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Dynamics of capital flight components and domestic investment in Nigeria

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ABSTRACT

Capital flight can cause challenges regarding the domestic availability of financial resources in sustaining domestic investment in Nigeria. The purpose of this study is to examine the connection between capital flight components and domestic investment in Nigeria. The study employed the autoregressive distributive lag model (ARDL) to analyze the time series data for Nigeria spanning from 1981 to 2018. The study found that changes in external debt, current account balance, and foreign direct investments have a negative effect on domestic investments in the short run and long run. Furthermore, the results obtained show that the intercept has a positive effect on domestic investment. The long-run coefficient of current account balance has a positive effect, while the other components of capital flight – foreign direct investment, external reserves and external debt – have a negative effect on domestic investment. The error correction coefficient is significant and conforms to the a priori expectation. Hence, the study concludes that growth in domestic investment can be achieved by regulating the components of capital flight within the desirable limits. The study recommends that emphasis should be placed on the components of capital flight to stimulate domestic investment for economic growth.

Contribution/Originality: The study extends the literature by examining the dynamics of capital flight components and domestic investment in Nigeria's developing economy. This study differs from other studies by disaggregating capital flight components. To date, little or no empirical research has employed the component method to examine capital flight and domestic investment in Nigeria.

1. INTRODUCTION

This international economy framework under the debt flight theory shows the ability of capital flight components to shift the level of domestic investment from a favorable to an unfavorable condition under a real adverse shock. To date, policy makers have mostly focused on how to stimulate domestic investment for the attainment of macroeconomic objectives. Domestic investment, which mostly comprises credit from the banking sector's infrastructure development (public investment), creates technological spillover, employment, production, exports and drives high growth rate. Usually, the increase in private investment provides high returns for investors, while the increase in public investment shows the improvement in infrastructure and reduces the cost of doing business. These roles of domestic investment allow foreign investors to reap the benefits of high returns from a favorable business environment.

Domestic investment is highly related to capital flight. Ndikumana, Boyce, and Ndiaye (2015); Yalta (2010) and Davis (2017) argue that the flow of scarce capital from developing countries to more developed countries worsens the domestic financing problems of the former. The outflow of capital from developing to advanced countries does not bring benefits to the origin's economy (Khan, 1987). As noted by Anyanwu (2012); Asongu and Nwachukwu (2016); and Asongu and De Moor (2017), investible capital in the financial market has become limited by excessive capital flight in most developing economies where the issue is prevalent. In Nigeria, for example, the government has been battling with the issue of huge capital flight. Collier, Hoeffler, and Pattillo (2001) reported that \$107 billion of government assets flowed out of Nigeria between 1970 and 2001. Net capital flight figures of approximately \$1.1 trillion in 1999 and \$8.8 trillion in 2011 were reported by the Central Bank of Nigeria (2015). Figure 1 shows the trend of capital flight in Nigeria between 1986 and 2018. There was a steady increase in capital flight between 1986 and 2012, followed by a drastic decline between 2012 and 2013; however, this has spiked again since 2014.

Amid the costs that capital flight brings, its possible connection with a significant loss of foreign capital and a greater ability to devalue the local currency may have serious consequences on domestic investment. Essentially, capital flight can cause more debt since there will be less local finance available to meet financial obligations and pay back existing debts (Hajer, Mounir, & Maamar, 2020). This default in payment of existing and new debts and the high motivation and commitment to reduce debt overhang government problems and constitute a reason for decreasing domestic investment in a country.

This study adds to the literature by shaping the factors that contribute to this incapability by stressing the role of capital flight components on domestic investment. Essentially, capital flight is viewed as a recurring stimulus for vulnerable economies to misuse their funds, become over-indebted, and increase internal and external deficits. Consequently, capital flight and the successive modifications are the foundation of a chain of macroeconomic, social, and political disturbances leading to fall in domestic investment and loss of access to domestic financial resources.

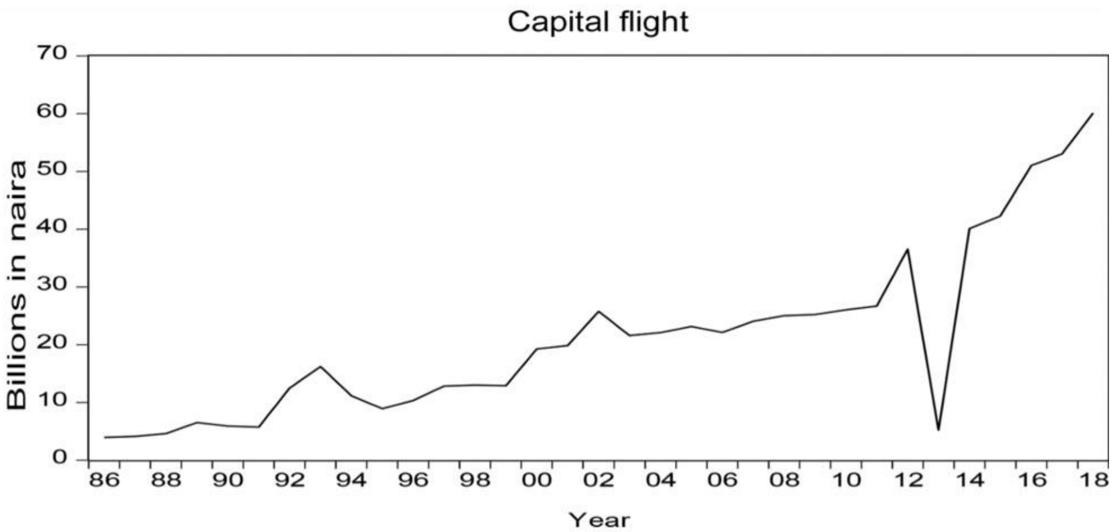

Figure 1. Capital flight in Nigeria, 1986–2020.

Earlier studies by Ajayi (2005); Williamson (1987) and Yalta (2010) suggest that differentiating between capital flows to developed countries and developing countries is vital to understanding capital flight. A few papers on capital mobility (e.g., Dooley, 1988) consider capital flow as legal capital and capital flight as illegal mobility of funds. Some research papers (Lensink, Hermes, & Murinde, 1998; Lensink & Cao, 2002; Morgan Guaranty Trust Company, 1986;

Schneider, 2003; The World Bank, 1985) focus on the different measures and determinants, while others focus on the relationship between capital flight and other macroeconomic outcomes, such as exchange rate and aid flows (Collier et al., 2001), severe debt (Boyce & Ndikumana, 2001; Cerra, Rishi, & Saxena, 2008), economic growth (Lawal et al., 2017), and financial liberalization (Lensink & Cao, 2002).

