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Revisiting the Macroeconomic Determinants of Capital Flows: Push or Pull for Nigeria?

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Abstract: The macroeconomic determinants of capital flows has been extensively discussed in the literature since the seminal paper of Lucas (1990) that considered push and pull factors as core determining factors of international capital flows. However, recent empirical studies have turned out with mixed findings thus justifying the need for further study. This paper empirically investigates this relationship for Nigeria with data ranging from 1980 to 2020 using the Autoregressive Distributed Lag (ARDL) model. The findings revealed that both push and pull factors collectively influenced the various types of capital flows. When studying the interactive effect of the push - pull factors on capital flows to Nigeria, it was observed that the interaction of push factors with the pull factors influenced all types of capital flows to a considerable extent. Specifically, the long run hypothesis of statistical significance holds for the effect of global liquidity on FDI; the effect of global real GDP growth rate on FPI; the effect of risk aversion on FPI and international bank credit; the effect of global interest rate on FDI, FPI and international banks' credit; the effect of domestic real GDP growth on international banks' credit; the effect of exchange rate on FDI; the effect of monetary policy rate on FDI and FPI; and the effect of inflation on FPI. In terms of policy implications, the governments should focus on efficient macroeconomic policy implementation to improve the domestic macroeconomic environment to withstand global shocks in the periods of crisis so as to pull foreign capital for economic productivity.

Keywords: capital flows; push factors; pull factors; ARDL; Nigeria

JEL Codes: C82; F21 · F32 · F41 · F47

1. Introduction

Following the global financial crisis of 2008–2009, there has been an increase in capital flows to emerging economies (EMEs), which has reignited interest in the factors that influence international capital flows. Due to their impacts on the real economy, the exchange rate, and asset prices, this has happened (Fratzscher, 2011). Increased cross-border capital flows can have an impact on developing economies in at least two different ways. On the one hand, foreign borrowing enables a nation to boost investment without cutting back on consumption. Large episodes of capital flows, on the other hand, may be accompanied by current account deficits, inflationary pressures, and real exchange rate volatility in the recipient economy. The trading sector may then see a decline as a result of the latter. As a result, the current account may be more susceptible to outside shocks and changes in FDI-related capital inflows.

The topic of capital flows and their determinants is one that is frequently addressed in the economic world. The benefits that foreign capital flows bring to a host country's standard of living and possibilities for economic growth far outweigh the drawbacks. It's also nothing new to think about why one may invest abroad. Foreign direct investment (FDI) as a component of capital flow is determined by three sets of advantages, perhaps the most well-known eclectic theory (Dunning, 2001). A target foreign nation should provide an investor with a distinct geographical advantage in addition to a specific ownership and internalization advantage. The latter can take the shape of an economic advantage (cheap pricing for inputs, infrastructure, market size, geographic position, economic stability, etc.), a social advantage (proximity in terms of language and culture), or a political benefit (free trade, pro-investment policies, political stability, etc.). There has been less progress in understanding the mechanisms by which global factors (push) impact FDI inflows, despite the fact that studies like Aderemi (2019), Nwokoye and Oniore (2017), Nwinee and Olulu-Briggs (2016), and others have made significant contributions to our understanding of how these pull factors (location or pull factors) influence global capital flows to developing countries.

Large capital flow episodes into and out of developing markets over the past ten years have served to highlight the significance of common elements in determining global financial flows. Continuing and expanding on the results of Calvo, Leiderman and Reinhart (1993) and related literature (such as Abbas and El-Mossallamy, 2016; Abubakar and Abdullahi, 2013), several studies have shown how

global factors can influence nonresident investment flows to developing nations, even more so than for industrialized economies (e.g., Norimasa *et al.*, 2021; Tellez-Leon & Ibarra, 2019; Belke & Volz, 2018; Cerutti, Claessens & Puy, 2015). It has been discovered that a large portion of bond and equity flows to emerging nations over the past few years have been driven by unorthodox monetary policy in some advanced economies, particularly the U.S. (see Fratzscher, Lo Duca & Straub 2013; IMF 2013). Although the significance of various push factors varies across studies, a consensus has emerged regarding the role of US monetary policy, the availability of global liquidity (especially in US dollars), and global risk aversion in explaining the high synchronicity of investment flows to developing economies.

The portfolio balance mechanism, quantitative easing, and liquidity channel are the three (3) main ways that changes in U.S. monetary policy impact foreign capital movements both within the domestic economy and across the globe (Davis & Zlate, 2018). First, by extension, the portfolio balancing mechanism functions in the global economy. For instance, quantitative easing, in which the Federal Reserve (FER) buys existing government bonds from the general public to inject cash into the economy, increases liquidity in the United States and encourages the Central Bank to buy longer-term financial assets, specifically long-term government securities and mortgage-backed securities. Due to the inadequate substitutability between securities with different maturities, this affects long-term interest rates and reduces the supply of such financial assets to private investors. As a result, investors in the United States gravitate toward riskier assets in search of higher risk-adjusted returns, driving up demand for all alternative financial assets, including those of emerging markets.

Through the signaling mechanism, quantitative easing can also influence global portfolio flows and the values of financial assets in the second channel. For instance, there might be a fall in the risk-neutral component of bond yields if quantitative easing is seen as the FER's promise to keep the Federal Funds Rate (FFR) lower than anticipated. As a result, there will be significant interest rate differences that cause money to flow towards emerging economies (EMEs). Regarding this, Bauer and Rudebusch (2013) emphasized the importance of this channel for Federal Reserve statements since 2008 and showed that it was just as important as the portfolio balance channel.

In the third situation, quantitative easing may also have an impact on portfolio choices and asset prices by altering the liquidity channel and premium for liquidity

in the financial markets. Here, large scale asset purchases (LSAPs) are attributed to private banks' balance sheets as increased reserves. Because it is considerably simpler to sell such reserves in secondary markets than long-term securities, the liquidity premium declines, allowing banks with limited liquidity to offer loans to borrowers. Due to this circumstance, the lending rate declines and bank lending—including international lending—increases (Dahlhaus & Vasishtha, 2014). Further, shocks to the United States' monetary policy rate (popularly known as the FFR) alter U.S. economic activities (Tyson and Beck, 2018; IMF, 2013).

Figure 1 indicates the mechanism of US monetary policy in the process of capital flows:

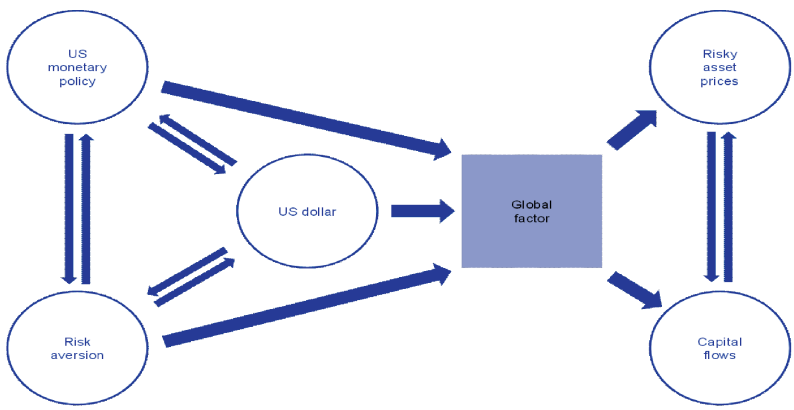

Figure 1: U.S. monetary system as a determinant of global capital flows

Source: European Central Bank (ECB) Economic Bulletin, Issue 6/2018

This study looked at the factors that affected capital flows to Nigeria between 1980 and 2020, a time when the country's economy was open, dependent on exports, and subject to a flexible currency rate policy. The literature on capital flows has concentrated on two groups of determinants: external or push factors and internal or pull ones, which encourage investors to shift resources to emerging economies (Fernandez-Arias, 1996). Push factors are outside of Nigeria's control because they reveal trends in macroeconomic conditions in industrialized nations like the US. They consist of international liquidity, foreign interest rates, and risk environments worldwide. Pull factors offer insight into the country's current economic circumstances, such as macroeconomic stability. Government officials can better create macroeconomic, macroprudential, and financial market policies by having a better grasp of these aspects.

The key trends in the expanding empirical research on the factors that influence capital flows to developing and emerging markets were summarized by Koepke (2015). The factors that influence capital flows appear to change throughout time and among various types of capital flows. He divided the elements into cyclical and structural factors and classified the drivers using the conventional "push vs. pull" framework. His analysis reveals that push factors, which are also supported by Belke and Volz (2018), Bruno and Shin (2012) are the ones that have the most impact on portfolio flows. Pull factors, however, matter for each of the three components separately. Finally, he made the argument in his historical assessment that recent studies might have overemphasized the significance of cyclical (push) elements at the expense of longer-term structural (pull) aspects. This study would like to specifically test this claim with its sizable dataset, though. As mentioned earlier, it is not impossible that the cyclical effects of global push forces would have a long-lasting impact on capital flows.

A fairly modest level of disaggregation was used to analyze capital movements in the vast majority of literature publications, including foreign direct investment (FDI) and foreign portfolio investment (FPI) flows. For instance, Ukachukwu and Odionye (2020), Wijaya *et al.* (2020), Yakubu *et al.* (2019), Osemene and Arotiba (2018), Nwokoye and Oniore (2017), Nwosa and Adeleke (2017), and Nwinee and Olulu-Briggs (2016) have analyzed the determinants of the aforementioned composition of capital flows to Nigeria without considering the effects of the push factors. However, a more disaggregated analysis of capital flows may lead to a better understanding of their impact on the economy. Hence, this study disaggregates capital flows into foreign direct investments (FDI), foreign portfolio investments (FPI), and international bank credit (IBC) flows to Nigeria.

