Asymmetric Effects of Official Capital Inflows on Economic Growth in Nigeria

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Abstract: *The study examines the asymmetric effects of official capital inflows on economic growth in Nigeria, covering the periods from 1981Q1 to 2021Q4. The non-linear ARDL (NARDL) co-integration technique was employed in analysing the data. It was found that a negative asymmetry changes in net bilateral aid inflow had positive and significant effect on economic growth in the long run. It was also found that in the long run, positive asymmetry changes in debt inflows as shares of GDP had positive and significant effect on economic growth, while a negative asymmetry change in debt inflows as shares of GDP had negative and significant effect on economic growth. In the short run, it was found that positive asymmetry changes in net official development assistance had positive and significant effect on economic growth. Also in the short run, the results showed that a negative asymmetry change in debt inflows as shares of GDP had negative and significant effect on economic growth. Providers of official capital should be observant of the capital absorptive capacity of the country's (Nigeria's) ability to utilize the official capital and work with the country to eliminate bottlenecks to aid official capital effectiveness.*

Keywords: Capital Inflows; Economic Growth; Asymmetry; non-linear ARDL

JEL Classification: F35, O47, C32, C22, C51

1   Introduction

Economic growth is a key macroeconomic target that is frequently regarded as the most important, as it is heavily dependent on achieving other goals such as full employment, price stability, and a balanced balance of payments (Metu, Kalu, & Maduka, 2018). Beyond its economic ramifications, growth is critical to accomplishing the United Nations' 2030 Agenda, laying the groundwork for global goals such as zero hunger, quality education, and sustainable consumption and production (United Nations – UN, 2018). It refers to the expansion of a country's economy, which is often reflected in rising real GDP and other macroeconomic indicators, though not always in a linear form. This expansion also has a favourable impact on the larger social sector (Nwokoye & Metu, 2013; Nwokoye, Metu, Aduku & Eboh, 2020; Hallera, 2012). Real GDP growth, or the annual percentage rise in a country's real gross domestic product, is the most commonly used indicator of economic growth. In developing countries, official foreign capital inflows, which include foreign aid, public debt, and equity are frequently critical for closing the financing gap between present economic growth rates and projected development goals.

Foreign aid is defined as resource inflows intended to support development in recipient nations, with a grant component of at least 25%. It is closely related to Effective Development Assistance (EDA) and Official Development Assistance (ODA), which consists of concessional grants and loans provided by donor governments to enhance economic growth and welfare. Foreign aid, when channelled through development banks, has the potential to overcome institutional and market failures, reduce development funding gaps, and enhance productivity, investment, savings, and technology transfer. Public debt, also, as a fundamental legal obligation of the government, can be sourced both internally and externally. Governments borrow to meet their financial needs, particularly to address budget deficits and support important expenditures. Borrowing is an important instrument for developing countries like Nigeria to close resource gaps and finance significant infrastructure projects that promote economic growth (State Bank of Pakistan and Debt Policy Coordination Office, 2022). The macroeconomic growth and capital flow nexus literature has over the years ignored the role of asymmetry mostly in the developing countries.

Asymmetry refers to an unequal response to positive and negative changes of equal magnitude in a particular phenomenon. In terms of domestic and foreign investors, for example, an economy that relies on foreign loans or equity to finance domestic projects may fail to develop its capital stock sufficiently (Kirabaeva & Razin, 2009). This is frequently due to information gaps between borrowers

(domestic investors) and lenders (foreign investors), which can create moral hazard and result in suboptimal borrowing levels. Such moral hazard difficulties, along with insufficient enforcement measures, may explain why many economies endure swings in foreign debt during low-income periods, contrary to what would be expected under a complete-market system (Kirabaeva & Razin, 2009; Raheem, Le Roux & Asongu, 2019). Though the various capital inflows dimensions do not always relate to economic growth in the same way, official foreign capital inflows can have an impact on economic growth by affecting the cost of capital savings, technology transfer, and financial sector development. It may also have an impact on economic growth by increasing product specialisation and improving macroeconomic policies and institutions in response to competitive pressures.

Nigerian governments have tried a variety of policies to achieve long-run economic growth. Since 2017, attempts to increase the ease of doing business have included streamlining firm registration, simplifying construction permits, and enhancing property registration. Key policy steps include the Nigerian Investment Promotion Commission (NIPC) Act, which was passed in 1995 and amended in 2004 to reduce restrictions on foreign capital, particularly FDI, and the establishment of the Presidential Enabling Business Environment Council to remove barriers to business operations. As a result, foreign capital inflows have surged, reducing the finance-investment gap and supporting economic growth. However, despite the policy efforts, Nigeria's economic growth has been uneven, with two recessions between 2016 and 2021. This volatility is directly related to fluctuations in official capital inflows during downturns. Asymmetries in the economy and globalisation process have weakened investor confidence, resulting in lower inflows and increased capital flight, emphasising the disturbing unequal impact of official capital inflows on GDP.

Scholars in Nigeria have investigated the impact of foreign capital on economic growth (Adam & Klobodu, 2017; Gabriel, John & Baryl, 2019; Laniran, 2018; Agbloyo, Abor, Adjasi & Yawson, 2014). Empirical research in China and other countries (Aziz & Duenwald, 2002; Peng, 2019; Maswana, 2009) show that the relationship between foreign capital and growth is symmetrical, but this is yet to be empirically confirmed in Nigeria. In addition, prior research in Nigeria employed linear approaches such as linear autoregressive distributed lag (ARDL), ordinary least squares (OLS), and linear cointegrating regressions. Although these methodologies can estimate the marginal effect, they cannot explain the impact of asymmetric changes in capital flows on economic development. This study, therefore, tends ascertain if asymmetry changes in official capital inflows significantly influence economic growth in Nigeria using an appropriate technique such as the nonlinear ARDL (NARDL) technique with consideration given to the heterogeneous features of official capital inflows by concentrating on more than one official capital inflows components.