Past literature (Davis, 2017; Gankou, Bendoma, & Sow, 2016; Obeng-Odoom, 2017) argues that policy makers must synchronize the interconnection between capital flight and domestic investment. Yalta (2010) disaggregated investment into public and private and concluded that capital flight reduces private investment but found no evidence of its impact on public investment. Fofack and Ndikumana (2010) found that capital flight can stimulate domestic saving and investment in African countries. However, none of these studies provided evidence of the effect of capital flight components on domestic investment. For Nigeria, available studies (Adegbite & Adetiloye, 2013; Adetiloye, 2011; Ajayi, 2012; Ayadi, 2008) examine how capital flight affects macroeconomic outcomes using aggregated measure for capital flight.

From this standpoint, it is appropriate to focus on the effect of capital flight components on domestic investment by showing how capital flight can decrease the potential and actual domestic investment through diminishing financial resources. Capital flight may shift national financial distress into a debt repayment crisis.

This study further contributes to the literature by examining the link between domestic investment and the components of capital flight defined by The World Bank (1985). Specifically, we analyze the dynamics of domestic investment, foreign direct investment, foreign reserves and external debt in a unified framework with evidence from Nigeria. It is believed that the policy outcome of this study will also be useful to the government, analysts, and the public in general in tackling the negative effects of capital flight and its components on domestic investment in Nigeria.

The rest of the paper is set out as follows: Section two contains a review of the literature; Section three describes the data and methodology; Section four discusses the empirical results; and Section five concludes the study.

2. LITERATURE REVIEW

Large outflows of capital or assets from a given region or country is termed as capital flight (Ndikumana et al., 2015). Illicit capital outflow occurs when foreign investors send money home (repatriate it), or when money leaves their account and does not come back to support the host economy. Illegal capital flight avoids paying taxes to the government and may have negative effects on domestic investment as well as social and economic growth.

Capital flight can bring challenges regarding the local availability of financial resources in sustaining the desired level of domestic investment. Studies on the elements of domestic investment refer to the identification of domestic macroeconomic factors that analyze the increase of core disparities, and determine the weakening factors that precede the default and the indicators of domestic economic conditions (Abdullahi, Olaniyi, & Adekunle, 2018; Eichler, 2014; Giordani, Ruta, Weisfeld, & Zhu, 2017; Grandes, 2007; Kennedy & Palerm, 2014; Maltritz, 2012; Maltritz & Molchanov, 2013; Presbitero, Ghura, Adedeji, & Njie, 2016). Capital flight may stimulate domestic investment directly or indirectly; however, it presents a number of risks for struggling economies. When risk is not well monitored, it can cause shortages for the countries being trapped into domestic investment. Adverse financial situations, such as a discrepancy between a country's debt commitments and its income streams (fiscal imbalances), signify a capital flight crisis. The origins of these disparities can be diverse depending on what first prompted the capital flight.

Cheung and Steinkamp (2019) and Lorenzoni (2013) argue that capital flight can be influenced by systematic issues relating to a nation's fiscal and monetary position, by monetary policy committee news on domestic investment growth prospects, by capital flight to safety in international capital markets, or by the capacity to repay some domestic sector debt that has accumulated (Demachi, 2014).

More revealingly, the impact of capital flight components on the domestic investments of developing and emerging economies can be evaluated via its connection with other aggregate indicators of a country. One implication of capital flight is a reduction in domestic investments, hence economic growth decreases via a fall in the required financial assets for domestic investment financing (Lawanson, 2007). Many early studies confirm that capital flight causes foreign direct investment and external debt to deteriorate the fiscal balance (Cerra et al., 2008; Chipalkatti & Rishi, 2001). Furthermore, a large portion of foreign debt is re-exported in the form of capital flight, as suggested by the debt-driven capital flight hypothesis explained above (Chipalkatti & Rishi, 2001; Ljungwall & Zijian, 2008). Empirical studies on how capital flight and domestic investment abound in the literature are scanty. However, most of these studies have reported a negative and significant relationship between capital flight and domestic investment. However, the direction of the relationship varies significantly across countries, continents and regional blocks. Muchai and Muchai (2016) concluded that capital flight reduces investible funds needed for domestic investment. In the overview of the previous emerging economies' empirical findings in the 1990s and 2000s, Arellano (2008); Chatterjee & Eyigungor (2012); Gordon & Guerron-Quintana (2018); Greenwood, Hercowitz, & Huffman (1988); Mendoza & Yue (2012); and Tomz & Wright (2013) found that long-term debt and endogenous output decreases investment. Consequently, the relationship between productivity spreads, investment and borrowing are consistent with many features of small open economy business cycles. Their findings were consistent across many empirical findings in term of the direction of the relationship, which show a negative connection.

The empirical investigations of some authors (Aivazian, Ge, & Qiu, 2005; Dang, 2011; Khaw & Lee, 2016; Okuda & Nhung, 2012; Phan, 2018; You, Kim, & Ren, 2014; Zheng & Zhu, 2013) show that the choice of debt level and debt maturity affect domestic investment behaviors. The results signify that the level of debt significantly and negatively impacts domestic investment, but the maturity of debt is insignificantly related to the investment rate. External debts were found to be positively and significantly related to capital flight from sub-Saharan African countries, suggesting that capital flight was debt-fueled to a large extent in these countries (Ndikumana et al., 2015). Ndiaye (2009) found that capital flight was driven by public rulers through external debt and aid in the Franc Zone from 1970–2005. In the case of Nigeria, Ajayi (1992) did not find any evidence to support the hypothesis that disbursement of external debt influenced capital flight.

Yalta (2010) applied a dynamic panel methodology for twenty-two emerging market economies between 1975 and 2000 to investigate the effect of capital flight on investment and how it changes financial liberalization policies. The empirical findings indicate that capital flight reduces private investment dramatically but does not have any effect on public investment. However, no statistically significant impact of financial liberalization on the marginal effect of capital flight on investment is found. Recent empirical literature (Fofack & Ndikumana, 2010; Kedir, 2015) indicates that capital flight reduces tax revenue through cross-border tax evasion, which, in turn, reduces domestic investment. These authors also found that African countries with higher capital flight tend to have lower tax revenue and lower domestic investment.

However, there is no evidence regarding the dynamics of capital flight, external debt and domestic investment in the case of Nigeria, and most empirical studies are based on a panel data analysis, hence there is a need for a specific country analysis.