In two key ways, this research adds to the existing body of knowledge on capital movements. First, the factors that influence each capital flow component were assessed. This is inspired by research by Tellez-Leon and Ibarra (2019), which highlights the significance of examining various capital flows and, in particular, the distinction between domestic and foreign investors. The decomposition of capital flows into FDI, FPI, and IBC is possible. These in turn comprise domestic residents' investments in international securities as well as investments made by foreign residents into public and private sector assets in Nigeria. Because distinct components of the capital flow may be influenced by various types of causes, it is crucial to analyze the drivers of capital flows at a high level of disaggregation. For

instance, FPI and IBC are likely to react to changes in economic fundamentals more quickly than FDI since they are more liquid. Furthermore, holdings of FPI and IBC are directly correlated with interest rates at a higher level of disaggregation. As a result, they are more susceptible than FDI to the effects of interest rate shocks.

The second fascinating aspect of this paper's case study is Nigeria, which, because of its natural resources and subsequent significant capital inflows in the 1980s and more recently in the wake of the 2008-2009 financial crisis, makes for an interesting case study. In other words, a period of low interest rates in industrialized nations and more liquidity in global markets followed the global financial crisis. This in turn spurred capital flows to Nigeria as foreign investors looked for high yields in an economy with a lack of capital. Nigeria also has the highest GDP of any country on the African continent. The sample examined in this research spans the years 1981 to 2020, when Nigeria operated under a flexible exchange rate policy. Thus, whereas most of the literature has concentrated on an earlier period, the sample includes data from before, during, and after the global financial crisis. Due to the substantial rise in capital flows following financial liberalization in 1986 and the global financial crisis in 2008, this time period is particularly interesting.

The autoregressive distributed lag model (ARDL) was used to analyze the short- and medium-term factors affecting capital flows. This is a significant shift from the panel model-based research on this topic. The panel models are helpful in determining the contemporaneous mean impact of push and pull factors on capital flows for a collection of countries. However, there could be significant variations across such nations as well as heterogeneity in the timing of capital flows' responses to various shocks. The ARDL model was used to analyze the example of Nigeria in particular, allowing for the investigation of the time-varying impact of the pull and push factors on the different components of capital flows. The error correction mechanism (ECM) of every capital component responds to both domestic and international shocks in this way. Global risk, US liquidity, US gross domestic product (GDP), and the US Federal Reserve rate are the push variables that have been looked at. The study took into account Nigeria's GDP, monetary policy rate, inflation, and exchange rate while determining pull variables.

The estimation outcomes might be summed up as follows: it was discovered that FDI, FPI, and IBC are affected over the long run by global liquidity and the global interest rate as assessed by the federal funds rate (FFR). Particularly, as most investors are risk-conservative and prefer to invest overseas when global

interest rates are higher, increases in global interest rates tend to be associated with reduced capital flows in FDI to Nigeria. Global interest rate shocks appear to have a very long-lasting impact on these items. Shocks to the world's interest rates and liquidity have a significant impact on FDI and FPI. IBC, on the other hand, appears to respond less to push forces, as their responses are generally not statistically significant for long-term global liquidity and real GDP. Due to their inclination to be more liquid than FDI, FPI and IBC appear to react to short-term shocks to a greater extent than FDI. We also discover that domestic factors contribute to the explanation of changes in capital flows. It was discovered, for instance, that higher GDP growth had a significant impact on IBC, whereas higher exchange rates reduced FDI inflows and lower inflation led to increased FPI.

Owing to the fact that only certain of the disaggregated components frequently respond to changes, this work adds data to the body of literature that highlights the advantages of evaluating disaggregated capital flows (Iacoviello & Navarro, 2019). For instance, FDI is significantly impacted by changes in the FFR, which can be explained by the fact that investments that are the closest replicas of those made in the United States likewise comprise FDI flows to Nigeria. Additionally, it was discovered that foreign investors' holdings of FPI grew following a long-term rise in global unpredictability, whereas their holdings of FDI had the reverse effect. This could happen if, following the shock of increased global unpredictability, international investors shift their money from riskier securities into relatively safer assets, i.e., a flight to capital-scarce economies with high yields. Additionally, the findings show that changes in the rate of interest around the world had a considerable impact on all three types of capital flows (FDI, FPI, and IBC). The impact of changes in domestic and American interest rates on FPI inflows to Nigeria was finally realized.

The paper is organized as follows: A succinct survey of the literature on capital flow is presented in the next section. The data and technique for the ARDL estimation are presented in Section 3. The presentation of the findings is the focus of section 4. The paper is wrapped up in the final part.

2. Literature Review

2.1. Stylized facts of capital flows to Nigeria

International financial institutions and mainstream economists assert that foreign capital flows to developing economies would be beneficial to the recipients by enhancing the availability of capital and thereby increasing the level of productivity

and the overall economic wellbeing of the host country. It has been argued that countries with developed financial markets are able to attract foreign capital inflows more efficiently. According to Mudyazvivi (2016), the potential of FDI to create backward linkages in the absence of well-developed financial markets is seriously impeded.

Episodes of capital inflow into Nigeria across time started in 1986 with financial deregulation and have persisted, if sporadically, until the present. The net inflows into the financial account from 1980 to 2020 are depicted in Figure 2 as a percentage of Nigeria's GDP. Although IBC was the most significant element of the financial account from 1980 to 2021, FDI and FPI flows have also become significantly more significant in recent years.

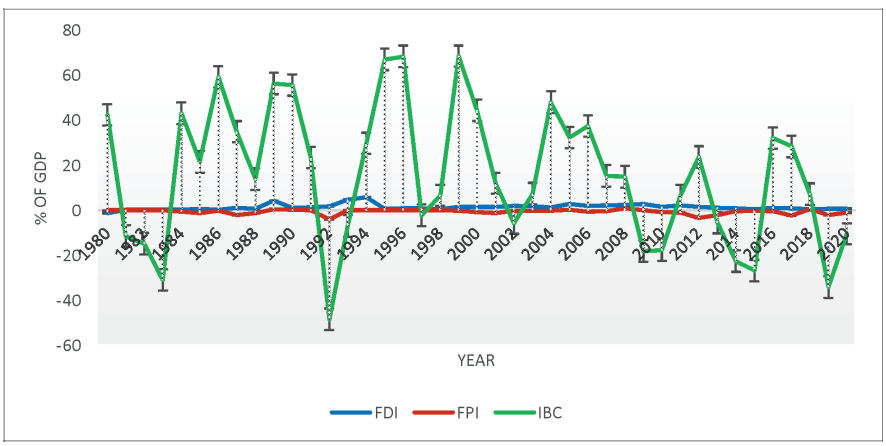

Figure 2: Net capital flows, 1980–2020 as a proportion of the Nigerian GDP

Source: Own elaboration with data from the Central Bank of Nigeria (CBN) Statistical Bulletin and World Development Indicators (WDI)

It was noted that whereas FPI and IBC display greater volatility, particularly after 2009, FDI exhibits a relatively steady dynamic. FPI movements appear to have significant dynamism since they exhibit more fluctuation over time and are more liquid than FDI, which would lead one to believe that FPI primarily reacts to shocks. Lower levels of investor confidence in the Nigerian economy over the short term are reflected in the drop in FPI relative to FDI. FPI flows for Nigeria have often been more erratic than FDI. Large net flows to large emerging economies are shown by recent international evidence, and these have generally been more turbulent. According to the Organization for Economic Co-operation and

Development (OECD), in the developing economies, especially in 2010, net flows have been above the pre-crisis average (OECD, 2013). This is partly explained by the increase in FPI since 2010, when the low interest rate environment created by the crisis in industrialized economies led to a quest for yield.

Going by the inconsistent level of the variants of capital flows denoted in Figure 2, it appears that Nigeria is currently experiencing the Lucas paradox that capital is not flowing into the developing countries were capital is scarce but rather flowing from the capital scarce economies to capital endowed advanced countries. This was also emphasized by Prassad (2008) that while poor and middle-income countries are receiving large sums of private capital inflows, they are exporting more capital than they are getting such that these poor countries that are integrated into the global economy are faced with capital scarcity over a long time. This is attributed to the poor state of the Nigeria economy that leads to significant loss of investment returns *vis-à-vis* the potentials of generating higher returns or profits by investing in advanced countries where the level of microeconomic swing is lesser.

Figure 3, which depicts investments in the financial sector via shares and banking as the main economic activities through which foreign capital was pulled to Nigeria between 2017 and 2020, summarizes the primary economic activities that have drawn foreign capital to Nigeria in recent years. Investments in stocks, banking, financing, and production, on average, drew the most foreign capital. Agriculture, telecommunication, agriculture, servicing, and building were additional businesses that made a negligible contribution to capital inflows.

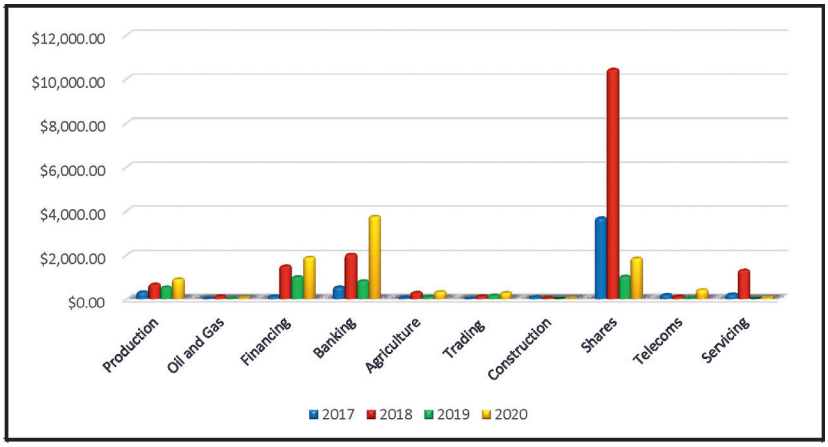

Figure 3: Capital flows to Nigeria by economic activities

Source: National Bureau of Statistics; Nigerian capital importation (2020)

2.2. Transmission Channels of Global Factors to Developing Countries

Large-scale asset purchases, long-term refinancing operations, low or negative nominal interest rates, and communication efforts in the form of forward guidance are the core components of an accommodating monetary policy stance by major central banks. Through three interconnected transmission channels, such unconventional monetary policies may have an impact on the values of financial assets as well as the demand-supply dynamics in the markets for goods and services in developing nations.

