REVIEW ARTICLE

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A systematic review of investment indicators and economic growth in Nigeria

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Most developing countries, including Nigeria, are stuck in a vicious cycle of low investment caused by insufficient domestic savings, resulting in inadequate capital formation and a large savings-investment gap. Given the significance of investment in poverty alleviation and economic growth, the study conducted a disaggregated analysis on the impact of various measures of investment on economic growth in Nigeria from 1981 to 2020. Using the conventional and structural break stationarity tests, as well as the autoregressive distributed lag (ARDL) approach, the epistemological findings confirm a compelling co-integrating relationship among the study variables and show that credit to the private sector, domestic investment, economic liberalization, foreign portfolio investment, and interest rate have a significant positive impact on long-term growth, whereas foreign direct investment, capital expenditure, and inflation rate retarded growth substantially in the long-run. Furthermore, the short-run results revealed that economic liberalization, private-sector credit, and portfolio investment all correlate positively with growth. In contrast, foreign direct investment, infrastructure spending, and inflation rate are profoundly negative. The study therefore advocated for effective fiscal and monetary policy coordination to lower the cost of doing business, incentivize and open up opportunities for domestic and foreign investors, increase infrastructure spending to create jobs, reduce poverty and sustain growth.

Introduction

Investment entails the purchase or acquisition of new capital equipment such as machines, buildings, and other means of production that boost the economy's productive capacity. It plays a critical role in a country's economic growth by allowing for the use of modern production methods, stimulating innovation, technology transfer and expanding countries' production efficiency. Countries see investment as a major element in increasing productivity by advancing technological progress and reducing unemployment as they advance toward economic growth (Bidemi et al., 2018). Fluctuations in investment have a significant impact not only on aggregate demand, but also on an economy's factor productivity and long-term economic growth. Developing economies around the world face challenges of growth and stability, apart from struggling to achieve structural transformation in accordance with the requirements of the twenty-first century economies. As a result, several nations are focusing on creating more favourable investment conditions (Kinyanjui et al., 2022).

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Investment comprises both domestic and foreign components that can be broadly classified into four basic types: the private domestic investment (private investment), public domestic investment (government investment), foreign direct investment (FDI) and foreign portfolio investment (FPI). Through domestic public investment, the government and public corporations buy properties, invest in real estate, and purchase tangible assets (Victor and Dickson, 2013). According to Hussain and Haque (2017), public investment is necessary to build the social capital and infrastructure required for private sector investments in the economy's sectors that offer the highest returns on capital. According to Barro and Sala-i-Martin (1992), public investment in infrastructures such as roads, communications networks, and energy sources, by raising the productivity of the private sector and creating new business opportunities serve as essential building blocks for the expansion of private investment. These infrastructures guarantee the accessibility of public services and goods like the telecommunications, water supply, and sewage system, all of which support the growth of commercial activity. Public investment therefore, boosts productivity, attracts private capital, and lowers unemployment (Kinyanjui et al., 2022).

Conversely, private investment refers to a fundamental economic tenet in a market-based economy where physical and financial resources are frequently owned privately and production decisions are driven by the desire for profit maximization. By making wise investment decisions and utilizing resources, private investment has the potential to boost the economy's productivity and efficiency (Babu et al., 2020). Private investment is therefore a critical prerequisite for economic growth because it enables entrepreneurs to start businesses by efficiently allocating resources to produce goods and services. Conventional wisdom suggests that private investment affects growth more significantly and positively than public investment. Productivity in the private sector is typically higher than that of the public sector due to the relatively lower level of corruption there (Herman et al., 2022). According to the International Finance Corporations (IFC) (2021), the private sector plays a significant role in addressing the developmental challenges faced by emerging nations by providing contributions in a variety of areas, such as growth, employment, poverty reduction, service provision, food security, climate change mitigation, environmental sustainability, and tax contributions.

