FDI is foreign direct investment. The choice for this theory is traced to its adaptability and variability by previous scholars in ascertaining the theoretical links between FDI and exchange rate (Nyoni, Ajevskis, *et at.*,2014; Okwu, Oseni, & Obiakor, 2020)

3.2. Design, Data, and Sources

This study explores the *ex-post facto* research design within a time-series data environment. The design is considered appropriate because previously published data, which are not subjected to manipulation, are used for the analysis. The monthly data for exchange rate was extracted from the Central Bank of Nigeria's Statistical Bulletin (CBN, 2020) and the annual time series of FDI (interpolated to monthly using Dento, 1979 method) from the World Development Indicator (WDI,2020). The design had been used in some previous studies Hermes and Lensink (2003), Saibu (2014). The design facilitates the determination of the impact of foreign direct investment on the exchange rate in Nigeria.

3.3. Cointegration Approach

Most empirical studies used the fundamental cointegration techniques developed by Engle and Granger (1987) cum the Johansen and Juselius (1990) cointegration techniques to examine and establish the existence of long-run nexus among a multivariate variable's framework. Meanwhile, according to Afshan, Sharif, Loganathan, and Jammazi (2018), one of the main criticisms of these cointegration approaches is the stagnant cointegration interrelation assumption over the entire period this is not welcomed while dealing with data of larger magnitude. Hence, this study uses the combine cointegration technique proposed by Bayer and Hanck (2013), as it captures the overall long-run cointegration between EXC (USD/NGR) and FDI. The Bayer Hanck approach combined the computed significance level of each of the individual cointegration tests using Fisher's formula:

$$EG - JOH = -2\left[In\left(P_{EG}\right) + \left(P_{JOH}\right)\right] \tag{5}$$

$$EG - JOH - BJ - BSJ = -2\left[In\left(P_{EG}\right) + \left(P_{JOH}\right) + \left(P_{BJ}\right) + \left(P_{BSJ}\right)\right] \tag{6}$$

Equation 5 and 6, P_{EG} P_{JOH} , P_{BJ} and P_{BSJ} represent the individual cointegration tests of Engel-Granger, Johansen, Banerjee and Boswijk's probability values, respectively. Furthermore, as witnessed in this study, the study utilises the Gregory and Hansen (1996) threshold cointegration approach to arrest emanating structural breaks issuers in a long time series. The GH test captures the long-run cointegration condition residual-based using the Augmented Dickey-Fuller (ADF) coupled with the Z_α and Z_t as proposed by Perron (1989). The following models are used in indicating the GH estimation with residual-based analysis:

$$EXC_t = \mu_{11} + \mu_{12}\gamma_{t,\tau} + \delta_{13}^{T} FDI_t + \varepsilon_{1,t} \tag{7}$$

Equation (7) is the *level shift* model specification denoted by *C*,
Where: EXC is exchange rate, FDI is the foreign direct investment, μ_{11} is the intercept before the shift, μ_{12} is the change in the intercept at the time of the shift, δ_{13}^{T} is the slope coefficient

$$EXC_t = \mu_{21} + \mu_{22}\gamma_{t,\tau} + \alpha t + \delta_{23}^{T} FDI_t + \varepsilon_{2,t} \quad (8)$$

Equation (8) is the level shift with trend denoted by C/T.
Where: μ_{21} represents the intercept before the shift, μ_{22} connotes the change in the intercept at the time of the shift, while δ_{23}^{T} captures the slope coefficient.

$$EXC_t = \mu_{31} + \mu_{32}\gamma_{t,\tau} + \delta_{33}^{T} FDI_t + \delta_{34}^{T} FDI_t\gamma_{t,\tau} + \varepsilon_{3,t} \quad (9)$$

Equation (9) is the regime shift captured as C/S,

Where: μ_{31} and μ_{32} are as in (4) and (5), δ_{33}^{T} denotes the cointegrating slope coefficient before the regime shift, and δ_{34}^{T} represents the changes in the slope coefficients. $\gamma_{t,\tau} = 0$

If $t \le |T\tau|$ and $\gamma_{t,\tau} = 1$ if $t \ge |T\tau|$, τ is the unknown break denoting the change point timings, t is the time trend , δ denote coefficient of each variables and $\varepsilon_{i,t}$ is the error term.

4. RESULTS AND DISCUSSION OF FINDINGS

As earlier acknowledged, the thrust of this study is to investigate the connection between foreign direct investment and exchange rate in Nigeria. The econometrics estimation started by first establishing the nature and characteristics of the variables, which was carried out via the descriptive statistics in table 1.