3. DATA AND METHODOLOGY

3.1. Data

Empirical literature on capital flight theory suggests several factors that can constitute capital flight. The World Bank (1985) and Erbe (1985) applied a measure of capital flight (CFWB), which they equal to the change in the level of external debt (CEXDET) plus net direct foreign investment (NDFI) minus the current account deficit (CAD) and foreign reserves (CFR): Capital Flight World Bank (CFWB) = CEXDET + NDFI – CAD – CFR (see (Muchai & Muchai, 2016; Ndikumana & Boyce, 2003)). We adopt this formula and use its constituent elements to examine their impact on investment. We employ annual time series data for the Nigerian economy from 1986 to 2018; we limit the scope to the periods in which capital flight was predominant in the country.

The data for domestic investment and other components that constitute capital flight are needed. The model takes into account current account balance, foreign direct investment, external reserve, and external debt. The results indicate that all series are positively skewed, except for the current account balance, which is skewed to the left. Domestic investment (DOI) is largely leptokurtic, which indicates outliers that may generate heteroskedasticity and thus we reject the null of normality for all series. There is a correlation between DOI and the capital account components. Table 1 shows the deterministic characterization of the variables, and Table 2 defines the variables and shows the sources from which they were obtained.

To overcome some of the observed methodological challenges of past studies, this study examines the relationship between capital flight and domestic investment in Nigeria using the autoregressive distributed lag (ARDL) technique. This method was used because it can forecast long-run relationships from short-run dynamics. The obvious difference to other methodology is that the ARDL does not impose a priori exogeneity assumptions on the variables to be tested. It corrects the lapses often associated with the ordinary least squares (OLS) and makes the results of the study more robust.

3.2. Methodology

Koyck (1954) estimated the dynamics of capital flight components and domestic investment based on flexible accelerator theory. This study adopted the ARDL approach to show how past economic variables transfer into the current for some series. The ARDL model is considered the major workhorse in dynamic single-equation regression stages (Hassler & Wolters, 2005). As noted by Duasa (2007) and Kennedy (2008), the approach has three main advantages in dynamic modeling: (a) it relaxes the stochastic constraint that all data should be stationary and allows I(0) or I(1) orders of integration, or even fractionally integrated variables; (b) its hypothesis testing is relatively efficient in the case of small sample sizes; and (c) it provides unbiased estimates of long- and short-run relationships (Harris & Sollis, 2003).

Before we estimate the ARDL model, we test for the presence of unit root in our time series in order to verify the stochastic property of the data generating process (DSG) and avoid spurious regressions. The augmented Dickey–Fuller (Dickey and Fuller, 1981) test was used to verify the stationarity (or otherwise) for each times series, x_t, denoted in Table 1 as DOI, CAB, FDI, RSV, and DEBT, which are the natural logarithms for domestic investment, current account balance, foreign direct investment, foreign reserve, and external debt, respectively. Each x_t is assumed to be generated from a data-generating process (DGP) of a representative ADF regression, denoted in Equation 1 as:

$$x_t = a_0 + \varphi x_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta x_{t-i} + \Omega_t \quad (1)$$

Table 1. Deterministic characterization of the variables.

Variable	Panel 1				Panel 2		Panel 3					
	Statistical property				Normality test		Correlation matrix					
	Mean	Std. dev.	Skewness	Kurtosis	Jarque–Bera	Prob.	Variable	DOI	CAB	FDI	RSV	DEBT
DOI	11.807	6.217	1.633	6.517	39.356	0.000	DOI	1.000	-0.422	0.355	0.547	-0.230
CAB	0.221	0.067	2.006	1.808	18.426	0.000	CAB		1.000	-0.137	0.242	0.490
FDI	4.673	7.185	-1.045	2.711	57.610	0.000	FDI			1.000	-0.097	-0.146
RSV	16.248	1.999	1.296	4.656	16.172	0.000	RSV				1.000	0.584
DEBT	1040.976	1410.787	1.554	4.118	18.643	0.000	DEBT					1.000

Table 2. Definition and source of the variables.

Variable		Definition	Sign	Justification	Source
Dependent	Domestic investment (DOI)	DOI consists of outlays in addition to the fixed assets of the economy plus net changes in the level of inventories.	NA	Were (2015); Zahongo (2016)	World Development Indicators (WDI)
Independent	Current account balance (CAB)	CAB measures the import and export of goods and services, payments made to foreign holders of a country's investment, and payments received from investments abroad. This is expected to reduce capital flight and hence increase domestic investment.	(+)	Adegbite and Adetiloye (2013); Ndikumana et al. (2015)	WDI
	Foreign direct investment (FDI)	FDI is an investment in the form of a controlling ownership of a business in one country by an entity based in another country. Williamson (1987) notes that capital, or FDI, flows outward from developing countries and increases capital flight. As FDI increases, capital flight also increases and domestic investment will decrease.	(-)	Abdullahi et al. (2018)	WDI
	External reserve (RSV)	RSV is money or other assets held by a central bank or other monetary authority used to pay its liabilities. Following the World Bank's definition, an increase in reserve will reduce capital flight as more investors develop confidence in the domestic economy and, therefore, domestic investment will increase.	(+)	Adetiloye (2011)	WDI
	External debt (DEBT)	DEBT is the total debt a country owes to foreign creditors. We apply the debt ratio, which is the total external debt divided by gross domestic product. Capital flight erodes the tax base, so there is an increased need for external borrowing. If the required foreign borrowing persists, external debt will mount and debt services will increase. This will reduce the investible funds for the domestic financial market and could result in a debt crisis.	(-)	Ayadi (2008); Davis (2017)	Central Bank of Nigeria (CBN)

Note: NA means not available.

The null hypothesis is $H_0: \varphi = \sum_{i=1}^{p} \varphi_j = 1$, and Equation 1 is estimated with ordinary least squares (OLS).

The maximum lag length is p, $\varphi = \sum_{i=1}^{p} \varphi_i$; $\delta_i = -\sum_{j=i+1}^{p-1} \varphi_j$; $i = 1, 2, \ldots, p-1$, and Ω_t is the white noise process. The null provides consistent estimators of the coefficients of Equation 1, and a test of $\varphi = 1$ can be constructed as: $\tau_\mu = \hat{\varphi}_T - 1/se(\hat{\varphi}_T)$; where *se* $(\hat{\varphi}_T)$ is the standard error attached to the estimate $\hat{\varphi}_T$. The ADF critical value (CV) (or ADF_α) is generated from a limiting distribution.