The private sector has the potential to produce equitable and sustainable growth in developing nations. This means that at the very least, the existence of the private sector can encourage economic growth and the eradication of poverty. Countries see increased private investment as a crucial factor in boosting productivity levels by expediting technological advancement and bringing down the unemployment rate as they move towards economic expansion (Marcus and Vale, 2022). However, the two types of domestic investments complement one another in that public investment increases the marginal product of private investment, while positive spill overs from public investment to other economic sectors also exist. Public investment, on the other hand, has the potential to displace private investment if the public and private sectors function as competitors, which would have a detrimental impact on growth (Herman et al., 2022). As a result, there is presently an ideological shift from government to private-sector-driven growth policies, demonstrating the economic dominance of market forces and the reduction of the role of the public sector in the production process. In view of the emerging paradigm, the public sector needs to reassess its role in the growth process. According to the rule, public sector spending must be directed toward projects that enhance private-sector investment rather than displace it (Abdulkarim and Mohd, 2021a, 2021b, 2021c).

Foreign capital inflows are important mechanisms for moving resources from developed to developing nations, where they are typically more productive. To close the savings and foreign exchange gap, capital inflows are required by countries with low capacity to generate wealth from domestic savings. Given that those economies rely so heavily on foreign sources for their productivity expansion, these foreign capitals augment domestically sourced capitals. The significant increase in capital inflows into economies around the world is a result of investors becoming more globally mobile in their quest for higher rates of return on investment over time and the opportunity to diversify risk internationally. As a result, many economies have removed restrictions that hinder capital inflows in order to promote the inflow of globally mobile capita. The main benefit of the influx of foreign capital is that it promotes growth, especially in the nations that attracted it (Osuka et al., 2022).

For least developed countries (LDCs), FDI is regarded as a significant source of capital formation, technological know-how, employment creation, increasing tax revenues, promoting trade opportunities, enhancing management and labour skills in host countries. (Chinasa et al., 2022). Because foreign investors typically have better investment arrangements and an understanding of the economic dynamics of the host country, FDI is also thought to be less vulnerable to crises. As a result, parties involved in developing economies typically assume that FDI inflow will bring the much-needed capital, new technologies, marketing strategies, management skills and reduction of poverty in the host economies (Babatunde et al., 2020). These might assist developing nations in breaking their vicious cycle of poverty and underdevelopment (Niels and Robert, 2003).

Due to the overwhelming significance of FDI, governments in developing nations, including Nigeria, are paying more attention to the potential benefits of attracting significant FDI. Although it seems reasonable to assert that FDI can boost knowledge spill overs to host economies, a host country's capacity to take advantage or profit from these externalities may be limited by its own domestic economic conditions, which include a poorly developed financial market and uncontrolled domestic industries. In addition, a strong stock market benefits the host economy because a considerable amount of FDI enters the nation through acquisitions and mergers. This could increase the financing options accessible to businesses and, as a result, play an integral part in fostering relationships between domestic and foreign investors (Chinasa et al., 2022).

Foreign portfolio investment (FPI) refers to a subset of global capital flows that includes the transfer of financial assets like cash, stocks, and bonds across international borders in an effort to increase profits (Ezeanyeji and Maureen, 2019). It includes transfers and financial assets like stocks or bonds that take place when investors buy non-controlling stakes in foreign corporations or government bonds, short-term securities, or notes, or buy foreign corporate or government securities. When foreigners deposit money in a nation's banks or make purchases on its stock and bond markets, sometimes for speculative reasons in search of a profit, that nation's financial system has received foreign funds (Osuka et al., 2022). Given that emerging markets have a low correlation to developed ones, foreign investors have been motivated to diversify their holdings, protect themselves against risk, and earn higher returns in these markets. These trends have broadened the range of potential investments available by making foreign portfolio investment a significant source of investable funds to promote investment in both developed and developing countries. Capital and accumulated wealth also move to the regions that are likely to be most profitable as trade relationships result from people, businesses, and nations utilizing their unique advantages (Idolor and Omehe, 2022).

Even a casual observer of Africa is likely to be aware that very few African nations have Nigeria's level of economic potential.

The nation is abundantly endowed with both natural and human resources. With a GDP of over USD 420 billion and an estimated population of over 211 million (National Population Commission, 2021 estimate), Nigeria provides investors with a cheap labour pool, a wealth of natural resources, and perhaps the largest domestic market in the African continent. The nation has a large amount of arable land and favourable environmental factors that support agricultural activities. Nigeria has the second-largest oil reserves in Africa. Along with having abundant oil and gas reserves, the nation also has about 37 solid mineral types that are commercially available and can be utilised in a variety of fields, including construction, pharmaceuticals, food processing, and other manufacturing processes. Despite these vast resource base and investment opportunities, the nation has not been able to grow its economy significantly or draw in foreign or portfolio investment on a par with its economic potential (Osuka et al., 2022).