The first transmission channel is the portfolio-balance channel, via which particularly large-scale asset acquisitions may have an impact on the pricing of financial assets. In other words, when central banks buy financial assets from the private sector, they disrupt the portfolios of financial investors. When a central bank purchases certain financial asset classes, assuming imperfect substitutability of financial assets, a local-supply effect may occur, limiting the specific relative supply of capital abroad. Additionally, large-scale asset purchases may have a duration effect regarding the effect on the term structure of portfolios as a whole (D'Amico & King, 2013).

For instance, adjusted financial investor portfolios may be less exposed to interest rate risks when foreign central banks buy significant amounts of government debt with extended maturities. As a result, financial investors can adapt their portfolio's composition to match (for example, by choosing a preferred maturity structure) and can also reevaluate the projected risk-adjusted returns on their total investments. In this regard, a change in the interest rate differential between developing and emerging market economies is brought about by the generally low-risk, high-profit character of portfolios spurred by central banks' large-scale asset purchases within major currency economies. Financial investors may thus be drawn to the latter economies, resulting in the possibility that the portfolio-balance channel is responsible for global liquidity spillovers.

The signaling channel is a second transmission channel. Through communication, central banks work to control the expectations of economic agents, particularly financial investors, regarding important economic variables and the future direction of monetary policy. Good remarks could influence liquidity premiums in the financial sector by guiding financial investors in the right direction. As a result, portfolio rebalancing that incorporates the economic changes mentioned in the preceding paragraphs may occur.

Third, through the liquidity channel, which predominantly functions during financial distress, central banks may have a direct impact on liquidity inside the banking sector. In these situations, financial investors may demand comparatively high returns on holding financial assets as compensation for the risk that one may encounter obstacles when negotiating bilateral agreements that ultimately permit such economic agents to sell the real goods and services to which one attributes value. Additionally, coordination costs associated with the search and matching procedures necessary to plan and carry out bilateral contracts may result in liquidity issues. In this regard, central banks may make an effort to reduce liquidity risk premiums by, for example, offering long-term refinancing operations and low or negative nominal interest rates, which would increase total trade volume as triggered by changes in the liquidity premium and could lead to portfolio modifications for financial investors.

In terms of empirical evidence, Bauer and Neely (2014) estimate dynamic term structure models, for instance, to determine the contribution of the portfolio balance and signaling channels to global liquidity spillovers in terms of influencing bond yields in developing and emerging market economies. In a similar manner, Bowman *et al.* (2015) assessed the effects on the prices of other financial assets and emphasized the significance of nation-specific peculiarities within small, open emerging markets and developing countries. It's interesting to note that Korniyenko and Loukoianova (2015) offered empirical proof that unconventional monetary policies in the US have changed the way the US transmits its monetary policy to other countries. Rather than internationally active commercial banks extending credit in US dollars, non-US issuers are now buying higher-yielding financial assets denominated in US dollars. Iacoviello and Navarro (2019) demonstrated that while US long-term interest rates were low, emerging markets and developing nations issued more governmental and private sector local currency bonds as well as more private sector foreign currency bonds.

Additionally, cross-border financial flows to developing and emerging market economies that result from the rebalancing of financial investor portfolios and might be linked to a loose monetary policy stance inside major currency economies may have an impact on the exchange rate and trade ties (Latief & Lefen, 2016). In light of this, recipient economies may see nominal revaluations as a result of global liquidity spillovers. The impending devaluation could be partially mitigated by the potential rise in foreign demand for goods produced in emerging markets

and developing economies within major currency economies. The size of the overall impact of global liquidity spillovers on the economic dynamics of developing and emerging market economies must obviously be determined empirically. The propagation of such financial shocks within small, open emerging market and developing economies must be taken into consideration when determining the sign and magnitude of the effects of global liquidity spillovers tracing back to unconventional monetary policies within major-currency economies.

2.3. Why is the US monetary policy dynamics seen as a major push factor for Nigeria?

As monetary policy and financial stability shocks in advanced countries have increased in frequency and potency over time, the significance of "push factors" has grown. It may be argued that push factors are becoming more significant as the basic asymmetry at the core of the world economy deepens. In this context, one natural inquiry is: Why are US variables employed to represent global economic factors? In order to answer this question, it is important to note that the US dollar serves as the preferred currency for at least half of international trade invoices, two-thirds of global securities issuance, and two-thirds of the foreign external debt of emerging market economies (EME). It also serves as the monetary anchor for nations that account for 70% of global trade GDP (WDI, 2020). Since its functions in international payments, as a reserve asset, and as a funding currency are mutually reinforcing, the US dollar is actually just as dominant today as it was during the Bretton Woods era, and it is likely to stay that way for some time. This indicates that changes in the US have a disproportionate impact on financial and economic circumstances around the world. In fact, Carney (2019) contends that despite the US's rapidly dropping percentage of global GDP, the impact of US financial conditions on international GDP has grown by a third compared to its average between 1990 and 2005. This suggests that any financial or macroeconomic tremors in the US will spread to developing nations like Nigeria, where a significant share of foreign investments (capital flows), debt, trade, etc. are denominated in US dollars. In this light, Emiefile (2017) issued a warning that Nigeria is progressively becoming a dollar economy because top businesses choose to hold dollars in the home market and because its exchange rate is declining against the dollar.

The US's response to its own internal events (such as a tightening of fiscal policy) has a significant impact on the world's financial conditions and economic activity.

This was true during the "taper tantrum" of 2013, when Fed communications materially altered public perceptions of US monetary policy. Capital flows at risk in EMEs increased throughout this time (Carney, 2019). The sustainability of capital flows to Nigeria has also been impacted by financial instability in the US. The 2008 global financial crisis, which was caused by the burst of the US real estate bubble, saw investors flee emerging and developing markets (EMEs) in favor of "safe haven" economies, as well as a sharp increase in capital flows at risk as a result of severely undercapitalized and liquidity-constrained banks in advanced economies. These events had a significant impact on Nigeria's capital inflows.

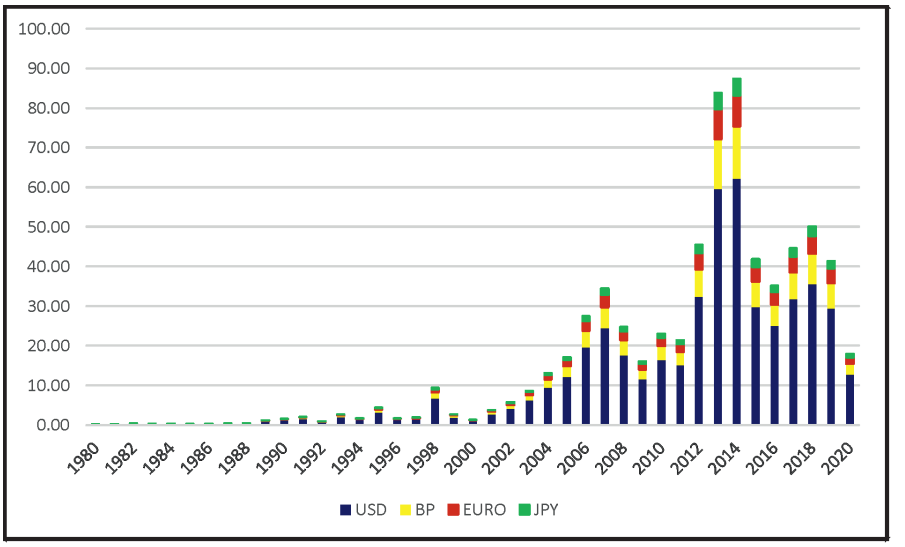

Figure 4: Currency composition of capital flows to Nigeria

Source: National Bureau of Statistics; Nigerian capital importation (2020)

The currency composition of capital flows to Nigeria from 1980 to 2020 is shown in Figure 4. Nigeria has attracted foreign investment from numerous countries over the years with large proportion of the foreign capital denominated in the US dollar. The US dollar is an important currency utilized by Nigeria in international financial transactions, which is why capital flows into Nigeria are predominantly denominated in the US dollar (NBS, 2020). This suggests that monetary changes in the United States will affect the volume and value of capital flows to Nigeria, rendering Nigeria susceptible to the push forces through their interactions with domestic microeconomic factors. This scenario was clearly explained by Kang *et al.*

(2002) that large shift in capital flows among countries might generate externalities for the smaller countries, which is called contagion. A vulnerable recipient economy is exposed to such externalities and contagion effects in the process of capital flows. Hence, understanding the determinants of capital flows is crucial in implementing proper economic policies. However, these policies should depend on whether such determinants of capital flows are endogenous or exogenous. As a result, policies in both source and recipient countries are important in driving cross-border capital flows.

2.4. Empirical Literature Review

As was said in the introduction, both theoretical and empirical research has been conducted on the factors that influence capital flows. There are just a few studies in the literature examining the relationship between pull-push factors and capital flows in emerging countries. There are several empirical studies, many of which were based on cross-country growth regressions, static panel data methods, time series analysis, and firm- and industry-level analysis. Recent research on the factors influencing capital flows is based on Robert Lucas' key article, which concluded that macroeconomic instability brought on by high political risk and growth rate disparities impeded capital flow to less developed countries (Lucas, 1990). Studies like Fernandez-Arias (1996), Calvo, Leiderman, and Reinhart (1993) established the pull-push approach to determining capital flows to developing nations, building on the Lucas paradox. Since then, a plethora of research has been conducted in the area of the pull-push analysis of capital flows, with differing results across nations and time periods, which has prompted the necessity for this study.