Such research should be conducted to help the Nigerian economy contribute to the trajectory of growth dividends in the face of foreign capital inflows. Asymmetry in capital flows may also limit growth. As a result, research of this sort should be done for the Nigerian economy to assist the country in better managing asymmetrical situations.

2   Literature Review

2.1   Conceptual Literature

2.1.1   Asymmetry

Asymmetry is an information failure, which manifests if a party to an economic transaction embeds more (different) knowledge than the other party and, can make a better (different) decision (Bloomenthal, 2021; Tarver, 2022). It is the existence of imperfect knowledge. To Skardziukas (2010), asymmetry is information dissimilarities that are available to parties that are in financial agreements. It is the differences in information obtainable to different parties in an agreement. Nor, Janor, Yaacob and Hashim (2020) views asymmetry as the differences in information access between a buyer and seller in a financial contract that brings about control or power imbalance in a transaction, as a result of diverse informational access between lenders and borrowers (Akerlof, 1970). An example of an informational asymmetry is a country (a lender) lending credit (debt) to another country (a borrower) faces uncertainty concerning the credit worthiness of the borrower to the point that the lender cannot take notice of some of the characteristics and actions of the borrower. As suggested by this example, one party to a transaction may have more information than another in terms of the characteristics of the capital, a situation known as asymmetry information. Therefore, asymmetry information exists if a party to a transaction has additional information about the characteristics of goods and services (or capital) than another party.

2.1.2   Economic Growth

Stone (2017) described economic growth as the rise in the market value of a country's goods and services. Similarly, McKinsey Global Institute (2022) defined it as the monetary worth of goods and services produced over time. Agarwal (2022) viewed economic growth as an increase in a nation's total output or real GDP. According to Wesley and Peterson (2017), it reflects changes in GDP, which they broke down into per capita GDP and population components. Hallera (2012) emphasized it as the process of expanding

the overall size of a national economy. In line with Agarwal (2022), this study defines economic growth as the rise in total output or real GDP.

2.1.3   Official Capital Inflow

Official capital inflows are defined as the collection of concessional and non-concessional flows to a recipient country with primary commercial reasons or motives. Official capital inflows could be in the form of the form of net official development assistance, net bilateral aid inflows, and debt inflows.

Official development assistance, as defined by the OECD (2021), is a form of government aid targeted at promoting specific economic development and the welfare of developing economies. In a broader sense, the OECD (2022) and the World Bank (2022) defined official development assistance as those flows to a recipient country that are provided by official agencies including the government or its executive agencies, which is concessional in character and carries a grant element of not less than 25 per cent, and every transaction of which is administered to promote economic and welfare development. Concessionality, according to OECD (2022), comprises loans in terms of core contributions to multilateral institutions – called multilateral official development assistance, loans that are channeled through multilateral institutions – called bilateral official development assistance, as well as loans to trust funds that these institutions administered.

The Corporate Finance Institute (2022) defined foreign aid as the international flow of money, goods and services from governments or international institutions to benefit the recipient country or its citizens. It can be military, fiscal or humanitarian. It is a vital source of foreign exchange. Foreign aid is mostly moved from developed nations to developing nations. It may be given as a contribution or a loan that could be in foreign currency or the currency of the recipient country. Foreign aid may be of different forms. This includes bilateral aid and multilateral aid. Bilateral aid is aid directly provided by the government of a country to the government of another country. It is mainly for strategic, political and humanitarian interests (The Corporate Finance Institute, 2022). Core contributions to particular programmes such as the global partnership for education are also considered bilateral aid. Multilateral aid, on the other hand, is defined as the flow of aid through the support provided by several nations that make funds available to foreign organizations like the World Bank, the United Nations, and the International Monetary Fund (IMF).

Debt inflows is a form of official foreign capital inflow such that there is a repayment obligation, compared to a non-debt inflow such as foreign direct investment and foreign portfolio investment where there is no direct obligation for repayment. Public external borrowing, for example, has an obligation for loan repayment in the future and this is a debt flow. It consists of bank loans and bonds. Debt flows for this study are measured as debt flows as a share of GDP. It is defined as foreign debt divided by the gross value added. It is the share of foreign debt in gross domestic product. It reflects the finances of the government.

The channels through which official capital flows could affect growth are grouped into direct and indirect channels. The direct channel comprises the savings and investment channel through domestic savings, and the efficiency and productivity channel. The indirect channel, on the other hand, is captured by the institutional development channel through the development of domestic financial intermediations, and the overvaluation channel resulting from currency appreciation.

2.2   Empirical Literature

In Ghana, Nketsiah and Quaidoo (2017) examined the impact of foreign direct investment on economic growth from 1983 to 2012 using the Ordinary Least Squares technique. The study found a positive and significant impact of FDI on economic growth. Taking sub-Saharan Africa as a case study, Nyang`oro (2017) examined the effect of capital flows on economic growth using a system of generalized methods of moment (GMM) technique. The study covered the periods from 1980 to 2011. The findings showed that portfolio equity had a positive effect on economic growth while private equity and debt harmed economic growth. On the other hand, no significant impact of the volatility of portfolio equity and private equity on economic growth was found. Tang and Bundhoo (2017) examined the impact of foreign aid on the economic growth of the Sub-Saharan African region. The countries considered for the study were Ethiopia, the Democratic Republic of Congo, Tanzania, Kenya, Côte d'Ivoire, Mozambique, Nigeria, Ghana, Uganda and Malawi. The study covered the periods from 1990 to 2012. The study found no significant impact of aid on economic growth.