Nigeria has been categorized as an economy with low savings and even lower investment (Marcus and Vale, 2022). The government has implemented a number of policies and reform initiatives, including the National Economic Empowerment and Development Strategy (NEEDS), privatization, and commercialization of federal and state-owned enterprises, to escape this low savings and low investment trap. Access to credit instruments offered by financial institutions has been made easier, thanks to Nigeria's foreign investment regime being liberalized by the Nigerian Investment Promotion Commission Decree of 1995. The lack of investable funds or their low availability, particularly in the productive sectors of the economy, has in turn been blamed for the unfavourable investment environment. Evidently, promoting balanced investment in physical and financial assets as well as human, natural, and environmental capital is necessary for the promotion of sustained economic growth (Babu et al., 2020).

The difference between the current rate of savings in less developed countries (LDCs) and the required rate of investment is enormous. The Brussels Declaration set 30 global development objectives for LDCs, including a 25 percent investment to GDP ratio and a minimum of 7 percent annual GDP growth rate for LDCs to achieve sustainable development and poverty reduction (UNCTAD, 2010). Gitahi et al. (2013) further suggested that developing countries should aim for and maintain a level of private investment of at least 25 percent of GDP in order to sustain growth and poverty reduction. They noted the significance of private investment in contributing to economic growth, including its capacity to efficiently allocate and employ resources. Bage (2003) came to the conclusion that investment rates between 20 and 25 percent could lead to growth rates of between 7 and 8 percent based on the experiences of Asian nations. Nigeria's average private investment as a share of GDP fell below 15% between 1999 and 2019 (Nigerian Investment Promotion Commission, 2021). This percentage falls short of what is required for attaining greater growth rates and what is available in the majority of Sub-Saharan African economies (World Bank, 2021). The simplified fact in Nigeria shows that private investment growth has been surprisingly poor and continues to decrease despite an increased drive for economic liberalization from the government to private sector-led growth strategies in recent years (Chinasa et al., 2022).

An important gauge of an economy's level of development is its rate of economic growth. Numerous macroeconomic issues, such as income inequality, poverty, and unemployment, can be resolved with sustained and strong economic growth. The Nigerian government must figure out how to promote both domestic and foreign investment if it hopes to realize the desired level of economic growth, which is necessary for attaining the Sustainable Development Goals (SDGs) and reducing poverty.

The current study, which uses annual time series data covering the years 1981 to 2020, aims to empirically address the following: What are the distinct long- and short-term impacts of disaggregated investment components in generating growth in Nigeria? Policymakers concerned about the growth of domestic and foreign investment in Nigeria will benefit from the findings' insightful details, as will other researchers in this and related fields. The research's findings are also crucial for creating short- and long-term stabilization programmes and development strategies.

The causes of both short-term and long-term growth are distinguished in economic theory. Given the significance of time horizons in econometric modelling, the study adopted the auto-regressive distributed lag (ARDL) bounds testing approach developed by Pesaran and Shin (2001), which enables simultaneous estimation of a model's long-run and short-run parameters as well as the speed of adjustment to long-run equilibrium caused by any short-run external shocks. Through this procedure, it becomes methodically feasible to cope with model selection, estimation, inference, and the rate of adjustment to return the economy to a long-term equilibrium growth path following an adverse shock (Abdulkarim and Mohd, 2021a). Following is the format for the remaining section of the paper: The study's theoretical foundation is covered in section 2 while the methods and procedures that were used to conduct the study are covered in section 3. Following section four which discusses the empirical findings of the study is section five which wraps up the study and offers policy recommendations.

Theoretical background of the research

Theoretical research on the relationship between investment and economic growth is quite extensive and has produced a class of well-defined theories, including but not limited to the accelerator theory, Jorgensen's neoclassical or user cost theory, and Tobin's Q theory of investment. The theoretical foundation of this study is based on the crowding-in and crowding-out acceleration theory of investment and the Solow–Swan neoclassical growth model highlighted below.