As a follow-up to the unit root test, we apply the ARDL approach to analyze if the lagged of the dependent variable (y_{t-i}) and the current (x_t) and past (x_{t-i}) of each explanatory variable has a significant influence on the current y_t. The general form of an ARDL $(p, s_1, \ldots, s_M)$ to be estimated is:

$$\mathrm{y_t} = \beta_0 + \sum_{i=1}^{p} \varphi_i \, \mathrm{y}_{t-i} + \sum_{j}^{m} \beta_j \, x_{j,t} + \sum_{j}^{m} \tilde{\beta}_{j,i} \, x_{j,t-i} + a_t \tag{2}$$

The estimates of the long-run relationship between y_t and x_t (denoted as, $\hat{\theta}_j$) from Equation 2 is:

$$\hat{\theta}_j = \left(\frac{\partial y_t}{\partial x_t}\right) = \hat{\beta}_j / (1 - \Sigma_{i=1}^{p} \hat{\varphi}_i) \tag{3}$$

Equation 4 presents the specific ARDL model that analyzes if the lagged of domestic investment and if the current and past capital flight components have a contemporaneous significant influence on the exogenous current $\mathrm{DOI_t}$ as follows:

$$\mathrm{DOI_t} = \beta_0 + \varphi_i \mathrm{DOI}_{t-i} + \beta_1 CAB_t + \beta_2 FDI_t + \beta_3 RSV_t + \beta_4 DEBT_t + \sum_{j}^{m} \tilde{\beta}_{j,i} \, \mathrm{CAB}_{t-i}$$

$$+ \sum_{j}^{m} \tilde{\beta}_{j,i} \, \mathrm{FDI}_{t-i} + \sum_{j}^{m} \tilde{\beta}_{j,i} \, \mathrm{RSV}_{t-i} + \sum_{j}^{m} \tilde{\beta}_{j,i} \, \mathrm{DEBT}_{t-i} + \varepsilon_t \tag{4}$$

We use the Akaike information criterion (AIC) to select our optimal lag in estimating Equation 5:

$$\mathrm{AIC} = \left(\ln |\, S_k|^2 + \frac{2q^2 k}{T}\right) \quad k = 1, 2, \ldots, m \tag{5}$$

Where, q is the number of variables, m is the maximum lag, and S_k is the residual covariance matrix of Equation 4 for lag k, and T is the length of the time series.

Once we estimate Equation 4, the next step is to analyze if there are long-run (equilibrium) relationships between variables that identify as I(0) or I(1). We apply the ARDL (cointegration) bounds test procedure developed by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). Greene and Villanueva (1991) observed that the test is robust when the unit root test contains series that are integrated of order I(0) or I(1). In general terms, the bounds test checks for cointegration in Equation 2 with the null $(H_0: \varphi(1) = \beta_j = 0,\ j = 1 \text{ to } m)$ by estimating another ARDL regression for $\Delta \mathrm{y}_t$ as:

$$\Delta \mathrm{y}_t = \alpha_0 + \varphi_i \mathrm{y}_{t-i} + \sum_{j=1}^{m} \beta_j \, x_{j,t-1} + \varphi^*(B) \Delta y_{t-1} + \sum_{j=0}^{m} \gamma_j \, (B) \Delta x_{j,t-1} + a_t \tag{6}$$

The null hypothesis is that that there is no cointegration (i.e., no long-run relationship) and Δ is the difference operator, that is, $\Delta \mathrm{y}_t = \mathrm{y}_t - \mathrm{y}_{t-i}$, for i = 1 to m. Note that Equation 6 is a reparametrized form of Equation 2. We estimate Equation 6 with usual OLS, and the F-statistic is computed and compared with the asymptotic critical bounds value (CBV). Pesaran et al. (2001) proposed two sets of CBVs consistent with the polar cases of all variables being purely I(0) or purely I(d), where d is the order of integration. If the test statistic is greater than the upper CBV, the null is rejected, meaning that cointegration exists. When the test statistic is less than the lower CBV, the null is not rejected, and it is concluded that cointegration does not exist.

If cointegration exists, we estimate the cointegrating regression. Engle and Granger (1987) stated in the Granger representation theorem that the cointegration of non-stationary variables is equivalent to an error correction model (ECM) (Hassler & Wolters, 2005). In differencing a linear combination of the I(0) or I(1), all variables are transformed equivalently into an error correction term (see Equation 7). In the estimation processes to obtain the ECM or cointegrating regression, the general ARDL (Equation 6) is again transformed to include the EC term, $ec_t = \left(y_t - \theta_0 - \sum_{j=1}^{M} \theta_j \, x_{jt}\right)$ and $\varphi^*(B) = \sum_{i=1}^{p} \varphi_i \, B^i$ as:

$$\nabla y_t = \beta_0 + \varphi^*(B)\Delta y_{t-1} + \sum_{j=1}^{m} \beta_j \,(B) x_{j,t} + \sum_{j=0}^{m} \gamma_{j,i} \,(B) \Delta x_{j,t-i} - \mu ECM_{t-1} + \varepsilon_t \tag{7}$$

The cointegrating regression in Equation 7 gives estimates for short- and long-run dynamics. The model expresses the current change in the endogenous variable, $\Delta \mathrm{y_t}$, as a linear function of the current change in the exogenous variable, $\Delta \mathrm{x_t}$, and a proportion $1 - \varphi$ of the previous error from the long-run "equilibrium" relationship. $\beta_j(B)'s$ denote the long-run coefficients which represent the equilibrium effects of the explanatory variables, $\mathrm{x_t}$, on the change in the dependent variable, $\Delta \mathrm{y_t}$. The $\tilde{\beta}_j's$ are the short-run coefficients which account for fluctuations that are not determined by deviations from the long-run equilibrium. The sign and degree (absolute value) of μ, the coefficient of one lagged error correction term, indicates the speed of convergence.

The t-test on the short-run coefficients, $\gamma_{j,i}$, shows the impact of each variable on the dependent variable in the short run. But a t-test on a properly (negative) signed μ (adjustment speed) confirms the existence of long-run equilibrium. Also, the existence of a long-run relationship between the variables indicates that there is Granger causality in at least one direction. We can use this ECM equation to test for the existence of both long-run (Granger type) and short-run causality in the model. In particular, an F-test on the joint significance of explanatory variables of the cointegrating regression indicates the existence of a short-run causal effect, while a t-test on the coefficient of the lagged error correction term shows the existence a long-run causal effect.

Lastly, we examine the validity and reliability of the estimated ARDL model by carrying out Breusch–Godfrey serial correlation and white heteroscedasticity tests, which are both based on chi-square ($\chi 2$) tests. In each case, if the computed $\chi 2$ statistics are lower than the chosen significance level, it indicates the presence of serial correlation and heteroscedasticity. Since Pesaran et al. (2001) noted that the stability of error correction models should be subjected to graphical investigation, we present the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ). The stability of the estimated coefficients is confirmed if the values of both tests remain within the critical values at 5%.