Table 1: Descriptive statistics

Statistics	EXC	FDI
Mean	91.916	2411.197
Median	98.191	1241.820
Minimum	309.730	8841.062
Maximum	0.53140	-738.8700
Standard Deviation	92.173	2550.263
Skewness	0.867	1.123507
Kurtosis	2.981	2.939963
Jarque-Bera Prob	60.173*	101.054*
	(0.000)	0.000*
Correlation Matrix		
EXC	1.000	
FDI	-0.520*	1.000
	0.000	

Source: Authors' compilation from E-views 10

The central tendency measures the mean, median and mode. The mean represents the average value of each variable over the considered time frame. On average, all the series variables depicted positive average values. The mean value of 91.916 for exchange rate over the years signifies a moderate rate of currency exchange, amounting to that on the average, the Nigeria Naira exchange for the USD is at ₦ 91.916 per USD during the 480 months observed. The FDI inflows show that during the 480 months under study, Nigeria attracted 2.41 billion USD in FDI on average. Furthermore, the maximum exchange rate and FDI values are ₦ 309.19 (1 USD in August 2016) and 8.84 billion USD, respectively.

Meanwhile, the minimum values of 53 kobo and (738 million USD) for exchange rate (EXC) and FDI respectively were recorded during these periods. Given these series' maximum and minimum values, we can measure how the series dispersed. The range value for exchange rate was N309.2, while that of FDI was 8.19 billion USD. In measuring how widely distributed the series was, it was reported that the exchange rate widely varied from the average by N8,495.78, while FDI was 6,500 billion USD. The variance shows the volatilities with these individual variables during the study period. The 6,500 trillion USD for FDI show how risky the Nigerian economy was for foreign investors. These high values depicted high market-volatility birthing market risks. Meanwhile, the standard deviation of N 92.17 to USD for the exchange rate is not harmful as it shows slight deviation and preferable lesser exchange rate volatility during the study period.

The normality measures start with the kurtosis that measures the peakedness or flatness of each of the series distributions. The kurtosis statistics revealed EXC is flatted-curve, i.e., platykurtic in nature, while FDI is leptokurtic, i.e., peaked-curve. The skewness measures the degree of the series asymmetry, with the rule of thumb for normal skewness should be zero, showing symmetric distribution around its mean. Meanwhile, positive and negative skewness means that a variable is above and below the mean, respectively. The series variables mirrored a positive skewness, signalling that they are above their respective mean and have a long-right tail. Finally, the Jerque-Bera statistic measures the skewness and kurtosis differences of each series with those of normal distribution shows evidence of non-normality for the variables under the sample period as the Jarque-Bera probabilities values are less than 0.05 significance value. The rationale for this is that most high-frequency series will face this normality problem (Afshan et al. 2018). Meanwhile, the correlation matrix shows a significant negative good relationship between FDI and EXC in Nigeria.

Table 2: Unit Root Tests

variables	ADF		PP		ZA		Perron	
	t-stat	Order	t-stat	Order	t-stat	Order	t-stat	order
LEXC	-21.537	I(1)	-21.536	I(1)	-21.900 $T_B = 1986(M11)$	I(1)	-28.710 $T_B = 1999(M01)$	I(1)
LFDI	-29.441	I(1)	-17.422	I(0)	-7.104 $T_B = 2008(M01)$	I(0)	-7.851 $T_B = 2007(M12)$	I(0)

Source: Authors' compilation from E-views 10

The ADF, PP, Zivot Andrew (ZA) and Perron unit root are conducted for the two variables' logarithm forms, as evident from table 2. The result shows the rejection of the null hypothesis at the first difference for EXC under the four tests. In comparison, the first difference null hypotheses were only rejected under ADF for FDI as the level null hypotheses were rejected under the three other tests. Furthermore, the null hypotheses of ZA and Perron's structural break unit root test were stationary with a structural

break. We found that there were mixtures in the order of integration, likewise the time of breaks. LFDI integrated at I(0) using the ZA statistics, while LEXC at I(1).

In contrast, LEXC integrated at first difference under the Perron test, while LFDI was at level. Furthermore, the time breaks in these variables also differ, as the time breaks (T_B) for exchange rate was 1986 M11 and 1999 M01 under ZA and Perron, respectively. The structural breaks for LFDI occurred in January 2008 under ZA, while it was in December 2007 under Perron.