According to the accelerator theory, investment changed as a linear function of output changes. The theory places a strong emphasis on how demand conditions affect investment decisions. According to the accelerator theory, businesses should increase their investment as demand or profits rise in the economy. It suggests that businesses have two options for meeting demand when supply levels result in excess demand. In order to balance demand, they either increase investment or raise prices (Chenery, 1952). According to the theory, the majority of businesses will decide to boost output and profits. The theory goes on to explain how this expansion draws in more investors, which accelerates growth (Treadway, 1971). The accelerator theory has several variants used in applied research which includes the simple, flexible, and the crowding-in and crowding-out accelerator theory (Abdulkarim and Mohd, 2021b).

According to Clark (1917), the fluctuation in investment demand is caused more by the acceleration of demand for finished goods than by the size of that demand. The simple accelerator theory of investment presumes that each time period results in the desired stock of capital and describes investment as a function of output growth alone. It indicates that the change in the capital stock is equal to a fraction of the change in output. This version of accelerator theory assumes a fixed capital-output ratio, suggesting that the interactions between investment and production is technologically fixed. Change in capital stock is expressed as a multiplier function of change in output. Thus, change in output is a determinant of investment (Gitahi et al., 2013).

The simple version of the acceleration theory posits that the demand for machinery and factories is derived from the demand for the firm's products. As a result, if the demand for capital equipment-produced goods increases and the current capacity is unable to satisfy the projected rise in demand, new investment in plant and machinery will be needed to increase output. Changes in output are thus strongly associated with changes in business investment, because investment is considered to adjust instantly and completely to changing market circumstances (Omojolaibi et al., 2016).

Accelerator theories in which investment responds slowly over time to changes in production levels are often called flexible accelerator models. The theory of flexible accelerator has been developed by Goodwin (1948) and Chenery (1952), Koyck (1954) but the most accepted approach is by Koyck (1954). One of the main flaws in the simple acceleration theory—that the capital stock can be modified optimally immediately—is eliminated by the flexible accelerator theory. According to the flexible accelerator theory, there are delays in the course of adjustment between the level of production and the level of capital stock (Koyck, 1954). It is necessary to take into consideration lag effects that result from the time required to plan, construct and set up fresh investments when modelling the accelerator theory (Chenery, 1952).

The flexible accelerator theory's central tenet is that the firm's rate of investment would increase in direct proportion to the size of the difference between its current stock of capital and its envisioned capital stock. Hence, this model assumes that investment is determined not only by the current change in production but also by its previous changes. The model is adaptable in that it enables investors to change in response to other pertinent variables, such as those associated with uncertainty and market imperfections. When analysing investment behaviour in developing economies, this is particularly crucial. The flexible accelerator theory also differs in that it does not assume instantaneous adjustment to the envisioned stock of capital. The accelerator model lacks a strong theoretical underpinning because investment in the model is independent of capital costs (Twine et al., 2015).

The main factors that link public policy to economic investment are the crowding-in and crowding-out acceleration theories. Babalola and Onikosii-Alliyu (2020) describes crowding-out as a decrease in private capital expenditure that is caused by a rise in interest rates instigated by expansionary fiscal policy. When the government decides to spend more than it receives in revenue, it borrows to fund the deficit. Taxes or public borrowing used to finance investments in the public sector will limit the funds available to the private sector, which will in turn lowers private investment activity. Public spending on infrastructure alongside the supply of public goods, however, can also be an obvious complement to private investments. The demand for inputs and support services may boost the demand for private production, which in turn raises the demand for private output, while aggregate demand and savings can improve the supply of resources in general (Babu et al., 2020). Public investment of this kind can also improve private investment prospects and enhance the efficiency of capital.

An expansionary fiscal policy would have the effect of increasing consumers' disposable income, thereby increasing their aggregate demand. Investors will have a robust profit due to a decrease in taxes and a consequent rise in demand (Abdulkarim and Mohd, 2021a). Government deficit financing via domestic and external borrowing may result in greater borrowing costs, fewer funds to spend, and wage increases, all of which reduce business profitability and consequently, private investment. As a result, private investment may be discouraged or crowded out,

lowering an economy's output (Babalola and Onikosi-Alliyu, 2020). Fiscal expansion, according to Keynesian economists, has the potential for growing overall demand for private sector products via the fiscal multiplier, thus encouraging the growth of private investment (Omojolaibi et al., 2016).