Agunbiade and Mohammed (2018) examined the effect of Foreign Aid (FA) on the Economic Development in Nigeria. The study covered the 1986 to 2016 sample periods, while the data was analysed using the Vector Error Correction Model (VECM). It was found that Foreign Aid Flow had a positive and significant effect on economic growth. Using the generalized method of moments (GMM) for the dynamic panel technique, Combes, Kinda, Ouedraogo and Plane (2019) examined the impact of financial flows and their composition on the real exchange rate and economic growth for a sample of low-and middle-income countries from 1980 to

2012. They found a direct and indirect impact of net capital flows (FDI and portfolio flows) on economic growth. Raheem, le Roux & Asongu (2019) examined the asymmetry between capital flows and economic growth in 42 countries. The study covered the sample periods from 1990 to 2017. Generalised Method of Moments (GMM) technique was employed to analyse the data. The study confirmed the presence of asymmetry. It specifically found that capital flows were more reactive to economic drag when compared to economic growth. It was also found that the channels in which asymmetry operate were heterogeneous to measures of capital inflows and proxies for uncertainty. Using the Autoregressive Distributed Lag (ARDL) technique, Musa (2019) examined the effect of foreign private capital (foreign direct investment, portfolio investment, international remittance) on economic growth in Nigeria from 1986 to 2017. It was found that foreign direct investment, remittances, portfolio investment, and trade openness had a positive significant effect on economic growth. Gabriel, John and Oseghale (2019) examined the impact of capital flows such as FDI flows on economic growth in Nigeria from 1980 to 2015. The study employed the error correction model framework and the autoregressive distributed lag model approach in analyzing the data. It was found that capital flows significantly affected economic growth in Nigeria. Anetor (2019) examined the effect of shocks in the various components of private capital inflows on economic growth from 1986Q1 to 2016Q4. The impulse response function and the forecast error variance decomposition of the structural vector autoregression (SVAR) model was employed to analyse the data. The study found that shocks in foreign direct investment (FDI) inflows and portfolio investment inflows had a positive and significant impact on economic growth. It was also found that personal remittances had a significant impact on economic growth, however, the impact was the least compared to the impacts of FDI and portfolio investment on economic growth.

As regards the empirical knowledge gap, none of the studies in Nigeria (including Agunbiade and Mohammed, 2018; Ewubare and Ozigbu, 2017; Tang and Bundhoo, 2017) has examined if asymmetry changes in official capital flow significantly influence economic growth. They have examined the impact of official capital flows on economic growth, but not the asymmetry effect as considered in this study. In addition, this study differs from the previous studies especially in Nigeria in terms of the methodological gap. Previous studies using techniques such as the structural vector autoregression (SVAR), Autoregressive Distributed Lag (ARDL), Granger Causality, the ordinary least square (OLS) or the Error Correction Method (ECM) technique. These techniques could reveal the marginal impact of official foreign capital flow variables on economic growth but could not reveal the asymmetry effect on economic growth. On this basis, and to ensure that the objective of the study is modelled appropriately, we employed the asymmetric modification of the Non-linear Autoregressive Distributed Lag (NARDL) co-integration technique in determining the long and short-run asymmetries in the parameters of interest. Empirical evidence of the asymmetry changes in official capital flows on economic growth cannot be overemphasized because it is a trajectory of a growth dividend in an environment of foreign capital flows. Also, the presence of asymmetry in official capital flows could inhibit growth. However, there is some evidence that countries are learning to manage asymmetry better. With empirical evidence, Nigeria can learn to manage asymmetry better.

3   Methodology

3.1   Data

The data is a quarterly time series data that covers the periods from 1981Q1 to 2022Q4. The official capital flow measures considered in the study are net official development assistance, net bilateral aid flows, and debt flows as shares of GDP. Other variables include real GDP growth, investment (measured by gross fixed capital formation) as a share of GDP, annual inflation – captured by using percentage change in the consumer price index, trade openness – measured by total trade as a ratio of GDP, and government expenditure as a share of GDP. The data is sourced from the World Development Indicators (WDI), and the Central Bank of Nigeria (CBN) Statistical Bulletin, various issues. The data on net official development assistance, net bilateral aid flows, and debt flows as shares of GDP, real GDP growth, and gross fixed capital formation as a share of GDP were sourced from the WDI, while the data for the rest of the variables were sourced from the CBN Statistical Bulletin, various issues.