According to Norimasa *et al.* (2021), the likelihood of significant capital outflows for emerging nations varied depending on changes in the monetary policy stance of the United States. In a similar vein, Tellez-Leon and Ibarra (2020) asserted that decreases in FPI flows to Mexico were caused by rises in U.S. interest rates and liquidity shocks and that decreases in portfolio investments, notably in private sector assets, were caused by an increase in global risk aversion. Davis *et al.* (2019) found that the global financial cycle and commodity price determinants combined explained 50% of the variation in gross flows in rich countries and 40% of the variation in gross flows in developing markets using a sample of 50 emerging and developed nations. With a focus on Sub-Saharan Africa (SSA), Calderon *et al.* (2019) explored the factors that drive capital flows across areas of the world. They

found that the total flows were mostly influenced by external factors, such as the rate of U.S. economic development and the unpredictability of global markets and policies. Based on cointegration methods, Koepke (2015) claimed that pull factors such as domestic output growth, asset returns, and country risk mattered for all three components of capital flows, but most for banking flows. Push factors, on the other hand, included global risk aversion and external interest rates, which were found to matter most for portfolio debt and equity flows but somewhat less for banking flows through lending. In a study of emerging markets, Cerdeiro and Komaromi (2019) concentrated on the terms of interaction between financial openness and traditional push-pull factors and found that countries with a higher level of financial openness were more susceptible to some push-pull factors, but not necessarily all of them.

Again, Lipovina-Bozovic and Ivanovic (2018) used a structural vector autoregressive (SVAR) model to examine the dynamics of push-pull factors as determinants of capital flows to Montenegro. They found evidence that push factors, such as foreign output, interest rate differentials, and Euro area risk sentiment, significantly explained variations in FDI and FPI, while domestic factors, such as domestic output and domestic risks, were insignificant in explaining the changes in FDI. Additionally, Belke and Volz (2018) looked into the importance of push- and pull-factors to FDI, portfolios, and "others" (including loans), and they demonstrated that global liquidity, economic turbulence, and other risk factors, like the U.S. yield spread, were sufficient to explain the direction of international portfolio flows to developing economies. In a similar vein, Durdu *et al.* (2018) examined the impact of U.S. monetary policy on global financial stability using a cross-country database covering the years 1870–2010 across 69 countries, and they found that the tightening of U.S. monetary policy increased the likelihood of banking crises for those nations with direct links to the U.S., either through trade ties or a sizable portion of U.S. dollar-denominated liabilities. Singhania and Saini (2017) found that interest rate differentials, trade openness, host country stock market performance, and U.S. stock market returns were significant determinants of FPI flows to developed countries, while the freedom index, interest rate differentials, host country stock market performance, trade openness, and U.S. stock market returns were significant determinants of FPI flows to developing countries.

In Nigeria, Uremadu *et al.* (2022) found that push factors such as US real GDP growth, global uncertainty, the US FFR, which was used to measure global

interest rate, and pull factors such as domestic real GDP growth rate, inflation, and the exchange rate caused a diminishing effect on total capital flows. However, Nwosa and Adeleke (2017) investigated the relationship between FDI and foreign FPI volatility in Nigeria and found that FDI volatility was significantly explained by trade openness and global GDP, while FPI volatility was significantly explained by domestic interest rates and stock market capitalization. On the other hand, pull factor impacts on capital inflows were the focus of other Nigerian studies. Adebayo *et al.* (2021), for instance, found that exports and trade openness had a favorable effect on FDI inflows. Additionally, Odili and Onyele (2021) demonstrated how stock market performance affects the flow of capital into Nigeria. Ukachukwu and Odionye (2020) demonstrated how the foreign exchange rate, inflation, and price of crude oil had a substantial impact on FDI flows to Nigeria. In a different study, Wijaya *et al.* (2020) found a long- and short-term association between FDI in Nigeria and GDP (market size), inflation, debt overhang, interest rates, exchange rates, and infrastructure investment. Likewise, Yakubu *et al.* (2019) and Aderemi (2019) found that exchange rate volatility has a significant short-term impact on Nigeria's foreign trade. Osemene and Arotiba (2018) also noted that FPI flows to Nigeria were significantly and favorably impacted by the official rate's volatility. According to Nwokoye and Oniore (2017), monetary policy rate strongly influenced capital flows to Nigeria between 1994 and 2015.

To summarise the above empirical studies, the following table was presented, which captures the variables used in empirical studies. Ideas from these studies have been used in section 3 to conduct this study's econometric estimation. The data consists of both times series and panel data, and they mostly used the standard method of regression analysis to obtain robust results.

Author(s)	*Dependent variable*	*Independent variables*	
		Push (global factors)	Pull (domestic factors)
Uremadu *et al.* (2022)	Total capital flows	US liquidity US RGDP growth rate Volatility index Federal Funds Rate	RGDP growth rate Exchange rate Monetary policy rate Inflation rate
Norimasa *et al.* (2021)	Total capital flows	US interest rate	RGDP growth rate Debt overhang
Odili and Onyele (2021)	FDI and FPI		Banking sector development Stock market development Bond Market Development

Author(s)	*Dependent variable*	*Independent variables*	
Tellez-Leon and Ibarra (2020)	FDI, FPI and other investments	Volatility index US liquidity Federal Funds Rate US RGDP growth rate	Domestic RGDP growth Overnight interest rate Domestic inflation Exchange rate
Ukachukwu and Odionye (2020)	FDI		RGDP growth rate Inflation Crude oil prices Foreign exchange rate
Wijaya *et al.* (2020)	FDI		RGDP growth rate Debt overhang Inflation Interest rate Exchange rate Foreign reserves Infrastructure spending
Davis *et al.* (2019)	Capital inflows Capital outflows	Global financial cycle	
Calderon *et al.* (2019)	Total capital flows	RGDP growth Fiscal policy	US GDP growth Uncertainty in global markets and policies.
Cerdeiro and Komaromi (2019)	Total capital flows	US interest rate US RGDP growth rate Volatility index	RGDP growth rate Interest rate Exchange rate
Aderemi (2019)	FDI and Remittances		Exchange rate
Lipovina-Bozovic and Ivanovic (2018)	Total capital flows, FDI and FPI	EU GDP growth rate EU risk sentiment EU interest rate	GDP growth rate Domestic risk
Belke and Volz (2018)	FDI and FPI		Global liquidity Volatility index US yield spread
Durdu *et al.* (2018)	Global banking financial crisis (dummy)	Economic globalization Debt liabilities Institutional quality Inflation GDP growth rate	
Singhania and Saini (2017)	FPI	Interest rate differential Trade openness	US stock returns
Nwosa and Adeleke (2017	FDI and FPI	US GDP US consumer price index	GDP per capita Inflation Trade openness Interest rate Market capitalization
Nwokoye and Oniore (2017)	Total capital inflows		Broad money Exchange rate Inflation rate Interest rate
Koepke (2015)	Banking flows and FDI	Volatility index Global interest rate	RGDP growth rate Country risk Current account deficit

2.5. Hypotheses development

Based on this succinct overview of the empirical literature and the theoretical approaches to the determinants of capital flows, the paper formulates two main hypotheses that were tested.

HO_1: Pull factors do not have a significant effect on disaggregated capital flows to Nigeria.

HO_2: Push factors do not exert a significant effect on disaggregated capital flows to Nigeria.

3. Methodology

3.1. Empirical Method

A multiple regression analysis based on the autoregressive distributed lag (ARDL) model was used to estimate the data. According to the Pasaran criteria of bound limits, the bounds test was applied to the ARDL to ascertain the long-term relationship between the regressand and the regressors. The bound test has the advantage of accommodating potential structural breaks that could have a negative effect on whether there is a long-term association between the explained and explanatory variables. Even if the variables have a mixed level of integration, that is, I(1) and I(0), the long-run and short-run coefficients were simultaneously computed under ARDL and used for the cointegration test. In other words, the fundamental presumption is that none of the variables are integrated at the second differencing, I(2), despite the possibility of mixed integration between I(1) and I(0) (Pesaran *et al.* 2001). As a result, when these requirements are satisfied, the ARDL model is created. Following Pesaran *et al.* (2001), the ARDL bounds test for cointegration is expressed equation (I):

$$\Delta CIF_t = \delta_o + \Sigma_{i=1}^{p}\delta_i \Delta CIF_{t-i} + \Sigma_{i=1}^{p}\delta_i \Delta push_{t-i} + \Sigma_{i=0}^{p}\delta_i \Delta pull_{t-i} + \beta_i CIF_{t-1} + \beta_i push_{t-1} \beta_i pull_{t-1} + \mu_t \quad \text{(I)}$$

Following the discovery of cointegration, the conditional ARDL model was used to estimate the long-run connection as displayed in equation (II):

$$\Delta CIF_t = \delta_0 + \beta_i\, push_{t-1} + \beta_i pull_{t-1} + \mu_t \quad \text{(II)}$$

Using the error correction mechanism (ECM), it was possible to estimate the short-run dynamic relationship as shown in equation (III):

$$\Delta CIF_t = \delta_o + \Sigma_{i=1}^{p}\delta_i \Delta CIF_{t-i} + \Sigma_{i=0}^{p}\delta_i \Delta push_{t-i} + \Sigma_{i=0}^{p}\delta_3 \Delta pull_{t-i} + \theta ecm_{t-i} \quad \text{(III)}$$

The ARDL model identifies three variants of capital inflows which are foreign direct investment (FDI), foreign portfolio investment (FPI) and international bank credit (IBC). The push factors are the global liquidity (GLIQ) which was measured by M1 in the U.S., global real GDP growth rate (GGRT) which was measured by real GDP growth rate for U.S., global volatility index (GVIX) proxy for global risk aversion and uncertainty, and global interest rate (GITR) which was measured by the U.S. federal funds rate. The pull factors are Nigerian macroeconomic parameters like domestic real GDP growth rate (DGRT), exchange rate (EXCR), monetary policy rate (MPR) and inflation rate (INFR). δ_0 is the constant; δ_i denotes short-run elasticities (coefficients of the first-differenced explanatory variables); β_i represents long-run elasticities; θ = speed of adjustment; ecm_{t-i} = error correction term lagged for one period; Δ = first difference operator and p = lag length.