Table 3: Gregory and Hansen Threshold Cointegration Result

Regime shift	ADF		Z_t^*		Z_α^*	
	Breakpoint	Statistic	Breakpoint	Statistic	Breakpoint	Statistic
Level shift	1991(M09)	-3.07 (-4.61)	2013(M12)	-4.28 (-4.61)	2013(M12)	-54.51* (-40.48)
Level shift & time trend	1999(M04)	-3.79 (-5.50)	1999(M02)	-3.87 (-5.50)	1999(M02)	-23.58 (-58.58)
Regime shift	1998(M07)	-2.83 (-4.95)	2013(M12)	-4.50 (-4.95)	2013(M12)	-58.80* (-47.04)

Source: Authors' compilation, 2022 from STATA 15

Notes: * denotes the rejection of the null hypothesis at 5 % significance level. The critical values for the GH test are available at Gregory and Hansen (1996), while the AIC lag selection was used. The number in parentheses represent the critical value.

The GH test result are reported in table 3. The result of no cointegration in the presence of possible level shift, level shift & trend and regime are accepted under ADF and Z_t^*. Meanwhile, the level and regime shift null hypothesis of no cointegration are rejected under Z_α^*. Meanwhile, the rule of thumb is that the lower the statistics' value, the better the model, leading to choosing the Z_α^* statistics. Overall, the GH cointegration result shat the unknown structural breakpoints determined in the study have a significant impact on the long-run cointegration relationship; hence, FDI has a long-run impact on EXC in Nigeria.

Table 4: individual and combined cointegration test

Test type	Test statistics	p-value	Cointegration
Individual approach			
Engle-Granger	-3.5002*	0.0314	Yes
Johansen	58.4911*	0.0000	Yes
Banerjee	-0.9788	0.8235	No
Boswijk	3.3263	0.6243	No
Combine approach			
EF-Johansen	62.1839* (11.229)		Yes
Bayer and Hanck	63.4575* (21.931)		Yes

Source: Authors' compilation, 2022 from STATA 15

Notes: * denotes the rejection of the null hypothesis at 5 % significance level. The number in parentheses represents the critical value., while the AIC lag selection was used

Table 4 shows the results for the individual and combined cointegration tests. The table explicitly displayed that two of the individual statistics (Banerjeea & Boswijk) failed to reject the null hypothesis except for the Engel-Granger and Johansen tests that individually rejected the null hypothesis of no cointegration among the variables at a 5% significance level. The rationale for this was that the t-statistics and p-value of all these two tests were greater than their critical value in absolute terms and lesser than the 5% significance level. However, the combination of Engle and Granger and Johansen (EG-J) tests reject the null hypothesis of no cointegration, as the EG-J statistics of 62.1839 is greater than the 11.229 critical value for 5%, establishing a long-run cointegration among the variables. Furthermore, when the Bayer and Hanck (2009) combined test was used, the EG-J-Ba-Bo t-statistics of 63.458 is greater than the 5% critical value of 21.931. Based on the Fisher type Bayer Hanck test, we reject the null hypothesis of no cointegration at 5% significance level, implying that the FDI exhibited a significant impact on exchange rate over the estimated periods in the long run.

Following the cointegration of the two series in the long run as ascertained by the GH and Bayer-Hanck combined cointegration tests, it is further imperative to establish the impact of LFDI on exchange rate (LEXC). This is estimated using the DOLS method, and the results are presented in Table 5.

Table 5: Dynamic Ordinary Least Squares (DOLS)

Dependent variable: LEXC			
Variables	Coefficient	t-statistics	Probability
C	13.841	9.055	0.000
LFDI	-1.638	-10.031	0.000
R-squared: 0.600			

Source: Authors' compilation from E-views 10

$$LEXC = 13.841 - 1.638LFDI + \varepsilon_t \qquad (10)$$

From estimated model 10 and as tabulated in table 5, LFDI depicted an inverse relationship with exchange rate during the study period. The result reveals that *ceteris paribus*, a percentage increase in FDI during these periods triggered a 1.638 per cent decrease in the exchange rate. This is a good signal as this depicts that FDI contributed to the appreciation of the Nigeria Naira against the USD during these periods, negating the *Dutch disease* syndrome. This relationship is further affirmed to infer a significant impact on exchange rate, as the P-value of 0.000 is less than the 0.05 significance level threshold for this study. Furthermore, the R-squared value of 0.600 depicted that FDI caused 60.0% variation in EXC during the study period. In comparison, the remaining 40% variations could be traced other variables not included in the model but have been captured by the error term ε_t

The DOLS result further establishes the GH and Bayer-Hanck cointegration result as it does not only agree with the long-run relationship between FDI and EXC but extends to pronounce the significant impact of FDI on EXC during the study periods.