Crowding-in occurs when increased government spending leads to increased economic growth, which stimulates firms to invest as there now exist more profitable investment opportunities. It is concerned with how increased government spending encourages firms to invest more as a result of the income effect of productive government expenditures. If the economy is in a slump or operating at less than full capacity, expansionary fiscal policy can boost growth while generating an advantageous multiplier effect, leading to increased private sector investment. Crowding-in is more probable during a recession because the private sector has unspent savings. Crowding-in may only be a short-term consequence. Crowding-out will occur when the economy is nearing full capacity and there are few spare savings (Herman et al., 2022). An unstable political climate may also discourage investment or lead to high levels of inflation, which would lower the rate of economic growth. For investors, inflation volatility breeds uncertainty regarding the viability of potential projects. Political instability is also likely to reduce policymakers' time horizons, which will result in less-than-ideal macroeconomic short-term policies. In addition, it might cause policy changes to occur more frequently, which would increase volatility and harm economic growth (Zouhaier and Kefi, 2012).

Solow (1956) and Swan (1956) have made significant contributions to our understanding of the factors that influence the rate of economic growth in various countries. According to the Solow (1956) and Swan (1956) neoclassical model, growth comes from increasing capital and labour inputs, as well as from new ideas and technology. A sustained increase in capital investment only temporarily accelerates growth because it increases the capital-to-labour ratio. Nevertheless, the marginal product of additional units of capital may fall (there are diminishing returns), and thus an economy returns to a long-term growth path, with real GDP growing at the same rate as workforce growth plus a factor to reflect improved productivity. A 'steady-state growth path' is reached when output, capital, and labour all grow at the same rate, resulting in constant output and capital per worker. Neo-classical economists believe that increasing the trend rate of growth necessitates an increase in labour supply as well as higher levels of labour and capital productivity. According to the Solow (1956) and Swan (1956) model, catch-up growth occurs when a poorer country catches up to a richer one. This is frequently due to faster-growing countries having higher marginal rates of return on invested capital. The Solow–Swan model predicts some convergence of living standards (measured by per capita incomes), but the extent of catch-up in living standards is disputed, not the least because of the middle-income trap, which occurs when developing economies struggle to maintain growth and rising per capita incomes past a certain point.

Data and methodology

In order to offer empirical solutions to the research problems, this study used the quantitative approach and a descriptive research design. Answering who, what, when, where, and how questions about a research problem is made easier by descriptive research designs (Abdulkarim and Mohd, 2021c). Secondary data sourced from the Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS), and the statistical database for the World Development Indicators were used for this study. The subjects of the data collection included the real gross domestic product (RGDP), various components of investment disaggregated into

Foreign Direct Investment Inflow as a percentage of GDP (FDI), foreign portfolio investment (PINV), gross fixed capital formation as a percentage of GDP (GFCF) (proxy for private investment), and government capital expenditure (CAPEX) (proxy for public investment), and control variables such as domestic credit to private sector (CPS), inflation rate (INFR), effective interest rate (INTR) and economic liberalisation (ELB) adopted as a dummy variable, respectively.

Economic liberalisation was included in the model as a dummy variable to investigate whether a planned economy encourages more growth than a deregulated or free market economy. The variable was measured with the value of 1 in years 1986 to 1993 and 2007 to 2020 when major attempt at economic liberalization started in Nigeria following the implementation of the Structural Adjustment Programme (SAP) and the National Economic Empowerment and Development Strategy (NEEDS) and zero for other years (Abdulkarim and Mohd, 2021c). All variables were taken on annual basis in nominal and percentage terms from 1981–2020. Data on RGDP, CAPEX, CPS and PINV taken in nominal forms were log-transformed to stabilize the variance of the series and make interpretation in proportionate terms while the GFCF, INFR and INTR retained their percentage form. E-views 12 statistical package was utilized for data analysis.