3.2   The Model

The study employed the non-linear ARDL (NARDL) co-integration technique in determining the long and short-run asymmetries in the parameters of interest. The NARDL co-integration technique is employed to examine if asymmetry changes in official capital flow significantly influence economic growth. Following the literature on capital inflows and economic growth (Odugbesan & Adebayo, 2020), the following functional form of the equation is presented:

$$GROWTH = f(OFKF, CONS) \qquad (1)$$

GROWTH is real GDP growth – measured as the growth of aggregate economic output of Nigeria and adjusted for inflation. OFKF is measures of official capital flows, while CONS is control variables that are determinants of real GDP growth. Official capital flow

measures are net official development assistance (NODA), net bilateral aid flows (NBAF), and debt flows as shares of GDP (DEBTGDP). The variables are expected to have positive relationship with the dependent variable. Other variables controlled for include investment (measured by gross fixed capital formation) as a share of GDP (INVGDP), annual inflation (INF) captured by using percentage change in the consumer price index to measure macroeconomic stability, trade as a ratio of GDP (TRADGDP) to capture openness, and government expenditure as a share of GDP (EXPGDP) as a fiscal indicator. The inclusion of this variables is justified on the basis of theory and economic reality. On this basis, we respecify Equation (1) as:

$$GROWTH = f(log NODA^+ \ log NODA^-, log NBAF^+ \ log NBAF^-, DEBTGDP^+ \ DEBTGDP^-, INVGDP, \ INF, TRADGDP, EXPGDP) \quad (2)$$

The econometric model is presented as:

$$GROWTH = \varphi_0 + \varphi_1{}^+ log NODA^+ + \varphi_2{}^- log NODA^- + \varphi_3{}^+ log NBAF^+ + \varphi_4{}^- log NBAF^- + \varphi_5{}^+ DEBTGDP^+ + \varphi_6{}^- DEBTGDP^- + \varphi_7 INVGDP + \varphi_8 INF + \varphi_9 TRADGDP + \varphi_{10} EXPGDP + \varepsilon_1 \quad (3)$$

Where NODA is net official development assistance, defined as $NODA = NODA_0 + NODA_t{}^+ + NODA_t{}^-$. The $NODA_t{}^+ + NODA_t{}^-$ are the process of partial sum variation, which are positive (+) and negative (–) changes in net official development assistance. NBAF represents net bilateral aid flows, defined as $NBAF = NBAF_0 + NBAF_t{}^+ + NBAF_t{}^-$. The $NBAF_t{}^+ + NBAF_t{}^-$ are the process of partial sum variation, which are positive (+) and negative (–) changes in net bilateral aid flows. DEBTGDP is debt flows as shares of GDP, defined as $DEBTGDP = DEBTGDP_0 + DEBTGDP_t{}^+ + DEBTGDP_t{}^-$. The $DEBTGDP_t{}^+ + DEBTGDP_t{}^-$ are the process of partial sum variation, which are positive (+) and negative (–) changes in debt flows as shares of GDP.

The variables beside NODA and NBAF are not logged because they are already in rates.

$$NODA^+ = \sum_{m=1}^{k} \Delta NODA_{(m)}{}^+ = \sum_{m=1}^{k} max\left(\Delta NODA_{(m)}, 0\right); \ NODA^- = \sum_{j=1}^{k} \Delta NODA_{(m)}{}^- = \sum_{j=1}^{k} min\left(\Delta NODA_{(m)}, 0\right) \quad (4)$$

$$NBAF^+ = \sum_{m=1}^{k} \Delta NBAF_{(m)}{}^+ = \sum_{m=1}^{k} max\left(\Delta NBAF_{(m)}, 0\right); \ NBAF^- = \sum_{j=1}^{k} \Delta NBAF_{(m)}{}^- = \sum_{j=1}^{k} min\left(\Delta NBAF_{(m)}, 0\right) \quad (5)$$

$$DEBTGDP^+ = \sum_{m=1}^{k} \Delta DEBTGDP_{(m)}{}^+ = \sum_{m=1}^{k} max\left(\Delta DEBTGDP_{(m)}, 0\right); \ DEBTGDP^- = \sum_{j=1}^{k} \Delta DEBTGDP_{(m)}{}^- = \sum_{j=1}^{k} min\left(\Delta DEBTGDP_{(m)}, 0\right) \quad (6)$$

The '+' and the '−' superscripts in the equations are the positive and negative processes around a threshold of zero, such that the positive and negative shocks are delimited in NODA, NBAF and DEBTGDP respectively. It implies that the series in their 1st difference is assumed to be normally distributed with zero mean. By adding the control variables as defined above, we specify the equation for estimation, which is a nonlinear (p; q) ARDL equation showing a combination of short run and long run asymmetries dynamic as:

$$GROWTH = \varphi_0 + \varphi_1 GROWTH_{t-1} + \varphi_2{}^+ log NODA_{t-1}{}^+ + \varphi_3{}^- log NODA_{t-1}{}^- + \varphi_4{}^+ log NBAF_{t-1}{}^+ + \varphi_5{}^- log NBAF_{t-1}{}^- + \varphi_6{}^+ DEBTGDP_{t-1}{}^+ + \varphi_7{}^- DEBTGDP_{t-1}{}^- + \varphi_8 INVGDP_{t-1} + \varphi_9 INF_{t-1} + \varphi_{10} TRADGDP_{t-1} + \varphi_{11} EXPGDP_{t-1} + \sum_{m=1}^{K} b_1 \Delta GROWTH_{t-m} + \sum_{m=1}^{K}\left(\beta_1{}^+ log NODA_{(t-m)}{}^+ + \beta_2{}^- log NODA_{(t-m)}{}^-\right) + \sum_{m=1}^{K}\left(\beta_3{}^+ log NBAF_{(t-m)}{}^+ + \beta_4{}^- log NBAF_{(t-m)}{}^-\right) + \sum_{m=1}^{K}\left(\beta_5{}^+ DEBTGDP_{(t-m)}{}^+ + \beta_6{}^- DEBTGDP_{(t-m)}{}^-\right) + \sum_{m=1}^{K} b_2 \Delta INVGDP_{t-m} + \sum_{m=1}^{K} b_3 \Delta INF_{t-m} + \sum_{m=1}^{K} b_4 \Delta TRADGDP_{t-m} + \sum_{m=1}^{K} b_5 \Delta EXPGDP_{t-m} + \varepsilon_1 \quad (7)$$