3.3. A Priori Expectation

The a priori expectation shows the theoretical expectation of the coefficient:

$$\varphi > 0 \quad \beta_1 > 0 \; \beta_2 < 0 \; \beta_3 > 0 \; \beta_4 < 0$$

4. EMPIRICAL RESULTS

4.1. ADF Unit Root Test

The results of the stationarity tests (see Table 1) show that the ADF tests reject the null of non-stationarity for DEBT, CAB and RSV in favor of the alternative. Since this is surprising, the results are verified using the Phillips–Perron (PP) and Dickey–Fuller (DF) generalized least squares (GLS) tests, and the results confirm stationarity for the DEBT variable but could not establish the same for the other two, leaving the conclusion that all variables except DEBT are non-stationary and integrated. There is evidence, however, that these variables are stationary at first difference, I(1). Since the ARDL bounds test is based on the assumption that the series must be I(0) or I(1), we present the cointegration (bounds) test results in Table 4.

Table 3. Unit root test results.

Variable	ADF				DFGLS				PP				Result
	τ	1%	5%	P	τ	1%	5%	P	τ	1%	5%	P	
DOI	-1.426	-3.433	-3.544	0.558	-1.195	-2.566	-1.941	0.283	-2.384	-3.433	-2.863	0.319	Non-stationary
DEBT	-5.733	-3.433	-3.544	0.002*	-6.582	-2.566	-1.941	0.000	-4.559	-3.433	-2.863	0.000	Stationary
FDI	-1.066	-3.433	-3.544	0.731	0.815	-2.566	-1.941	0.415	-1.718	-3.433	-2.863	0.422	Non-stationary
CAB	-4.017	-3.433	-3.544	0.019*	-1.742	-2.566	-1.941	0.458	-1.677	-3.433	-2.863	0.850	Non-stationary
RSV	-4.558	-3.433	-3.544	0.012*	-1.166	-2.566	-1.941	0.244	-2.267	-3.433	-2.863	0.183	Non-stationary
DOI	-2.155	-3.962	3.548	0.252	-1.822	-3.480	-2.890	0.687	-1.472	-3.962	-3.412	0.182	Non-stationary
DEBT	-6.086	-3.962	3.548	0.000	-5.387	-3.480	-2.890	0.005	-4.918	-3.962	-3.412	0.001	Stationary
FDI	-1.574	-3.962	3.548	0.000	-2.328	-3.480	-2.890	0.451	-1.571	-3.962	-3.412	0.097	Non-stationary
CAB	-3.017	-3.962	3.548	0.000	-2.084	-3.480	-2.890	0.511	-1.619	-3.962	-3.412	0.641	Non-stationary
RSV	-5.558	-3.962	3.548	0.000	-1.918	-3.480	-2.890	0.235	-1.914	-3.962	-3.412	0.219	Non-stationary
ΔDOI	-11.766	-3.433	-2.951	0.000	21.673	-2.566	-1.941	0.000	-3.225	-3.433	-2.863	0.001	Stationary
ΔDEBT	-21.500	-3.433	-2.951	0.000	-44.854	-2.566	-1.941	0.001	-23.709	-3.433	-2.863	0.000	Stationary
ΔFDI	-21.699	-3.433	-2.951	0.000	-32.161	-2.566	-1.941	0.000	-22.056	-3.433	-2.863	0.000	Stationary
ΔCAB	-30.160	-3.433	-2.951	0.000	-30.195	-2.566	-1.941	0.000	-16.543	-3.433	-2.863	0.000	Stationary
ΔRSV	-13.258	-3.433	-2.951	0.000	-24.183	-2.566	-1.941	0.000	-30.961	-3.433	-2.863	0.000	Stationary
ΔDOI	-11.766	-3.962	3.548	0.000	-14.143	-3.480	-2.890	0.001	-24.582	-3.962	-3.412	0.000	Stationary
ΔDEBT	-15.497	-3.962	3.548	0.000	-19.411	-3.480	-2.890	0.000	-23.838	-3.962	-3.412	0.000	Stationary
ΔFDI	-8.183	-3.962	3.548	0.000	-14.150	-3.480	-2.890	0.000	-32.097	-3.962	-3.412	0.000	Stationary
ΔCAB	-10.154	-3.962	3.548	0.000	-12.662	-3.480	-2.890	0.000	-16.533	-3.962	-3.412	0.000	Stationary
ΔRSV	-13.296	-3.962	3.548	0.000	-18.940	-3.480	-2.890	0.002	-12.135	-3.962	-3.412	0.000	Stationary

Note: ADF: MacKinnon (1996) one-sided p-values; ERS_{α}: Elliott, Rothenberg, and Stock (1996); and PP: Phillips–Perron; * indicates significance where other tests do not. The null hypothesis (H_0) = non-stationarity is same for all three tests.

4.2. The ARDL Model

In the ARDL approach, after the unit root test, the next stage is to estimate the ARDL model with the I(0) or I(1) variables. This ARDL model will later be used to verify the existence or otherwise of cointegration based on the bounds test approach. In doing this, we note that the lag length of the five variables selected by the AIC provides the ARDL (1, 2, 2, 3, 3) specification described by Equation 8 or Equation 9. To estimate Equation 9, the ARDL dynamic model ignores the *"I(1)*-ness" of the unit root series (DOI and FDI) and estimates the non-stationary series with the usual OLS. Table 3 presents the results of the unit root tests.

$$\mathrm{DOI_t} = \beta_0 + \varphi_1 \mathrm{DOI_{t-1}} + \beta_1 CAB_{j,\mathrm{t}} + \beta_2 FDI_{j,\mathrm{t}} + \beta_3 RSV_{j,\mathrm{t}} + \beta_4 DEBT_{j,\mathrm{t}} + \sum_1^2 \tilde{\beta}_{j,1}\,\mathrm{CAB}_{\mathrm{t}-i}$$

$$+\textstyle\sum_1^2 \tilde{\beta}_{j,2}\,\mathrm{FDI}_{\mathrm{t}-i} + \sum_1^3 \tilde{\beta}_{j,3}\,\mathrm{RSV}_{\mathrm{t}-i} + \sum_1^3 \tilde{\beta}_{j,4}\,\mathrm{DEBT}_{\mathrm{t}-i} + \varepsilon_t \quad (8)$$

$$\mathrm{DOI_t} = \beta_0 + \varphi_1 \mathrm{DOI_{t-1}} + \beta_1 CAB_{j,\mathrm{t}} + \beta_2 FDI_{j,\mathrm{t}} + \beta_3 RSV_{j,\mathrm{t}} + \beta_4 DEBT_{j,\mathrm{t}} + \tilde{\beta}_{1,1}\,\mathrm{CAB_{t-1}}$$
$$+\tilde{\beta}_{2,1}\,\mathrm{CAB_{t-2}} + \tilde{\beta}_{2,1}\,\mathrm{FDI_{t-1}} + \tilde{\beta}_{2,2}\,\mathrm{FDI_{t-2}} + \tilde{\beta}_{3,1}\mathrm{RSV_{t-1}} + \tilde{\beta}_{3,2}\mathrm{RSV_{t-2}}$$
$$+\tilde{\beta}_{3,3}\mathrm{RSV_{t-3}} + \tilde{\beta}_{4,2}\mathrm{DEBT_{t-2}} + \tilde{\beta}_{4,3}\mathrm{DEBT_{t-3}} + \varepsilon_t \quad (9)$$

The coefficients of the model are presented in Table 4.