4.2 Discussion of Findings

Three different estimation techniques were employed to establish how FDI impacts EXC in Nigeria, with the estimator of DOLS from 1981 to 2019 confirming the validity of the duo of GH and Bayer-Hanck cointegration tests. The results obtained Osigwe and Uzonwanne (2015), Ugwu and Udeh (2018) and Adejumo and Ikhide (2019) where the negative relationship between FDI and EXC in the DOLS denote an increase in the demand for the local currency, leading to the drop-in exchange rate, exhibiting appreciation of Naira against USD. Meanwhile, the result contradicts the outcome of Dey *et al.* (2021). The core question of the study is addressed with the estimation results that FDI plays a crucial role in balancing and appreciating the Nigeria naira in the FOREX market, as the moderating role of FDI is statistically estimated to be significant.

Furthermore, the negative coefficient of FDI in the DOLS was in agreement with the *a priori* expectation that FDI should have a negative influence on EXC; as FDI increases, the exchange rate decreases. Meanwhile, a reduction in the exchange rate implies currency appreciation. In a similar, Froot and Stein (1999) found a negative relationship between FDI and exchange rate, explaining that an increase in the supply of foreign funds means more demand for local currency as those funds would be converted to local currency before utilisation for daily operations. FDI is usually associated with the movement of significant or colossal capital, which is linked to the appreciation of currency of the recipient nation (Lipsey & Chrystal, 2011), whilst in view of the demand and supply theory, there may be an appreciation of currencies (Lily, Kogid, Mulok, Thien Sang, & Asid, 2014). In another perspective, it could come in the form of increased goods for export; exported goods purchased by foreigners would amount to the inflow of foreign currencies and appreciation of the local currency through demand and supply mechanisms

5. CONCLUSION AND POLCY RECOMMENDATIONS

The current study applied the combined combine cointegration approach of Bayer Hank to investigate a long-run association between FDI and exchange rate in Nigeria. The datasets considered in the current study comprises monthly observation of foreign portfolio investment (FDI) (interpolated using Denton, 1979 method) and exchange rate (EXR) of Nigeria, i.e., the bilateral official exchange rate of NAIRA/USD. The data for both variables are gathered from the CBN statistical bulletin. We have a sample of 480 monthly observations from 1980(M01) to 2019(M12) for the two series.

The GH cointegration result establishes the long-run relationship between FDI and EXC through the Z_{α}^{*}, which was further strengthened by the Bayer-Hanck combine cointegration test displaying that in the long run, FDI cointegrates with EXC in Nigeria. In contrast, the impact of such relationship was established by the DOLS, where it was confirmed that following economic presumption, the *a priori* negative relationship between FDI and exchange rate was achieved, as an increase in FDI inflows leads to a decrease in the volume of Naira to be exchanged for the USD signalling appreciation of the Naira against USD. These findings are derived from the mythological framework, which could not have been realised under the traditional cointegration approaches

Finally, it is recommended that Government should put more efforts towards increasing the nation's foreign exchange rate reserves, which could be accomplished by employing appropriate trade policies to enhance export and raise the value of the exchange rate. The government through the CBN could sell any of the country's dormant or acquired foreign asset through the anti-craft agencies which proceed should be saved to increase the foreign reserve and eventually appreciate the Naira. This would probably ensure some level of stability in the exchange rate, which attracts more FDI in the economy. Furthermore, priority should be given to FDI-led companies as business, and diplomatic moves through bilateral, multilateral and regional singings and agreements will aid in harnessing needed foreign

currencies to fill and aid the savings-investments gaps. These, in turn, reduce Naira's exchange rate to USD, as upheld in this study.

Furthermore, the Government should strive to attract FDI into the manufacturing sector against the oil and gas sector, as the sector is the engine oil for economic growth, which eventually leads to an increase in output for global consumption, thereby increasing the demand for the country's Naira. The FDI inflows into the oil and gas sector should be channelled to the local conversion of the crude oil to Liquified Petroleum Gas (LPG), Dual Purpose kerosene (DPK), asphalt base, Automotive Gas Oil (AGO), heating oil and Premium Motor Spirit (PMS) by encouraging the Transnational Cooperation (TNC) to set up refineries in the geopolitical zone of the country as against the extraction and exploration. This will reduce the outflow of the Naira in importing processed crude oil in the form of PMS, AGO and DPK, which leaks much of our currency outwardly as against the lesser dollar injection during extraction and exploration.

In addition, the tourism industry has not been attracted to foreign investors, as Nigeria is blessed with a lot of monumental sites that could serve as tourism for foreign tourists. The government through the ministry of tourism, arts and culture should partner with the state and local government, and foreign agencies of TNCs to develop all these monumental, historical and cultural sites in different geopolitical zone, as this could turn the industry another bullish revenue generation. The ministry should also engage in tangible and sophisticated digital promotion on global networks like CNN, Aljazeera and BBC to enhance the development of the tourism industry through the widest digital advertisement.

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