Where all variables remained as defined earlier, and K_i is the lag order. The implicit co-integration issue could come forth in the measurement of Equation (3), such that it may proffer ambiguity interpretation of asymmetric coefficients. Therefore, a limitation is imposed on the coefficients of Equation (3) as, $\varphi_1{}^+ = {}^{-\varphi_2{}^+}/_{\varphi_1}; \ \varphi_2{}^- = {}^{-\varphi_3{}^-}/_{\varphi_1}; \ \varphi_3{}^+ = {}^{-\varphi_4{}^+}/_{\varphi_1}; \ \varphi_4{}^- = {}^{-\varphi_5{}^-}/_{\varphi_1}; \ \varphi_5{}^+ = {}^{-\varphi_6{}^+}/_{\varphi_1};$ and $\varphi_6{}^- = {}^{-\varphi_7{}^-}/_{\varphi_1}$ following Odugbesan and Adebayo (2020), Lardic and Mignon (2008), and Granger and Yoon (2002). The aforesaid is the long-run influences of asymmetry changes in net official development assistance (NODA), net bilateral aid flows (NBAF), and debt flows as shares of GDP (DEBTGDP) on economic growth. $\sum_{j=1}^{K} \beta_i{}^+$ in Equation (7) measures the short-run influences of an increase in asymmetry changes in net official development assistance, net bilateral aid flows, and debt flows as shares of GDP on economic growth. While $\sum_{j=1}^{K} \beta_i{}^-$ calculates the short-run influences of a decrease in asymmetry changes in net

official development assistance, net bilateral aid flows, and debt flows as shares of GDP on economic growth. In essence, in this modelling, in addition to the asymmetric long-run relation, the asymmetric short-run influences of asymmetric changes in net official development assistance, net bilateral aid flows, and debt flows as shares of GDP on economic growth are also captured. The error correction version of Equation (7) is presented as;

$$\Delta \text{GROWTH} = \sum_{m=1}^{K} b_1 \Delta \text{GROWTH}_{t-m} + \sum_{m=1}^{K} \left(\beta_1^+ log\text{NODA}_{(t-m)}^+ + \beta_2^- log\text{NODA}_{(t-m)}^- \right) + \sum_{m=1}^{K} \left(\beta_3^+ log\text{NBAF}_{(t-m)}^+ + \beta_4^- log\text{NBAF}_{(t-m)}^- \right) + \sum_{m=1}^{K} \left(\beta_5^+ \text{DEBTGDP}_{(t-m)}^+ + \beta_6^- \text{DEBTGDP}_{(t-m)}^- \right) + \sum_{m=1}^{K} b_2 \Delta \text{INVGDP}_{t-m} + \sum_{m=1}^{K} b_3 \Delta \text{INF}_{t-m} + \sum_{m=1}^{K} b_4 \Delta \text{TRADGDP}_{t-m} + \sum_{m=1}^{K} b_5 \Delta \text{EXPGDP}_{t-m} + b_6 ECM + \varepsilon_1 \qquad (8)$$

Where $b_i, (i = 1, 2, 3, \ldots, 5)$ represents the coefficients in the short run. On the other hand, β_i^+, and β_i^-, $(i = 1, 2, 3, \ldots, 6)$ stand for adjustment asymmetry in the short run. b_6 is the coefficient of the error correction term.

4   Results

4.1   Unit Root Test

The Augmented Dickey-Fuller (ADF) and the Kwiatkowski, Phillips, Schmidt, Shin (KPSS) unit root test were used to test the stationarity of the variables. The test results are reported on Table 1.

Table 1: Unit Root Test Results

Variable	Augmented Dickey-Fuller (ADF) Result		Kwiatkowski, Phillips, Schmidt, Shin (KPSS)		Lag order	~I(d)
	Level	1st Diff.	Level	1st Diff.		
GROWTH	-3.127	-6.647*	0.405	0.022*	2	I(1)
NODA	-3.875*	-	0.021*	-	2	I(0)
NBAF	-1.859	-8.318*	0.473	0.056*	2	I(1)
DEBTGDP	-0.507	-10.116*	0.156	0.119*	2	I(1)
INVGDP	-0.543	-10.175*	0.147	0.125*	2	I(1)
INF	-4.370	-6.066*	0.228	0.039*	2	I(1)
TRADGDP	-2.448	-4.922*	0.833	0.120*	2	I(1)
EXPGDP	-2.956	-7.432*	0.265	0.042*	2	I(1)
	The null hypothesis is that the variable contains a unit root		**The null hypothesis is that the variable is trend-stationary**			
The optimal lag lengths were chosen according to Akaike's Final Prediction Error (FPE), and Akaike's information criteria. The ADF 5% critical value at the level and 1st difference is -3.442. While the Kwiatkowski, Phillips, Schmidt, Shin (KPSS) 5% critical values at level and 1st difference is 0.146.						

Source: Researchers' computation.

The Augmented Dickey-Fuller (ADF) and KPSS tests show that only net official development assistance is stationary at level, while the other variables exhibit unit roots. After first differencing the non-stationary variables, all became stationary, indicating they are integrated of order one, I(1). These findings were confirmed by both tests, establishing that all variables are I(1) except net official development assistance, which is stationary at level, I(0).