Table 4. ARDL model (DOI).

Coefficient		Std. error	T-stat.	Prob.
β_0	1.1448	2.0053	0.5003	0.40004
φ_1	-1.3521	0.2127	-6.3561	0.0000
β_1	0.2483	0.0615	4.0341	0.0012
β_2	-0.1568	0.3116	-0.5034	0.6225
β_3	-0.5441	0.1316	-4.1347	0.0010
β_4	-0.0410	0.0474	-0.8640	0.4022
$\tilde{\beta}_{1,1}$	-0.2340	0.0621	-3.7704	0.0021
$\tilde{\beta}_{1,2}$	-0.1200	0.0441	-2.7236	0.0165
$\tilde{\beta}_{2,1}$	0.3875	0.1096	3.5350	0.0009
$\tilde{\beta}_{2,2}$	1.1565	0.2338	4.9469	0.0050
$\tilde{\beta}_{3,1}$	0.4119	0.1085	3.7971	0.0020
$\tilde{\beta}_{3,2}$	0.2713	0.0873	3.1070	0.0077
$\tilde{\beta}_{3,3}$	0.1831	0.0644	2.8415	0.0131
$\tilde{\beta}_{4,2}$	-0.0462	0.0257	-1.7991	0.0936
$\tilde{\beta}_{4,3}$	-0.0357	0.0217	-1.6454	0.1221
No. of observations	32			
$\bar{R}^2$	0.8949			
AIC	5.0321			
Durbin–Watson statistic	2.0901			
F-statistic	3.2131			
Prob(F-statistic)	0.0016			

The results show that the coefficients of the lag values for domestic investment, φ_1; foreign direct investment, β_2; external reserve, β_3; and external debts, β_4 all have a negative influence on domestic investment. Also, an increase in one and two lag periods of the current account balance, $\tilde{\beta}_{1,1}$ and $\tilde{\beta}_{1,2}$, will reduce investment in the economy. The one lag period for external debt was zero and hence was removed by the model. An increase in the second and third lag periods of external debt, $\tilde{\beta}_{4,2}$, and $\tilde{\beta}_{4,3}$, respectively, reduces domestic investment. The other attendant variables and their corresponding lags are directly proportional to domestic investment.

For each specific component of capital flight, as expected, the previous value of domestic investment has a significant effect on the current value. Its coefficient, φ_1, is negative, an indication that a 1% increase in previous domestic investment may reduce the current year's investment by approximately 14%. The effect of a 1% rise in the current account balance, CAB_t, on domestic investment is positive and significant at 5%. Also, a 1% percent rise in CAB_{t-1} leads to an approximate reduction of 23% in domestic investment. A change in CAB_{t-2} in the two period lags indicates a direct relationship with domestic investment. The CAB_{t-3} effect was inconsequential on DOI. Mendoza and Yue (2012) observed that the relationship between external balance, investment and borrowing is consistent with many features of a small open economy business cycle. Muchai and Muchai (2016) concluded that capital flight reduces investible funds needed for domestic investment for emerging opened economies in the 1990s and 2000s.

Gordon and Guerron-Quintana (2018) found that long-term debt and endogenous output decreases investment. Our results support Tomz & Wright (2013) and show that the effect of the immediate two past lags in external debt on domestic investment is negative. It also shows that a 1% rise in one lag of $DEBT_{t-1}$ has no effect on domestic investment, all things being equal. However, a change in external debt into the third period of $DEBT_{t-3}$ lags also indicates a negative relationship with domestic investment. This finding is consistent with some previous studies.

The effect of foreign reserve on the immediate past exerts an expected positive effect on domestic investment. It shows that a 1% rise in RSV leads to an approximate increase of 41% in domestic investment. Moving RSV into two and three period lags also indicates a positive relationship with DOI. A 1% increase in RSV in lag two and three leads to respective increases in domestic investment of $\tilde{\beta}_{3,2}$ (27%) and $\tilde{\beta}_{3,3}$ and (18%). FDI moved into the immediate past period has a negative and non-significant effect on domestic investment. The negative relationship indicates that a 1% increase in FDI will lead to a 15% reduction in DOI. From the empirical analysis of the components that make up capital flight, it is obvious that RSV influences domestic investment most because a 1% increase in RSV leads to an increase in DOI of 41% and a 1% rise in CAB leads to a 23% increase in DOI.

Regarding statistical significance, $\varphi_1, \beta_1, \beta_3,$ and all the lag terms for the 12 variables, except the third lag of external debt, $\tilde{\beta}_{4,3}$, are statistically significant at 5%, while the coefficient $\tilde{\beta}_{4,2}$ is significant at 10%. However, the intercepts $\beta_0, \beta_2,$ and β_4 are not statistically insignificant and can be eliminated. Largely insignificant and inconsequential lags are not reported by the AIC. The F-test has indicated that the overall model is highly significant. Each significant variable is statistically different from zero, and the explanatory power of the independent variable is potent, as the regression for the underlying ARDL equation fits very well at approximately 89%. Since the long-run relationship as well as the variables that influence DOI have been established, it is paramount to also estimate the short-run dynamics of the variables in relation to DOI in order to obtain the speed of adjustment between DOI and other variables.

4.3. Cointegration (Bounds) Test

The next step is to verify if cointegration exists among these variables, whose dynamic relationships are presented by the results of the bounds test in Table 5. If cointegration exists, the necessary transformation is performed to obtain the estimates of the long-run coefficients from the ARDL (1, 2, 2, 3, 3) specification in Table 5. To check for the existence of cointegration between DOI and the attendant variables (CAB, FDI, RSV and DEBT), we conduct an F-test for the joint significance of coefficients of the model, which has a non-standard asymptotic distribution under the null of no cointegration.

Table 5. ARDL (cointegration) bounds test.