The time series data were checked for stationarity prior to ARDL estimation. The test for stationarity of data will be carried out with the Augmented Dickey-Fuller (ADF) unit root test (Afriyie *et al.*, 2020). This stage is essential because most macroeconomic time series have unit root, and non-stationary series regressions almost always produce significant results even when there is no relationship between the variables. Equation (IV) represents the general model for the ADF unit root test.

$$\Delta y_t = \beta_0 + \beta_1 t + \beta\lambda y_{t-1} + \Sigma_{j-1}^{p}\delta_j \Delta y_{t-j} + \mu_t \quad \text{(IV)}$$

Where, y_{t-1} = lagged value of y_t at first difference; Δy_{t-j} = a change in lagged value; δ = measure of lag length; Δy_t = first difference of y_t and μ_t = error term.

3.2. Data and Variables

Nigerian annual time series data were used in the study. It made use of annual data from 1980 to 2020. The dependent variables in the estimated models were capital flows, which were divided into FDI, FPI, and IBC. The Federal Fund Rate, which was used to measure the global interest rate, and the pull factors of domestic real GDP growth, the exchange rate, the monetary policy rate, and inflation are among the independent variables. The push factors are global liquidity, global real GDP growth, global risk aversion and uncertainty, and the Federal Fund Rate. According to the literature, the push factors are predicted to show negative indicators, whereas the pull factors are predicted to show negative signs. These

explanatory variables for the pull factors were taken from the Central Bank of Nigeria (CBN) Statistical Bulletin, whereas those for the push factors were taken from the World Development Indicators and International Financial Statistics. As noted by Tellez-Leon and Ibarra (2019), better performance of the push factors than the pull factors would restrict capital flows to Nigeria as investors would prefer to hold their investments in developed countries like the U.S., and if the domestic macroeconomic condition (pull) improves, investors would be attracted to Nigeria. Aiming to match the penetration level recorded by the OECD (2019), the initial level of capital flows was expressed as a percentage of nominal GDP. The World Bank has set a benchmark of 5% to 6% of capital inflows to GDP (IMF, 2016). Countries with a capital inflows to GDP ratio of less than 5% to 6% are considered to not be attracting enough capital into their economies. Therefore, the level of capital flows to Nigeria would decrease as the push factors improved and the pull forces declined.

The variance inflation factor (VIF) for the explanatory variables is shown in Table 1. VIF examines how much the dynamics (variance) of an explanatory variable are inflated or impacted by its interaction with other explanatory variables. In general, high correlation is evident if the VIF value is between 5 and 10; however, if the VIF is greater than 10, multicollinearity becomes a serious issue (Sheater, 2009). There was a reasonably minimal probability of multicollinearity because the VIF values for the independent variables in all models were below 5, which means that these variables did not enter alternatively into the estimations. Thus, the model kept all of the original explanatory variables.

Table 1: Variance inflation factor (VIF)

	Coefficient	*Uncentered*	*Centered*
Variable	Variance	VIF	VIF
ILIQ	0.000470	2.780452	1.932085
GGRT	0.012315	4.520382	1.875082
GVIX	0.001760	2.468605	1.710548
GITR	0.005993	4.752534	1.330803
DGRT	0.001892	2.545739	1.945330
EXCR	0.009706	4.482699	1.305348
MPR	0.002370	4.126353	1.377063
INFR	0.000175	3.875178	1.690829

Some descriptive statistics for the dependent and explanatory variables are shown in Table 2. Looking at the different capital flow components, it can be seen that during the sampled period, the mean for FDI, FPI, and IBC was, respectively, 1.47% with a maximum of 5.79%, -0.53% with a maximum of 1.01%, and 15.80% with a maximum of 68.55%. This suggests that while FPI was much below the norm and IBC was well above the benchmark, FDI just slightly exceeded the World Bank's target (5–6%). This suggests that IBC was the main route for capital transfers to Nigeria. Nigeria has a history of IBC expansion, with international banks serving as the country's primary source of credit.

The global liquidity (GLIQ) data series had an average of 7.14% for the push factors, with values ranging from -3.42% to 69.99%, indicating that the GLIQ variable maintained a positive trend between 1980 and 2020. The global real GDP growth rate (GGRT) had an average value of 2.46 and ranged from -4.27% to 7.24% at its lowest and highest points, indicating that the US experienced phases of recession and recovery. The global volatility index (GVIX), with data series ranging from 11.09% to 32.69%, averaged 19.21%, suggesting that it could be jarred during times of high risk. The US kept its FFR at a moderate rate to ensure the necessary liquidity needed to run its economy. The global interest rate (GITR), which has a range of values between 0.09% and 16.38%, averages 4.57%.

Regarding the pull factors, Nigeria has experienced several years of poor output and economic depression, as evidenced by the domestic real GDP growth rate (DGRT), which had an average (mean) value of 2.994634 and values ranging from -13.13 to 15.33. The minimum and maximum values of the naira/dollar exchange rate (EXCR), which indicate a sharp depreciation of the Nigerian currency, ranged from 0.55 to 379.01 and averaged 98.81. The minimum and maximum values of the series, which range from 5.39% to 72.84%, reveal a significant level of price instability in Nigeria. The mean inflation rate (INFR) was 18.77%.

Table 2: Descriptive Statistic

Variable	*Mean*	*Maximum*	*Minimum*	*Std. Dev.*
FDI	1.466098	5.790000	-1.150000	1.279955
FPI	-0.536829	1.010000	-3.940000	1.023168
IBC	15.80878	68.55000	-48.34000	30.52864
GLIQ	7.144878	69.99000	-3.420000	10.91637
GGRT	2.463659	7.240000	-4.270000	2.099979
GVIX	19.20707	32.69000	11.09000	5.305890

Variable	*Mean*	*Maximum*	*Minimum*	*Std. Dev.*
GITR	4.566098	16.38000	0.090000	4.012227
DGRT	2.994634	15.33000	-13.13000	5.457308
EXCR	98.80878	379.0100	0.550000	102.0313
MPR	12.86585	26.00000	6.000000	4.101866
INFR	18.77024	72.84000	5.390000	16.71940

Note: For the Jarque-Bera test, a prob. less than 0.05 leads to the rejection of the null hypothesis of a normal distribution (Jarque and Bera, 1987).

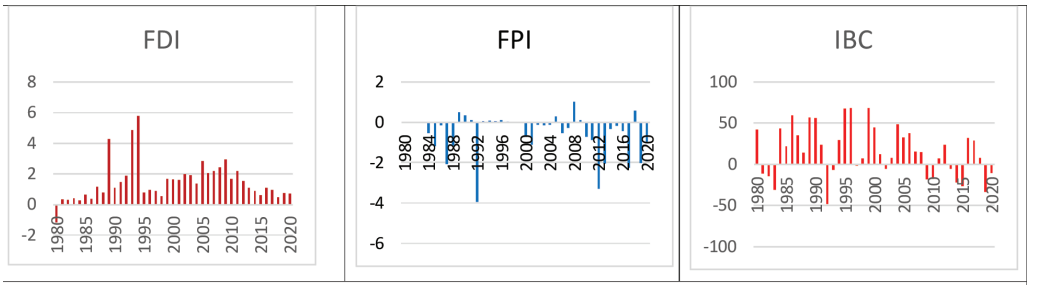

Figure 5: Trend of FDI, FPI and IBC

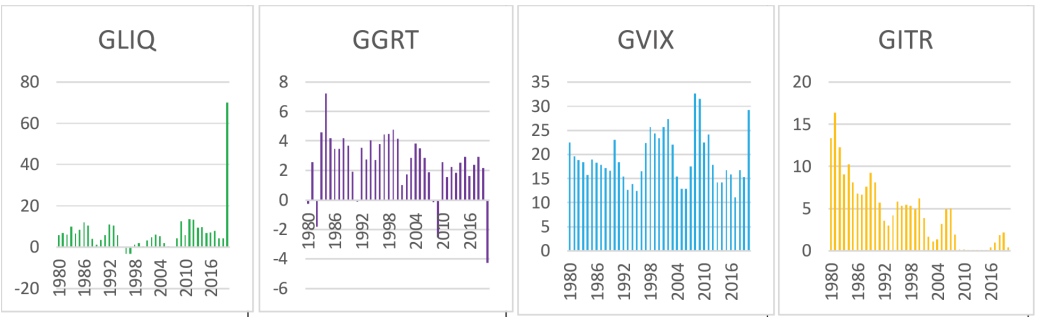

Figure 6: Trend of GLIQ, GGRT, GVIX and GITR

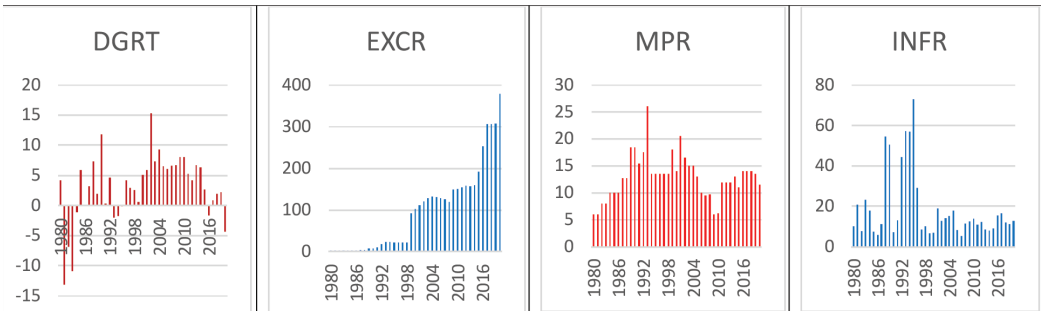

Figure 7: Trend of DGRT, EXCR, MPR and INFR

4. Data Analysis and Results

4.1. Test for Stationarity of Data

Data stationarity was tested using the Augmented Dickey-Fuller (ADF) unit root testing methodology. To determine if the time-series data were stationary, the ADF test was run on the variables under consideration. The variables are shown in Table 3 in both level form and first difference form (where the variable was non-stationary at level).