Following the lead of Omojolaibi et al. (2016), Kengdo et al. (2020) and Babu et al. (2020), the study modelled economic growth proxy by RGDP as a function of disaggregated forms of investment and the aforementioned control variables. In accordance with the literature and the study's objectives, an Autoregressive Distributed Lag (ARDL) model with modifications, presented in its general form as an unrestricted error-correction model (UECM) regression from which all tests and estimations are conducted was devised and specified as follows:

$$\Delta \mathrm{Ln\,RGDP_t} = \alpha_0 + \alpha_1 \mathrm{LnRGDP_t} + \alpha_2 \mathrm{ELB_t} + \alpha_3 \mathrm{FDI_t}$$
$$+ \alpha_4 \mathrm{GFCF_t} + \alpha_5 \mathrm{INFR_t} + \alpha_6 \mathrm{INTR_t}$$
$$+ \alpha_7 \mathrm{LnCAPEX_t} + \alpha_8 \mathrm{LnCPS_t} + \alpha_8 \mathrm{PINV_t}$$
$$+ \sum_{i=0}^{n} \beta_1 \Delta \mathrm{LnRGDP_t} + \sum_{i=0}^{n} \beta_2 \Delta \mathrm{ELB_t}$$
$$+ \sum_{i=0}^{n} \beta_3 \Delta \mathrm{FDI_t} + \sum_{i=0}^{n} \beta_4 \Delta \mathrm{GFCF_t}$$
$$+ \sum_{i=0}^{n} \beta_5 \Delta \mathrm{INFR_t} + \sum_{i=0}^{n} \beta_6 \Delta \mathrm{INTR_t}$$
$$+ \sum_{i=0}^{n} \beta_7 \Delta \mathrm{Ln\,CAPEX_t} \sum_{i=0}^{n} \beta_8 \Delta \mathrm{LnCPS_t}$$
$$+ \sum_{i=0}^{n} \beta_9 \Delta \mathrm{LnPINV_t} + \mathrm{ECT_{t-1}} + \mathcal{E}_t$$

$$(1)$$

Where: $\alpha_0 =$ Intercept and i is the lag indicator. $\alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$ and α_9, represent the long-run multipliers which show the long-run effects of the identified determinants of investment on economic growth to be calculated. $\Delta =$ Denotes the first difference operator, $t =$ deterministic time trend consisting of years from 1981 to 2020. $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ and β_9 are the short-run dynamic coefficients which help to estimate the error correction mechanism and the model's convergence to equilibrium. k is the number of explanatory variables, and ξ is the disturbance term that is uncorrelated with the x's. while $\mathrm{ECT_{t-1}}$ is the error correction term's one-period lag value and the speed adjustment parameter that gauges how quickly the variables, in the event of a disturbance, returned from short-run disequilibrium to long-run equilibrium. The coefficient must be negative, less than one and statistically significant in order to achieve long-run equilibrium. The coefficient's value provides the long-run annual path to equilibrium GDP. A test of the disturbance term, $\mathcal{E}_t$, can confirm that the regression includes an adequate lag length. If the error series is serially uncorrelated and indicative of a white noise process, the lag lengths included are sufficient (Abdulkarim and Mohd, 2023).

Estimation procedure. The co-integration relationship between the variables was examined using the ARDL bounds test developed by Pesaran and Shin (2001). According to Pesaran and Shin (2001), one of the most important characteristics of co-integrated variables is their proclivity to react to any shock that might require a break from long-run predictability. As a result, the ARDL method's error correction model depicts the degree to which the variables are vulnerable to short-run shocks on the one hand, as well as the measure of such variations caused by shocks that are adjusted within a year on the other. Due to its robustness, reliability, and statistical properties, which are thought to be superior to other long-run analytical techniques in the literature, the ARDL has been widely used in recent empirical analysis. When compared to previous and traditional co-integration methods proposed by Engle and Granger (1987) and the maximum likelihood method suggested by Johansen (1988, 1990); Johansen and Juselius (1990), which require a long sample period and all variables to be I (1), the ARDL methodology has several advantages.

The first is that the ARDL approach does not require that all variables under study be integrated in the same order and can be used regardless of whether the fundamental variables are integrated in order one, order zero, or a mixture of both. However, when the basic variables are integrated of order I. (2), this model cannot be used. In this study, none of the variables were integrated of order I(2). As a result, the obligation of assessing the order of integration among variables and pre-testing for unit roots is lifted from the econometric methodology (Ewetan et al., 2020). However, Pesaran and Shin (2001) explained that the dependent variable must be first difference stationary as a prerequisite for the co-integrating relationship to be valid.