Test statistic	Value	*M*
F-statistic	8.582	5
Significance	I(0) Bound	I(1) Bound
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06
CBV (5%)	I(0): 2.86	I(1): 4.01

With AIC as the choice criteria for the model selection, we set the maximum lag order at $m = 5$, eliminate the insignificant order lag terms, and an ARDL (1, 2, 2, 3, 3) is selected from the five possible equations. We fit Equation 4 with domestic investment and other I(0) or I(1) variables.

The F-statistic, which tests the joint null ($\varphi_i = \beta_i = \tilde{\beta}_{j,i} = 0$) produced a value of 8.582, which exceeds the 5% and 1% CBVs of 2.86 and 3.74, respectively, thus providing a strong rejection of the null of no cointegration. This means that a long-run cointegration relationship exists among the variables in Equation 4.

4.4. Long-run Coefficients

Once cointegration is established, the conditional ARDL (1, 2, 2, 3, 3) long-run model for DOI is presented. From Equation 8, the long-run coefficient for the model is obtained by normalizing the DOI as:

$$\mathrm{DOI_t} = \frac{\beta_0}{1-\varphi_1} + \frac{\beta_1}{1-\varphi_1}CAB_\mathrm{t} + \frac{\beta_2}{1-\varphi_1}FDI_\mathrm{t} + \frac{\beta_3}{1-\varphi_1}RSV_\mathrm{t} + \frac{\beta_4}{1-\varphi_1}DEBT_\mathrm{t} \quad (10)$$

$$\mathrm{DOI_t} = \beta_0^* + \beta_1^* CAB_\mathrm{t} + \beta_2^* FDI_\mathrm{t} + \beta_3^* RSV_\mathrm{t} + \beta_4^* DEBT_\mathrm{t}$$

$\beta_i^* = \beta_i/1 - \varphi_1$; for all $i = 0$ to 4

The long-run coefficients are presented in Table 6.

Table 6. Long-run coefficients.

Coefficient		T-stat.	Prob.
β_0^*	0.48671	0.1403	0.0004
β_1^*	0.10556	0.0341	0.0007
β_2^*	-0.06666	-0.0480	0.0041
β_3^*	-0.23133	-0.1877	0.0000
β_4^*	-0.01743	-1.5034	0.0000

Note: * represents the significance of the coefficient at the 1% level.

The results show that the intercept has a positive effect on domestic investment. The long-run coefficient of the current account balance has a positive effect, while the other components of capital flight – foreign direct investment, external reserves and external debt – have a negative effect on domestic investment. Except for external debt, β_4^*, all the long-run coefficients are highly significant at 1%. There is at least 88% confidence that the external debt coefficient, β_4^*, is statistically different from zero.

The non-significance of change in external debt with DOI signifies that the debt obtained during the period of the study was inappropriately utilized because it is expected that debt of any nature should consolidate DOI. Hence, the debt obtained was siphoned out of the country as part of capital flight, which negatively impacted DOI (Abdullahi et al., 2018).

4.5. Short-run Coefficients

Following the procedure in Equation 7, we obtain the short-run dynamic by estimating the cointegrating regression to capture the error correction model associated with the long-run estimates. The equation where the null hypothesis of no cointegration is rejected is estimated with an error correction term. Equation 7 provides the general ARDL ECM equation. Following appropriate reparameterization, we estimate the cointegrating regression short-run coefficients of the effect of capital flight components on domestic investment, with the AIC as the lag selector. The short-run model estimated is:

$$\mathrm{DOI_t} = \sum_{1}^{3} \gamma_{1,j}\, \Delta\mathrm{CAB}_{\mathrm{t}-i} + \sum_{0}^{2} \gamma_{2,j}\, \Delta\mathrm{FDI}_{\mathrm{t}-i} + \sum_{0}^{3} \gamma_{3,j}\, \Delta\mathrm{RSV}_{\mathrm{t}-i}$$

$$+\sum_{0}^{3}\gamma_{4,j}\,\Delta\mathrm{DEBT}_{t-i}-\mu\mathrm{ECM}_{t-1}+\varepsilon_t \tag{11}$$

The $\gamma'_{4,j}s$ are the short-run dynamic coefficients of the model's convergence to long-run equilibrium, and μ is the speed of adjustment on account of any perturbation or disequilibrium. The estimated results of the short-run dynamic coefficients associated with the long-run relationships are given in Table 7.

The signs of the short-run dynamic effects are sustained in the long-run. The coefficient of the lagged error correction term is significant at the 1% level with the expected sign, which confirms the result of the bounds test for cointegration. In the short run, all of the changes in the lag terms are significant at 10% except for external debt and the two lag period for current account.

The equilibrium correction coefficient, -0.84 (0.0011), is highly significant and has the anticipated sign, specifying a high speed of adjustment to equilibrium after a shock. Approximately 84% of disequilibria from the previous year's shock converge to the long-run equilibrium in the current year.

Table 7. Estimated short-run coefficients using the ARDL approach.

Variable	Estimated coefficient		Std. error	t-stat.	Prob.
ΔCAB_{t-1}	$\gamma_{1,1}$	-0.1012	0.053862	-1.879449	0.07302
ΔCAB_{t-2}	$\gamma_{1,2}$	-0.0381	0.046307	-0.82082	0.4255
ΔCAB_{t-3}	$\gamma_{1,3}$	-0.0931	0.037507	-2.484538	0.0156
ΔFDI_{t-1}	$\gamma_{2,1}$	-0.7756	0.209863	-3.696073	0.0005
ΔFDI_{t-2}	$\gamma_{2,2}$	-0.4620	0.155457	-2.972439	0.0054
ΔRSV	$\gamma_{3,0}$	-0.0722	0.054922	-1.315763	0.2094
ΔRSV_{t-1}	$\gamma_{3,1}$	0.1270	0.065873	1.929246	0.02442
ΔRSV_{t-2}	$\gamma_{3,2}$	0.1024	0.06298	1.626262	0.0992
ΔRSV_{t-3}	$\gamma_{3,3}$	0.1767	0.064029	2.760497	0.0093
$\Delta DEBT$	$\gamma_{4,0}$	-0.0307	0.020763	-1.482383	0.1604
$\Delta DEBT_{t-1}$	$\gamma_{4,1}$	0.0297	0.022266	1.336822	0.2026
$\Delta DEBT_{t-3}$	$\gamma_{4,3}$	-0.0332	0.021036	-1.581943	0.1364
ECM_{t-1}	μ	-0.8437	0.208781	-4.041076	0.0000

4.6. Diagnostic Tests

To test the validity and reliability of the ARDL model, we present the Breusch-Godfrey serial correlation and the white heteroscedasticity diagnostic tests based on the residuals of the ARDL model. We also investigate the stability of the model by presenting the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ). The regression for the underlying ARDL model passes the diagnostic tests against serial correlation and passed the heteroscedasticity test at 5%. The heteroscedasticity test also shows a P-value of 52% for the observed R^2, meaning that the null hypothesis that the residuals have no autoregressive conditional heteroskedasticity (ARCH) effect cannot be overruled. All tests confirmed that the model is robust for policy consideration.