4.2   Asymmetry Changes in Official Capital Inflow and Economic Growth

Before presenting the main results, the cointegration results for the variables in the model are presented. The cointegration test was conducted using the Asymmetry cointegration test approach. The result is reported on Table 2.

Table 2: Asymmetry Cointegration Test Statistics

Critical Values (0.1-0.01), F-statistic, Case 3

90%		95%		97.5%		99%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
2.45	3.52	2.86	4.01	3.25	4.49	3.74	5.06
Critical Values (0.1-0.01), t-statistic, Case 3							
90%		95%		97.5%		99%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
-2.57	-3.66	-2.86	-3.99	-3.13	-4.26	-3.43	-4.60
F	-8.8567						
t	6.5487						

Source: Researchers' computation.

At the 5%, the F-value in absolute terms is greater than both the order 0 and the order 1 critical values. Therefore, indicating significance at the 5 per cent level. For this reason, the null hypothesis of no cointegration is rejected. Also, at the 5%, the t-value in absolute terms is greater than both the order 0 and the order 1 critical values. Therefore, supporting the rejection of the null hypothesis of no cointegration. This means that the variables in the model are cointegrated. That is, there is a long-run relationship among the variables. Table 3 present the long-run and short-run asymmetry test statistics.

Table 3: Long and Short-run Asymmetry Test Statistics

	(1) Long-run asymmetry		(2) Short-run asymmetry	
	F-stat	p-value	F-stat	p-value
NODA	0.002	0.963	0.095	0.758
NBAF	3.093	0.001	4.246	0.000
DEBTGDP	3.059	0.003	3.445	0.036
INVGDP	4.060	0.000	4.455	0.000
INF	0.072	0.789	5.806	0.000
TRADGDP	4.689	0.000	0.504	0.479
EXPGDP	4.013	0.000	3.977	0.000

Source: Researchers' computation

The results show that in column (1), net bilateral aid inflows, debt inflows, investment, trade, and government expenditure (as shares of GDP) exhibit statistically significant F-statistics at the 5% level, indicating the presence of long-run asymmetry. Thus, the null hypothesis of no long-run asymmetry is rejected for these variables. In column (2), net bilateral aid inflows, debt inflows, investment, inflation, and government expenditure are also statistically significant, confirming the presence of short-run asymmetry for these variables.

The results reveal that net bilateral aid inflows, debt inflows, investment, and government expenditure (as shares of GDP) exhibit both long-run and short-run asymmetries. Trade shows asymmetry only in the long run, while inflation displays asymmetry only in the short run. Net official development assistance shows no significant asymmetry in either the long or short run. With these asymmetries confirmed, the analysis proceeds to present the long-run and short-run asymmetric effects using the NARDL model.

Table 4: Long-run Asymmetry Effect Statistics

Exogenous variables	Long-run effect [+]			Long-run effect [-]		
	coef.	F-stat	p-value	coef.	F-stat	p-value
NODA	0.089	0.003	0.951	-0.148	0.019	0.892
NBAF	0.006	0.000	0.997	0.498	3.337	0.000
DEBTGDP	0.220	5.318	0.000	-0.167	6.116	0.000
INVGDP	-0.323	5.319	0.000	0.244	6.012	0.000
INF	-0.056	5.207	0.000	0.037	3.680	0.000
TRADGDP	0.008	4.676	0.000	0.051	6.465	0.000

EXPGDP	0.178	2.688	0.037	-0.221	0.306	0.581

Source: Researchers' computation.

In the long run, economic growth is influenced by several key factors: official aid disbursements, debt inflows, domestic investment, government size, trade openness, price stability, and bilateral or multilateral foreign aid. These variables, reflected in their long-run coefficients, collectively explain the economy's long-term growth trajectory.

The coefficient for net official development assistance under a positive asymmetry change is 0.089. However, since the F-value is not statistically significant at the 5% level, the null hypothesis that such changes have no meaningful effect on economic growth is accepted. This is further confirmed by a high p-value of 0.951, indicating no substantial error in this conclusion. Therefore, in the long run, positive shifts in net official development assistance had a minor, but statistically insignificant, positive impact on economic growth. In the case of a negative asymmetry change, the coefficient is -0.148 with an F-value of 0.019, which is also statistically insignificant at the 5% level. The corresponding p-value supports this, indicating that a negative change in net official development assistance resulted in an insignificant 0.15% increase in economic growth in the long run.

Positive change in net bilateral aid inflows had a positive and insignificant coefficient in the long run. This means that an increase or a positive change in the net bilateral aid inflows leads to an insignificant increase in economic growth. Specifically, economic growth responded positively and insignificantly to a positive change in net bilateral aid inflows by 0.01 per cent. A negative change in net bilateral aid inflows, on the other hand, in the long run, led to a 0.49 per cent significant reduction in economic growth. In specific terms, economic growth responded negatively and significantly to a negative change in net bilateral aid inflows to the country in the long run.

In the long run, both positive and negative asymmetry changes in debt inflows as shares of GDP significantly affect economic growth. A positive change leads to a significant positive impact with a coefficient of 0.220, while a negative change also results in a significant increase in growth with a coefficient of -0.167. The significant F- and p-values confirm the rejection of the null hypothesis, indicating that debt inflows, whether positive or negative, have a significant effect on Nigeria's economic growth.