Table 3: ADF unit root test

Variable	*ADF at Level; I(0)*			*ADF at first difference; I(1)*		*Order of integration*
	t-Statistic	*Prob.*		*t-Statistic*	*Prob.*	
FDI	-4.078076	0.0137**		--	--	I(0)
FPI	-5.799597	0.0001***		--	--	I(0)
IBC	-6.067111	0.0001***		--	--	I(0)
GLIQ	-1.171694	0.9028		-3.693755	0.0283**	I(1)
GGRT	-4.208298	0.0099***		--	--	I(0)
GVIX	-3.435533	0.0612*		-4.872251	0.0018***	I(1)
GITR	-5.759958	0.0001***		--	--	I(0)
DGRT	-2.033786	0.5651		-11.64878	0.0000***	I(1)
EXCR	-0.002993	0.9948		-4.621806	0.0035***	I(1)
MPR	-3.098962	0.1204		-8.730486	0.0000***	I(1)
INFR	-3.773039	0.0289**		--	--	I(0)

Note: p-values denoted by ***, ** and * show significance at 1%, 5% and 10% levels, respectively

Table 3 shows that the series of FDI, FPI, IBC, GGRT, GITR, and INFR are stationary at levels, while the series of GLIQ, GVIX, DGRT, EXCR, and MPR are non-stationary at levels but became stationary by taking the first difference of the series. A 5% level of significance is used to examine the probability values of t-statistic values. As a result, variables are deemed stationary if their respective probability values were less than 0.05 at either the first difference (I(1)) or the levels (I(0)). Since GLIQ, GVIX, DGRT, EXCR and MPR are stationary while FDI, FPI, IBC, GGRT, GITR and INFR are integrated at levels, implying that the variables are mixed at I(0) and I(1) levels. This situation, according to Paseran *et al.* (2001) supports the use of the autoregressive distributed lag (ARDL) technique for the study and suggested that the variables were integrated in varying orders (though none were integrated at the second difference).

4.2. Bounds Test Results

Table 4 shows the results of the bounds test approach to cointegration, which assessed whether long-term relationships existed in the models.

Table 4: Bound test results

Null Hypothesis: No levels relationship				
Model 1: FDI				
Test Statistic	*Value*	*Signif.*	*I(0)*	*I(1)*
F-statistic	8.292442	5%	2.38	3.41
k	8	1%	2.93	4.06
Model 2: FPI				
Test Statistic	*Value*	*Signif.*	*I(0)*	*I(1)*
F-statistic	8.140145	5%	2.11	3.15
k	8	1%	2.62	3.77
Model 3: IBC				
Test Statistic	*Value*	*Signif.*	*I(0)*	*I(1)*
F-statistic	5.691387	5%	2.38	3.41
k	8	1%	2.93	4.06

Table 4 shows long-run bound test results for the connection linking pull-push factors and various components of capital flows to Nigeria. F-statistic values of 8.29, 8.14, and 5.69 were more than 5% upper bounds; therefore, the unfounded proposition of no long-run connection was not accepted. According to the findings, there were long-run links between the pull-push parameters and FDI, FPI, and IBC. This necessitates the estimation of the short-run and long-run dynamics in addition to the ARDL-ECM representation of the models.

The cointegrating equations for the models are delineated by equations 5 to 7 for FDI, FPI and IBC, respectively:

$$EC = FDI + 1.1415GLIQ + 0.3050GGRT - 0.3787GVIX + 0.4868GITR - 0.0690DGRT - 0.0053EXCR - 0.4311MPR + 0.1047INFR \quad (5)$$

$$EC = FPI - 0.0783GLIQ - 0.4779GGRT + 0.1469GVIX + 0.3200GITR + 0.0009DGRT + 0.0027EXCR + 0.1826MPR - 0.0326INFR \quad (6)$$

$$EC = IBC + 0.2827GLIQ - 0.1432GGRT + 0.2439GVIX - 0.4416GITR - 0.2476DGRT + 0.1540EXCR - 0.1177MPR - 0.9158INFR \quad (7)$$

The cointegrating equations 5 to 7 shows the error correction dynamics of the ARDL model. It was found that during the process of long run adjustments, GLIQ contributed positively to FDI and IBC but it contributed negatively to IBC. Apart from its positive contribution to FDI, GGRT appeared to have exerted a diminishing dynamic effects on FPI and IBC overtime. The GVIX is seen to cause a downward trend in FDI while FPI and IBC increased with the trend in GVIX. GITR was found to cause an upward trend in FDI and FPI but it appeared to have caused a decreasing effect on IBC. DGRT caused a declining FDI and IBC while it increased FPI. The long run dynamics of EXCR discouraged FDI but it increased FPI and IBC. The dynamics of MPR was found to have caused a decrease in FDI and IBC but encouraged FPI. This shows that in the process of long run adjustments, the dynamic effects of the push – pull factors on capital flows to Nigeria varied.

4.3. Error Correction Estimation

Table 5 presents the ECM of the ARDL model. The probability values of the F-statistic values, which quantify the joint relevance of push and pull factors in affecting capital flows to Nigeria, were statistically significant at a 1% level even though they were less than the 0.05 critical threshold. This means that the capital flows to Nigeria were simultaneously and severely impacted by the push and pull variables. For FDI, FPI, and IBC, respectively, the adjusted R-squared values of 0.97, 0.93, and 0.83, which demonstrate the explanatory strength of the push-pull effects on capital flows, were found to be about 97%, 93%, and 83%. This indicates that for the study period, the push and pull factors jointly accounted for a sizeable share of the total variance in capital flows (FDI, FPI, and IBC), meaning that a considerable deviation in capital flows to Nigeria was explained by the push and pull forces.

The push-pull nexus model's coefficient of error term (ECM), designated as -0.49, -0.33, and -0.11, reflects the rate of adjustment of capital flows (FDI, FPI, and IBC), demonstrating that the model will eventually converge at a rate of 49% for FDI, 33% for FPI, and 11% for IBC annually. This means that whenever the model is in a state of disequilibrium, it will eventually return to equilibrium. This further implies that FDI responded to shocks in the push-pull factors more quickly than FPI and IBC, but IBC had the slowest adjustment mechanism, meaning that while FDI and FPI flows to Nigeria are likely to continue in the reasonably short

to medium term, IBC would take a longer period to adjust probably due to some debt default that would have occurred due to the disequilibrium or shock witnessed in the short run, making foreign financial institutions look elsewhere for credit extensions.

Table 5: Error Correction Mechanism (ECM)

	Model 1: FDI		*Model 2: FPI*		*Model 3: IBC*	
Variable	*Coefficient*	*Prob.*	*Coefficient*	*Prob.*	*Coefficient*	*Prob.*
C	3.905998	0.0001***	-1.909217	0.0002***	33.63744	0.0000***
D(GLIQ)	-0.064544	0.0010***	-0.277352	0.0002***	-0.157809	0.0000***
D(GLIQ(-1))	0.262858	0.0007***	-0.244464	0.0003***	-0.127702	0.0200**
D(GLIQ(-2))	0.116970	0.0039***	--	--	-0.217547	0.0003***
D(GGRT)	-0.453903	0.0006***	-0.551349	0.0001***	-0.497063	0.0002***
D(GGRT(-1))	-0.611294	0.0004***	0.348317	0.0015***	-0.242761	0.0120**
D(GGRT(-2))	--	--	0.479421	0.0001***	-0.216963	0.0129**
D(GVIX)	-0.072487	0.0163**	0.385909	0.0000***	0.170794	0.0002***
D(GVIX(-1))	-0.167243	0.0010***	-0.079206	0.0320**	-0.235694	0.0001***
D(GVIX(-2))	--	--	0.112178	0.0121**	--	--
D(GITR)	0.282898	0.0107**	1.182960	0.0000***	0.284578	0.8328
D(GITR(-1))	-0.876710	0.0003***	-0.934428	0.0001***	0.616771	0.0047***
D(GITR(-2))	-0.786345	0.0005***	-0.328993	0.0076***	--	--
D(DGRT)	-0.113486	0.0008***	-0.162332	0.0001***	-0.215998	0.0000***
D(DGRT(-1))	-0.036881	0.0833	-0.104585	0.0064***	0.717809	0.0226**
D(DGRT(-2))	0.073338	0.0062***	-0.067339	0.0055***	--	--
D(EXCR)	-0.007575	0.0699	0.023250	0.0015***	0.124280	0.0934
D(EXCR(-1))	-0.029621	0.0010***	-0.017547	0.0147**	-0.273506	0.0036***
D(EXCR(-2))	-0.020393	0.0031***	0.010879	0.0696*	-0.225143	0.0056***
D(MPR)	0.145223	0.0016***	-0.113616	0.0047***	-0.227660	0.0003***
D(MPR(-1))	0.465956	0.0000***	-0.428922	0.0000***	--	--
D(MPR(-2))	0.206089	0.0009***	-0.222065	0.0001***	--	--
D(INFR)	0.070855	0.0005***	-0.071678	0.0000***	-0.100196	0.0000***
D(INFR(-1))	0.022630	0.0039***	--	--	--	--
D(INFR(-2))	0.055098	0.0016***	--	--	--	--

ECM(-1)	-0.491645	0.0001***	-0.326002	0.0417**	-0.109463	0.0053***
R-squared	0.988905		0.971867		0.910672	
Adj. R-squared	0.968423		0.934943		0.834743	
F-statistic	48.28043		21.43028		11.99371	
Prob(F-stat.)	0.000000	***	0.000000	***	0.000001	***
Durbin-Watson	2.093734		2.395941		2.451179	

Note: p-values denoted by ***, ** and * show significance at 1%, 5% and 10% levels, respectively

The effects of the push factors were discussed. In the long run, the effect of global liquidity (GLIQ) was found to be mixed, implying a time-varying effect of GLIQ over time. However, while FDI and IBC were negatively influenced by the changes in GLIQ in the long run, FPI was positively affected. The short-run coefficients (negative) of GLIQ and its equivalent likelihood values (0.01) show that FDI, FPI, and IBC were negatively affected. The short-run coefficient of GLIQ, denoted as D (GLIQ), indicated that FDI, FPI, and IBC declined by approximately 0.06 unit, 0.28 unit, and 0.16 unit due to a unit decrease in global liquidity. The probability values, which were less than 0.01, implied that the effect of GLIQ on FDI, FPI, and IBC was statistically significant at the 1% level. It then means that GLIQ was an important determinant of capital flows to Nigeria, and the effect of GLIQ on capital flows was instantaneous. This is consistent with the Calvo, Leiderman, and Reinhart (1993); Fernandez-Arias (1996) postulate of the foreign liquidity linkage with capital flows to developing countries. This could also mean that Nigeria is probably expected to pull excess liquidity from the US into the domestic economy through FDI, FPI, and IBC, resulting in a fall in GLIQ and a decline in capital flows to Nigeria. This finding conformed to Tellez-Leon and Ibarra (2019); Belke and Volz (2018), but contradicted Ahmed and Zlate (2014), who did not find a significant positive effect of GLIQ on capital flows.