Rahman and Islam (2020) assert that any I(2) variable or variables may result in a system failure. Therefore, it is desirable to run some effective unit root tests to make sure that the model does not contain any I(2) variables. Second, the speed of adjustment to long-run equilibrium caused by any short-run external perturbation can be estimated concurrently when the ARDL technique is utilized, as can unbiased estimates of the long-run and short-run parameters of the study variables. The ARDL approach to co-integration was chosen because it is suitable for studies with comparatively small sample sizes, like the one under consideration. According to Pesaran and Shin (2001), the short and long-run parameters obtained through the ARDL technique are fairly more accurate, robust, and better in the context of small and limited sample data sizes. Furthermore, when compared to vector autoregressive (VAR) models, the ARDL model allows for more variables and is more versatile about lag structure since it can incorporate different optimal lag structures for different variables in the model. The use of lag variables mitigates the problem of serial correlation. Because it allows the co-integration relationship to be estimated by OLS once the model's lag order is established, the ARDL technique is also more user-friendly and straightforward than other multivariate co-integration methods. Another benefit of the ARDL method is that it takes into account possible endogeneity among explanatory variables. Since the macroeconomic variables examined in this study possess an endogenous influence on each other, the ARDL approach is projected to correct the endogeneity problem (Abdulkarim and Mohd, 2021a, 2021b, 2021c).

Results and discussion

Preliminary analysis of study variables. By outlining the key characteristics of the investigated variables in our model, this initial evaluation gave an overall understanding of the nominal

Table 1 Descriptive statistics of the examined variables in nominal form.

Variables	RGDP	CAPEX	CPS	FDI	GFCF	INFR	INTR	PINV
Mean	36,182,298	509,505.1	6,245,879	1.50	35.72	19.14	17.64	315,207.5
Median	24,477,911	315,196.9	725,500.4	1.13	32.05	12.95	17.25	17,798.1
Maximum	84,064,364	2,289,000	29,890,460	5.79	89.39	72.84	31.66	2,687,233
Minimum	13,779,258	4100.1	96,705	0.20	14.17	5.39	8.92	151.60
Std. dev.	21,874,515	572,049.4	49,050,394	1.25	19.19	16.83	4.75	669,079.7
Skewness	0.723	1.334	1.232	1.72	1.064	1.81	0.281	2.677
Kurtosis	2.077	4.369	3.118	5.996	3.823	5.15	3.826	9.231
J. Bera	4.905	14.982	10.147	34.62	8.683	29.63	1.663	112.53
J.B Prob.	0.144	0.114	0.173	0.000	0.013	0.00	0.436	0.104
Obs.	40	40	40	40	40	40	40	40

Source: Author's computation 2023 using E-views 12 statistical package.

data set and determined whether the data series are normally distributed and appropriate for using the OLS regression. Table 1 summarizes the descriptive statistics for the study variables in their nominal form.

The standard deviation in Table 1 illustrates the degree of variable volatility. It displays how much each variable deviates from the mean. The skewness of the data reveals the asymmetry of the data. The data in Table 1 show that all of the variables under scrutiny are positively skewed, which suggests a slightly heavy-right tail. Kurtosis measures the acuteness of a normal distribution curve's peak. With kurtosis values under 3, RGDP displays a platykurtic distribution, indicating that the variable produces outliers that are both less prevalent and less severe compared to those observed in the normal distribution. But every explanatory variable exhibits a leptokurtic distribution with a kurtosis value above 3. This suggests that these variables have higher-than-average kurtosis and larger-than-average tail weights in their population density functions. In terms of skewness and kurtosis, the Jarque-Bera statistic assesses the degree to which sample data match a normal distribution. As shown by the probability values of the Jarque-Bera statistics for the INTR, LOGRGDP, LOGCAPEX, LOGCPS, and LOGPINV series, the null hypothesis is securely acknowledged for these data points. As a consequence, since the associated Jarque-Bera probability values have a threshold of significance above 5%, it can be said that these variables have a normal distribution. On the contrary, FDI, GFCF, and INFR series exhibit significant Jarque-Bera probability values of below 0.05, which amply demonstrate the absence of normality in their residuals. This implies that these variables are extremely vulnerable to shocks and other economic swings, that may have resulted in outliers and residual non-normality. For the purposes of our regression analysis, the Jarque-Bera probabilities for each of the logged variables revealed that they are all normally distributed. The ARDL co-integration method used in this study is not, however, dependent on the normality of the data distribution (Rahman and Islam, 2020).