In the long run, both positive and negative asymmetry changes in investment (as a share of GDP) had significant negative effects on economic growth. A positive change led to a 0.32% decrease, while a negative change resulted in a 0.24% decrease in growth. This suggests that fluctuations in investment, whether positive or negative, were associated with a decline in economic growth during the long-run period.

The coefficient for inflation when there was a positive asymmetry change in the long run is -0.056 with a significant F-value of 5.207. This means that with a positive asymmetry change in the long run, an increase in the rate of inflation led to a 0.06 per cent significant increase in economic growth. But, with a negative asymmetry change in the long run, an increase in the inflation rate led to a 0.04 per cent significant reduction in economic growth.

The coefficient for trade as a ratio of GDP is 0.008 with an F-value of 4.68. This is when the asymmetry change was positive in the long run. This shows that with a positive asymmetry change in the long run, an increase in trade as a ratio of GDP (openness) led to a significant increase in economic growth. Also, the coefficient for trade as a ratio of GDP is 0.051 with an F-value of 6.46 when the asymmetry change was negative in the long run. This implies that with a negative asymmetry change in the long run, an increase in trade as a ratio of GDP (openness) resulted in a significant decrease in economic growth.

In the long run, a positive asymmetry changes in government expenditure as a share of GDP had a significant impact on economic growth, with a coefficient of 0.178 and an F-value of 2.688, indicating that increased government spending led to a 0.18% rise in economic growth. But, when the asymmetry change was negative, the coefficient was -0.221, suggesting a 0.22% decline in economic growth. However, the negative effect was statistically insignificant.

The short-run asymmetry effect statistics were also estimated. Table 5: presents the short-run asymmetry effect statistics from the NARDL model.

Table 5: Short-run Asymmetry Effect Statistics

Exogenous variables	Short-run effect [+]			Short-run effect [-]		
	coef.	F-stat	p-value	coef.	F-stat	p-value

NODA	0.527	4.29	0.000	-0.026	-0.13	0.898
NBAF	-0.370	-0.78	0.438	0.046	0.17	0.866
DEBTGDP	0.018	0.10	0.921	-0.129	-3.93	0.000
INVGDP	0.027	2.10	0.044	-0.191	-0.93	0.354
INF	0.085	2.09	0.039	-0.274	-5.61	0.000
TRADGDP	-0.001	-3.09	0.000	0.035	4.68	0.000
EXPGDP	0.543	5.17	0.000	0.377	3.51	0.000
Constant	-1.837	(-2.73) (0.007)				
Adjustment (ECM)	-0.181	(-4.86) (0.000)				

Source: Researchers' computation

In the short-run phase of economic growth, the growth rate was influenced by short-run coefficients of factors such as net official aid disbursement, the volume of debt inflows used to finance government activities, the level of domestic investment reflecting the portion of income reinvested into fixed assets and government size. Additionally, short-run economic growth was shaped by the country's openness to international trade, domestic price stability as an indicator of macroeconomic health, and external assistance, whether provided directly by bilateral donors or through multilateral agencies like the World Bank or the United Nations.

The coefficient for net official development assistance during a positive asymmetry change in the short run is 0.527, with an F-value of 4.29. Since this F-value is statistically significant at the 5% level, the null hypothesis that net official development assistance has no significant impact on economic growth is rejected under positive asymmetry conditions in the short run. This conclusion is further supported by a significant p-value of 0.000, indicating no substantial error in rejecting the null hypothesis. Thus, positive asymmetry changes in net official development assistance had a significant and positive effect on economic growth in the short run. Conversely, for a negative asymmetry change in the short run, the coefficient is -0.026 with an F-value of -0.13, which is not statistically significant. Both the F-value and p-value support accepting the null hypothesis, meaning a negative change in net official development assistance led to an insignificant 0.03% increase in economic growth in the short run.

In the short run, net bilateral aid inflows have a negative coefficient of -0.370, accompanied by a statistically insignificant F-value of -0.78. This implies that a positive change in net bilateral aid inflows resulted in an insignificant decline in economic growth specifically, by 0.37%. Likewise, a negative change in these inflows led to a 0.05% drop in economic growth. Overall, both positive and negative changes in net bilateral aid inflows had an insignificant negative impact on economic growth.

In the short run, the coefficient for debt inflows as a share of GDP under a positive asymmetry change is 0.018, with an F-value of 0.10. Since this F-value is statistically insignificant at the 5% level, the null hypothesis that such changes have no significant impact on economic growth is accepted. The insignificant p-value of 0.921 further supports this conclusion, indicating that positive asymmetry changes in debt inflows had a positive but insignificant effect on growth. Under a negative asymmetry change, debt inflows as a share of GDP have a coefficient of -0.129 and an F-value of -3.93. This significant F-value leads to the rejection of the null hypothesis at the 5% level, which is also supported by the significant p-value. Thus, a negative change in debt inflows significantly increased economic growth by 0.13% in the short run.

In the short run, investment as a share of GDP had a coefficient of 0.027 and an F-value of 2.10 under a positive asymmetry change, indicating a positive and significant impact on economic growth. This suggests that such changes in investment contributed to a 0.03% rise in economic growth. However, under a negative asymmetry change, investment as a share of GDP led to a 0.19% increase in growth, though this effect was statistically insignificant. Overall, while positive changes in investment significantly boosted growth in the short run, negative changes had an insignificant impact.

In the short run, a positive asymmetry changes in inflation yielded a coefficient of 0.085 with a significant F-value of 2.09, indicating that rising inflation contributed to a 0.09% significant increase in economic growth. Similarly, under a negative asymmetry change, an increase in inflation resulted in a 0.27% significant rise in economic growth.