Likewise, apart from its positive and statistically significant effect on FDI in the long run, the global real GDP growth rate (GGRT) negatively but marginally influenced FPI and IBC, indicating a time-varying effect of GGRT over a long period. In the short run, GGRT was found to have caused a statistically significant diminishing effect on FDI, FPI, and IBC. The short-run coefficients denoted as D (GGRT) showed that a unit decline in GGRT led to 0.45 unit, 0.55 unit, and 0.50 unit decreases in capital flows (FDI, FPI, and IBC, respectively). This is an indication that a rattle in the US production level hinders foreign capital from

flowing into the Nigerian economy. The statistical significance of GGRT in the short run means that capital flows to Nigeria would decline when US real GDP growth falls, probably due to Nigeria's reliance on the US market as a major platform for its oil businesses. As such, foreign capital would likely not flow to Nigeria when the GGRT trends downwards because it could signal an impending collapse of the global economy, and investors' would prefer laying up investments in emerging countries that would have a speedy recovery should a global economic downturn emerge. The studies by Lipovina-Bozovic and Ivanovic (2018); Nwosa and Adeleke (2017) supported this finding that slowdowns in economic growth in developed countries hinder capital flows to developing countries, but the observation of Al-Smadi (2018) showed that GGRT did not stop foreign capital from flowing to countries that have the potential to recover rapidly from a sudden global economic crisis.

In the long run, the global uncertainty measured by the global volatility index (GVIX) had a negative and marginal effect on FDI but a positive and statistically significant influence on FPI and IBC, meaning that the effect of GVIX on capital flows to Nigeria varied over the long run. On the other hand, in the short run, D (GVIX), which denotes the short-run dynamics, indicated that a unit decrease in GVIX brought about a 0.07 unit decrease in FDI but a 0.38 unit and 0.17 unit increase in FPI and IBC, respectively. The probabilities of D(GVIX) were greater than 0.05 in the case of FDI but less than 0.05 in the cases of FPI and IBC, implying that the changes in GVIX had a marginal effect on FDI but significantly influenced FPI and IBC in the short run. This means that GVIX may not have had an immediate effect on FDI, but its effects on FPI and IBC were instantaneous, which could be attributed to the fact that FPI and IBC are more liquid than FDI, implying that foreign investors were attracted to short-term portfolio investments and credit extension to Nigeria. This did not align with Tellez-Leon and Ibarra (2019), but it corroborated Al-Smadi (2018), who found that foreign investors preferred financial markets, which allowed for risk diversification.

The global interest rate (GITR), which is represented by the FFR, denotes higher returns abroad; thus, it leads to an important reduction in several components of capital flows by foreign investors. This holds true for FDI and IBC in the long run, as they declined significantly due to the dynamics of GITR, but turned positive and statistically significant for FPI. In the short run, however, GITR was found to have a positive and statistically significant effect on FDI, FPI, and IBC. That is, changes in

the GITR have an important positive effect on capital flows to Nigeria, which could be driven by the behavior of foreign investors in different sectors of the economy, especially those in the oil sector. The short-run coefficients denoted by D (GITR) showed that an increase in the GITR [measured by the US Federal Funds Rate (FFR)] caused FDI, FPI, and IBC to increase by 0.28 unit, 1.18 unit, and 0.28 unit, respectively. This shows that a rise in the GITR would only direct foreign capital to Nigeria for a short period but reverse FDI and IBC in the long run, as shown by the long-run coefficients. This could be due to the quantitative easing embarked upon by the United States' monetary authorities (Acharya & Bengui, 2016). Hence, with quantitative easing, there could be excessive liquidity in the global monetary system, which could plausibly spill over to Nigeria for a short while and vice versa in the long run. The findings of this study agreed with those of Lipovina-Boovi and Ivanovic (2018) and Koekpe (2015), but failed to agree with the findings of Tellez-Leon and Ibarra (2019), that GITR lowered capital flows within a short period.

Next, the effects of the pull factors were explained. In the long run, a fall in the Nigerian real GDP growth rate (DGRT) decreased FDI and IBC but recorded an increase in FPI, which could be explained by the substitution effect of FDI and FPI. In the short run, however, the D(DGRT) estimate turned out to be negative and statistically significant. The coefficients of the short-run D(DGRT) suggested that FDI, FPI, and IBC significantly decreased by 0.11 unit, 0.16 unit, and 0.21 unit, respectively. This showed that the declining state (lower domestic economic activity) of Nigeria generated an immediate disincentive for foreign investors, as it is possibly connected with lower future returns. This effect is mainly driven by low productivity and macroeconomic instability. This finding is in consonance with Belke and Volz (2018) and Mudyazvivi (2016) that unstable DGRT hinders foreign capital flows to developing countries, but it fails to agree with the observation of Al-Smadi (2018) that DGRT attracts all forms of capital flows to developing countries.

In the long run, an exchange rate depreciation is associated with lower FDI, as denoted by the negative and statistically significant coefficient of EXCR, while an appreciation of the exchange rate is connected with FPI and IBC. Likewise, the short-run coefficient of exchange rate denoted by D (EXCR) indicated that exchange rate depreciation lowered FDI by 0.1 unit instantaneously, while FPI and IBC were increased by exchange rate appreciation immediately up to 0.02 unit and 0.12 unit, respectively. The probability values explaining the significance of D (EXCR) on FDI and IBC were greater than 0.05, implying a marginal effect

of D (EXCR), while the probability value for the effect of D (EXCR) on FPI was less than 0.05, which indicates its statistical significance. This clearly shows that the effect of the exchange rate on the various components of capital flows was not consistent over the period of study, thus implying that it differed with the passage of time. This effect is driven by the behavior of portfolio investors (FPI). That is, their investment in foreign assets increases, which could be associated with larger expected returns in domestic currency. In line with Osemene *et al.* (2017), who had found that exchange rate volatility did not deter FDI inflows. In tandem with Osemene and Arotiba (2018), the positive and insignificant effect of EXCR on FPI could be attributed to speculative activities in the global financial markets. In consonance with Shirota (2013), the positive effect of EXCR on IBC could be explained by the fact that international banks can cushion negative exchange rate effect by increasing interest rates and imposing lending conditions.

Regarding the dynamics of the domestic monetary policy rate (MPR), one would expect larger capital flows associated with larger returns in domestic securities. In the long run, it was found that the impact of the Nigerian overnight rate, also known as MPR, on FDI and IBC was negative, while it had a positive effect on FPI. Once again, this means that the effect of MPR adjustments on the various components of capital flows to Nigeria was not consistent with time. In the short run, on the other hand, adjustments to the MPR only increased FDI but caused FPI and IBC to decline. The short-run estimated coefficients of D (MPR) showed that an adjustment to the MPR triggered an upward trend (0.15 unit) in FDI while FPI and IBC decreased by 0.11 unit and 0.22 unit, respectively. The probability values were lower than the 0.05 critical value to indicate a statistically significant effect of MPR in the short run, implying that the effect of MPR on FDI, FPI, and IBC was immediate. It was then implied that changes to the monetary policy to manage the macroeconomic environment in Nigeria have largely failed to attract FPI and IBC to the country. This has been largely attributed to inconsistencies in monetary policy by the recipient country's government (Nwokoye & Oniore, 2017; Nwinee & Olulu-Briggs, 2016). On the other hand, Salandy and Henry (2018) advocated that frequent expansionary monetary policy restricted capital inflows but triggered capital flight as excess liquidity caused a significant decline in financial asset returns in developing recipient economies.

In the long run, the domestic inflation rate (INFR) had only a negative effect on FPI and IBC of 0.06 and 0.14, respectively, as it is associated with lower real

yields in domestic securities, thus reducing portfolio investments and foreign credit to Nigeria, but FDI was positively influenced by INFR. The varying long-run effects of INFR could be due to the peculiar dynamics of the various components of capital flows. A similar outcome was observed in the short run, where the D (INFR) turned out to have a diminishing and statistically significant effect on FPI and IBC, while the effect of the D (INFR) on FDI was found to be positive, which implied an increasing effect. The short-run coefficients of INFR showed that FDI increased by 0.07 unit due to an increase in the domestic inflation rate, while the FPI and IBC decreased by 0.07 unit and 0.10 unit due to a decline in the inflation rate. However, the probability values of D (INFR) were less than 0.05, indicating the statistical significance of the domestic inflation rate in pulling foreign capital to Nigeria. This implied that FPI investors and foreign creditors were probably aware of the potential loss of returns due to the rising rate of inflation in Nigeria. Also, international banks were on alert for the possible effect of inflation on returns and interest payments in the future. The significance of INFR in the short run conformed to the findings of Koekpe (2015) that pull factors such as inflation mattered most for capital flows to Nigeria.