The Breusch–Godfrey serial correlation LM test shows a P-value of 7% for the observed R^2, which means that we cannot scrap the null that the residuals are not serially correlated. Not enough evidence was found to reject the normality null that the stochastic errors are normally distributed, with a high p-value of 0.629. The CUSUM and CUSUMSQ plots (Figure 2 and Figure 3, respectively) fall inside the critical bands (red lines), indicating stability in the long-run coefficients.

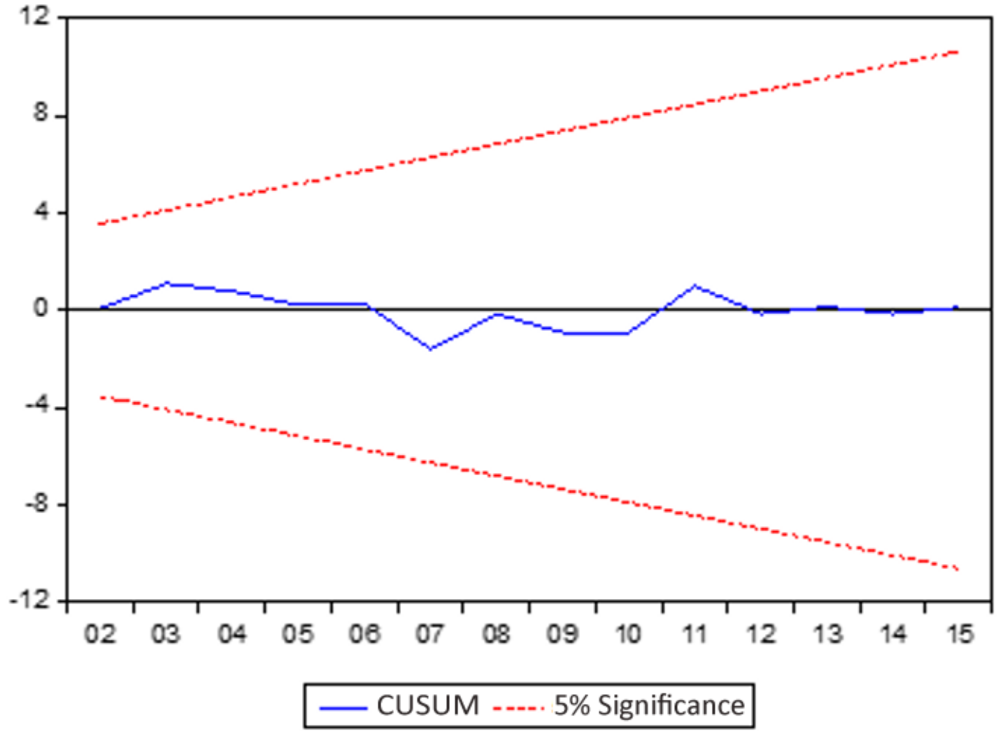

Figure 2. Cumulative sum of recursive residuals.

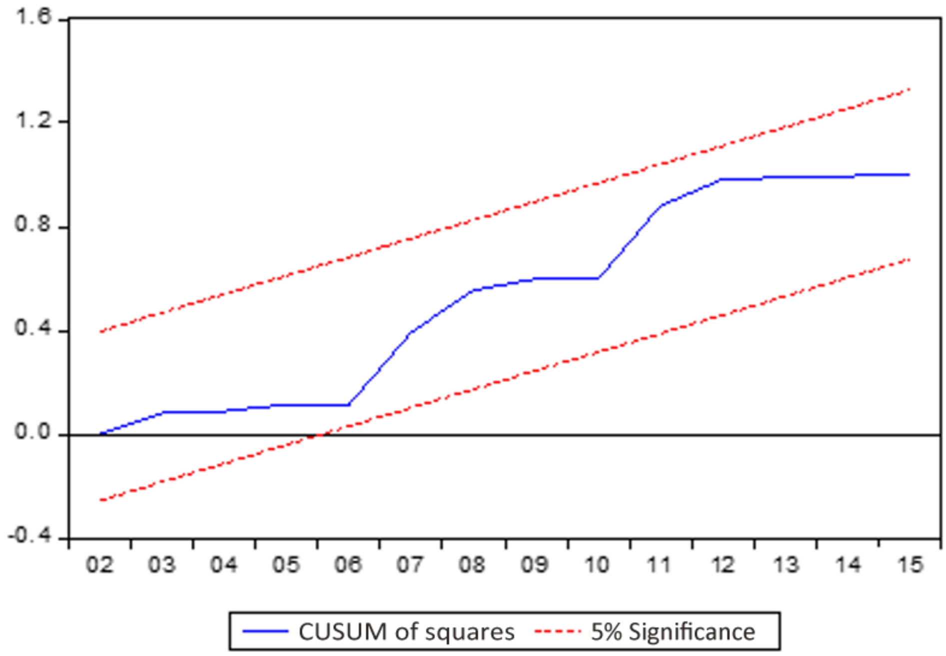

Figure 3. Cumulative sum of squares of recursive residuals.

Table 8. Diagnostic test for ε_t.

Statistic	Breusch–Pagan–Godfrey (Heteroskedasticity test)	Breusch–Godfrey (Serial correlation LM test)
	Null (H_0): No ARCH effect	Null (H_0): No serially correlated
R^2	1.3195	5.4067
F-statistic	0.6211	1.2199
Prob.(F)	0.5448	0.3294
Prob.(Chi-square)	0.5170	0.0670

Table 8 contains the diagnostic test results for ε_t.

5. CONCLUSIONS

This study provides meaningful insights into the connection between capital flight and domestic investment in Nigeria by extending the flexible accelerator theory developed by Koyck (1954). The study established that change in external debt, change in external reserves, foreign direct investments, and current account balance influence domestic investments. The study shows that change in external debt, current account balance and foreign direct investment adversely influence domestic investment, while change in external reserves influences domestic investments positively in the long run. The results reveal that external reserves in the immediate past have a positive and significant effect on domestic investments in long-run and short-run equilibrium situations. The equilibrium correction coefficient is significant and has the anticipated sign, which further shows a high speed of adjustment to equilibrium after a shock. We recommend that the governments of developing countries, including Nigeria, reduce their external debt by investing borrowed funds into productive ventures with a high probability of creating employment and yielding enough tax income to pay accumulated debts. These governments must refrain from spending such funds on exhaustive expenditures such as salaries and consumables.

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