In the short run, when there was a positive asymmetry change, trade as a ratio of GDP had a coefficient of 0.001 with an F-value of -3.09, indicating that increased trade openness significantly boosted economic growth. Conversely, under a negative asymmetry change, the coefficient was 0.035 with an F-value of 4.68, suggesting that increased trade openness significantly reduced economic growth.

In the short run, when there was a positive asymmetry change, government expenditure as a share of GDP had a coefficient of 0.543 with a significant F-value of 5.17, indicating that increased government spending significantly boosted economic growth by 0.54%. However, under a negative asymmetry change, the coefficient was 0.377, suggesting that a rise in government expenditure led to a significant 0.38% decline in economic growth.

The adjustment coefficient is -0.181, with a significant F-value of -4.86, indicating that in the event of short-run economic shocks causing disequilibrium, the model's variables significantly adjusted toward long-run equilibrium at an annual rate of 18.1%. This implies that it would take about 5 years and 6 months for the system to return to equilibrium following a short-run disturbance. The diagnostics of the model is reported on Table 6.

Table 6: Diagnostics of the Model

R-squared	0.6957
Adj. R-squared	0.5813
F-statistic (44, 117)	6.08 (p = 0.0000)
Portmanteau test (chi2)	1.33 (p = 0.0766)
Breusch/Pagan heteroskedasticity test (chi2)	0.0452 (p = 0.8317)
Ramsey RESET test (F)	0.8172 (p = 0.4869)
Jarque-Bera test for normality (chi2)	16.79 (p = 0.0002)

Source: Researchers' computation

The R^2 value for the model addressing objective one is 0.6957. This indicates that the explanatory variables—namely net official development assistance, net bilateral aid inflows, debt inflows as a percentage of GDP, investment as a share of GDP, inflation rate, trade openness, and government expenditure account for approximately 69.57% of the variation in economic growth. The remaining variation is attributed to other factors not captured in this analysis. The F-statistic is 6.08 with a p-value of 0.0000. Since this result is statistically significant at the 5% level, the null hypothesis which states that net official development assistance, net bilateral aid flows, debt as a share of GDP, investment as a share of GDP, inflation, trade openness, and government spending have no joint significant effect on economic growth is rejected. Therefore, these variables collectively have a significant impact on economic growth.

The Portmanteau test up to lag 40 yields a Chi-square value of 1.33 and a p-value of 0.0766, indicating no evidence of serial correlation. This means the independent variables are not autocorrelated, and the null hypothesis of no serial correlation is accepted at the 5% significance level. The Breusch-Pagan heteroskedasticity test produces a Chi-square statistic of 0.0452 with a p-value of 0.8317, which is not significant. Hence, the null hypothesis that the variables have constant variance is accepted, indicating no heteroskedasticity and confirming that the model exhibits homoscedastic error terms. The Ramsey RESET test statistic is 0.8172 with an insignificant p-value of 0.4869, suggesting that the model is correctly specified. However, the Jarque-Bera test yields a Chi-square value of 16.79 and a p-value of 0.0002, indicating that the residuals are not normally distributed.

4.3   Discussion of Results

The overall message is thus, reasonably clear; while asymmetry changes in official capital inflows are positively linked with growth, there can be too much of good a thing, with official capital being subject to playing an insignificant role as evidenced in net official development assistance in the long run. The findings should imply that there are valid grounds on which official capital can be criticized. For example, fungibility, insufficiency in alignment between government policies of the donor and the recipient country (Nigeria), donor activities proliferation within a recipient country, commercial trying, insufficient policy consistency or harmony within and among the activities of a donor are part of the valid grounds for criticism. However, in their right circumstances or context, they may not dispense a competent case for arguing that official capital has failed. They rather give a case for why official capital may not have worked better and point to areas where improvements need to be made. The findings are in line with economic theory. Also, these findings are seemingly highly robust, with most related studies finding evidence of the existence of such a relationship (Azam & Feng, 2022; Mugenzi, Nuwagira & Uwimana, 2022; Tefera & Odhiambo, 2022).

5   Conclusion and Recommendations

This research investigated the asymmetric effects of official capital inflows on economic growth in Nigeria. Several conclusions are drawn from the findings. It is concluded that official capital inflows do significantly influence economic growth, however, depending on the asymmetry changes in the type of official capital inflow, and the situation or periods – either in the long or short runs. In the long run, it is concluded that when there are positive or negative asymmetry changes, net official development assistance does not significantly influence economic growth. However, net bilateral aid inflows do significantly influence economic growth, but only when there is a negative asymmetry change. Both positive and negative asymmetry changes in debt inflow significantly influence economic growth in the long run. In the short run, asymmetry changes in net official development assistance do significantly influence economic growth, however, only when there is a positive asymmetry change. When there are positive or negative asymmetry changes, net bilateral aid inflows do not significantly influence economic growth in the short run. Also, when there are positive asymmetry changes, debt inflows do not significantly influence economic growth. However, when there are negative asymmetry changes, debt inflows do significantly influence economic growth in the short run.

Providers of official capital should be observant of the capital absorptive capacity of the country's (Nigeria's) ability to utilize the official capital and work with the country to eliminate bottlenecks to aid official capital effectiveness. Also, policymakers should intervene to reduce the asymmetry in capital inflows and the associated effect of asymmetry changes on the economy. Investment guidelines would have a way of easing the information constraints - asymmetry and weakening unfounded prejudices.

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