4.4. Diagnostic Tests of the ARDL Model

As a blue line cataract inside a 5% boundary of the lower and upper bounds, the CUSUM and CUSUM of squares showed a stable representation, implying that the ARDL models used for the estimation are stable. These results are presented in Figure 8:

To ascertain the robustness of the outcomes of the results, it was important to ensure that the stability and the correct functional form of the models were specified, and avoidance of severe serial correlation and heteroscedasticity. The test statistic for the various tests must be statistically insignificant to ensure the absence of the aforementioned econometric problems. Table 6 shows the results of the diagnostic test. Results from the Breusch-Godfrey Serial Correlation LM Test show that there are no successive relationships in the representation for the three models, as shown by a likelihood value greater than 0.05. Therefore, the hypothesis of no serial correlation is accepted. The results of the Breusch-Pagan-Godfrey heteroskedasticity test indicate homoskedasticity. Given the likelihood of more than 0.05, the homoskedasticity hypothesis is hereby accepted. The Jarque-Bera test yields the results of the normality test. With the Jarque-Bera value and its

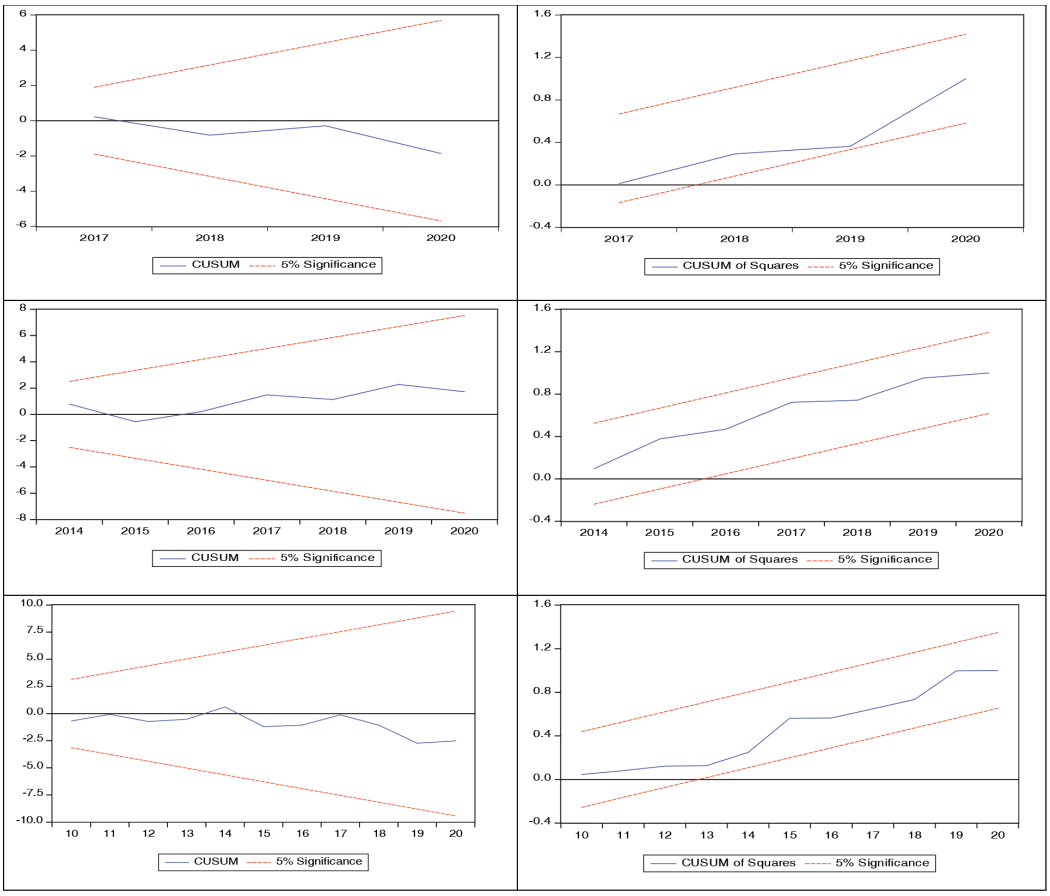

Figure 8: CUSUM with CUSUM of squares

equivalent likelihood value being more than 0.05 significant levels, it suggests that the data are regularly distributed.

Table 6: Diagnostic Tests Results

Test	*Test stat.*	*Model 1 (FDI)*	*Model 2 (FPI)*	*Model 3 (IBC)*
Serial correlation test:	F-statistic	2.0186	2.7665	3.5600
	Prob.	{0.1247}	{0.2720}	{0.0726}
Heteroskedasticity test:	F-statistic	0.7954	0.3984	0.8719
	Prob.	{0.6936}	{0.9628}	{0.6320}
Jarque-Bera test:	JB test	1.4714	2.8252	0.6028
	Prob.	{0.4791}	{0.2435}	{0.7395}

Note: p-values are denoted by the figures in parenthesis

4.4. Assessing the interactive effects of the push – pull factors on capital flows to Nigeria

In this subsection, this study used the VAR Granger Causality/Block Exogeneity Wald Tests to explore the interactive effects of the push and pull factors. This is necessary because a variable might not be an important factor that drives capital flows, but its interaction with other variables could produce a reasonable effect. The outcome of the VAR Granger Causality/Block Exogeneity Wald Tests is presented in Table 7.

Table 7: VAR Granger Causality/Block Exogeneity Wald Tests

Excluded	*Chi-sq*	*Excluded*	*Chi-sq*
Dependent variable: FDI			
GLIQ	1.078588	2	0.5832
GGRT	2.339733	2	0.3104
GVIX	1.633663	2	0.4418
GITR	0.127903	2	0.9381
DGRT	6.715116	2	0.0447
EXCR	1.570140	2	0.4561
MPR	6.044178	2	0.0487
INFR	13.84457	2	0.0010
All	32.20169	16	0.0094
Dependent variable: FPI			
GLIQ	7.602512	2	0.0223
GGRT	8.298870	2	0.0158
GVIX	7.605744	2	0.0223
GITR	7.068214	2	0.0292
DGRT	3.189396	2	0.2030
EXCR	2.576505	2	0.2758
MPR	10.66191	2	0.0048
INFR	24.47328	2	0.0000
All	50.48549	16	0.0000
Dependent variable: IBC			
GLIQ	10.13702	2	0.0063
GGRT	11.26009	2	0.0036
GVIX	0.141433	2	0.9317
GITR	9.038153	2	0.0109
DGRT	4.026852	2	0.1335
EXCR	2.547266	2	0.2798
MPR	7.521435	2	0.0233
INFR	9.323424	2	0.0095
All	37.37713	16	0.0019

From Table 6, it was observed that the interactive effect of push-pull factors significantly drove FDIs to Nigeria. However, the push factors played a marginal role, while the pull factors, such as DGRT, MPR, and INFR, played an important role in pulling FDIs to Nigeria which indicates that FDI. This could be due to the fact that large MNCs have been attracted to the Nigerian oil sector due to its large oil deposits. It then implies that, though the push factors could be weak in driving FDIs to Nigeria, their interaction with the pull factors proved to be more important. The interactive effect of the push-pull factors on FDI is adjudged statistically significant because the probability value of the variables combined ("all") was less than 0.05.

With regards to the interactive effects of push-pull factors on FPIs, the selected push factors turned out to have probability values that were less than 0.05, while the pull factors emerged with probability values that were less than 0.05, except DGRT and EXCR. The interactive effect denoted by "all" turned out to be statistically significant, indicating that the interaction of the push and pull factors influenced the trend of FPIs to Nigeria. Hence, this implies that, though some of the individual variables within the push-pull framework do influence the direction of FPIs to Nigeria, their interactive effects should be more important to policymakers. Given that the four push variables are statistically significant, it could be said that the pull factors respond to the dynamics of the push factors, which are then transmitted to the observed influence on FPIs. The probability value (0.0000) of the interactive effect indicates that the interaction of the push and pull factors was more potent in determining the flow of FPIs to Nigeria than the individual effects of the explanatory variables.

Likewise, the results of the VAR Granger Causality/Block Exogeneity Wald Tests clearly show that IBC was significantly triggered by the interactions between the push factors and the pull factors. However, IBC appeared to have reacted significantly to the individual effects of push factors (GLIQ, GGRT, and GITR) and pull factors (MPR and INFR), but the interactive effect appeared to be more significant than the individual effects. This implies that the interactive effect of the push-pull factors was more important than the individual effects of the variables. The potency of the interactive effects was based on the probability value of "all." 0.0019 suggests that policymakers consider the interactive effects of the push-pull factors in drafting their policies.

5. Conclusion

The purpose of this paper is to investigate if and how push-pull variables impact capital flows. The empirical research was conducted in Nigeria for the period 1980–2020 using the ARDL technique. To proxy the capital flows, the study used FDI, FPI and international bank credit as dependent variables. The push factors are Global liquidity, global real growth rate , global risk aversion as defined by the global volatility index, and the US FFR, which was utilized to gauge the global interest rate while the pull factors are domestic GDP growth rate, exchange rate, monetary policy rate and inflation rate. The econometric analysis showed a significant impact of global liquidity, global real growth rate and global risk aversion on all the variants of capital flows but the global interest rate only exerted significant impact on FDI and FPI. Regarding the pull factors, domestic real GDP growth rate, monetary policy rate and inflation rate had a considerable impact on all types of capital flows to Nigeria whereas exchange rate only impacted significantly on FPI. This implies that capital flows to Nigeria was largely impacted by both push and pull factors. The VAR Granger Causality/Block Exogeneity Wald Tests were used to evaluate the interaction impacts of the push and pull factors on the aggregated capital flows to Nigeria and it was found that the interactions between the push and pull factors determined the extent of capital flows to Nigeria. Therefore, policymakers should consider the implementation of policies that would strengthen the resilience of the domestic macro economy to global factors rather than just drawing conclusions about the impacts of push and pull factors in Nigeria. Future research should focus on discovering new linkages between the push – pull factors and global capital flows, using different econometric approaches, to better approximate the true nature and impact of those macroeconomic indicators.

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