To assess the impact of multi-collinearity on the precision of estimated regression coefficients, researchers frequently use the correlation coefficient and the variance inflation factor (VIF) test among pairs of predictors (Babu et al., 2020; Robert, 2007). The Pearson Product Moment Correlation Coefficient was used in the study to assess the level of multi-collinearity issues and the degree of linear dependability among the explanatory variables included in the empirical model. Nevertheless, the correlation analysis makes no inferences regarding the direction or strength of any causality or association among the variables under investigation. The correlation coefficient of the explanatory variables in their nominal form are displayed in Table 2.

Since the correlation coefficients of the study variables were found to be within the permissible upper limit of 0.80, multi-collinearity among the variables clearly mentioned in the model does not pose a significant threat (Abdulkarim and Mohd, 2023). However, one should exercise caution when translating high VIF values or correlation coefficients of the variables as proof of an elevated level of multi-collinearity. The importance of comparing VIF (and tolerance) threshold values to other variables influencing the variance of the regression coefficient is emphasized by Robert (2007). Values of the VIF of 10, 20, 40, or even higher do not, by themselves, invalidate the findings of regression studies, advocate the application of ridge regression, or encourage the combination of two or more independent variables into a single new variable to fix the problems associated with multi-collinearity. Similar to this, a number of recent research studies have demonstrated that multi-collinearity may not always be problematic or that the method often employed to address multi-collinearity difficulties in regression analysis may occasionally cause greater problems than they try to solve (Nguyen, 2020; Babu et al., 2020; Robert, 2008).

Test of stationarity of study variables. Time series analysis requires that the data be checked for stationarity. The literature on time series econometrics has made it clear that test results can be misleading if the estimated variables are non-stationary and/or not co-integrated. When time series data is not stationary, shocks in the data will disintegrate rather than be amplified, whereas shocks are neutralized and the data returns to its mean value when time series data is stationary. All study variables are checked for unit root issues since time series data are susceptible to them, ensuring a reliable and useful time series evaluation. The stationarity of the time series must be examined to make certain that none of the variables are integrated above one (I (1)) to guarantee the accuracy of the co-integration bounds test (Abdulkarim and Mohd, 2023). The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests as well as structural breakpoint methods were used to check the order of integration of the variables under analysis. This is significant since the accuracy and dependability of empirical results are impacted by the econometric analysis of non-stationary variables. ADF tests approximate the autoregressive moving average (ARMA) structure of the test regression errors using parametric auto-regression, whereas PP tests help to correct the bias brought on by ADF tests due to neglected autocorrelation. The way the Phillips-Perron (PP) unit root tests handle serial correlation and heteroscedasticity in the errors is where they basically differ from the ADF tests (Abdulkarim and Mohd, 2022).

The Dickey and Fuller (ADF) and Phillips-Perron (PP) unit root tests of stationarity, which are the norm, are typically ineffective in the presence of structural break. A break is a recurring shock that affects a time series over an extended period

Table 2 Pearson's correlation coefficients for explanatory variables.

Correlation	CAPEX	CPS	FDI	GFCF	INFR	INTR	PINV
CAPEX	1.00						
CPS	0.70	1.00					
FDI	−0.16	−0.25	1.00				
GFCF	−0.65	−0.61	−0.14	1.00			
INFR	−0.32	−0.27	0.45	0.20	1.00		
INTR	−0.07	−0.14	0.56	−0.32	0.37	1.00	
PINV	0.41	−0.51	−0.11	−0.49	−0.20	−0.06	1.00

Source: Author's computation 2023 using E-views 12 statistical package.

Table 3 ADF, PP and Zivot-Andrews stationarity tests results.

Variables	ADF		PP test			Zivot-Andrews			
	Level	1st Diff.	Level	1st Diff.	Remark	Break date	Level	1st Diff.	Rmk
RGDP	−1.319^n	−3.335^b	1.411^n	−2.695^a	I(1)	2002	−2.0653	11/2507^a	I(1)
CAPEX	4.007^n	−6.592^a	1.411^n	−6.030^a	I(1)	2016	−0.6117^n	−7.2387^a	I(1)
CPS	5.397^n	−5.751^a	4.991^n	−3.218^a	I(1)	2006	0.6076^n	−7.6604^a	I(1)
ELB	−2.038^n	−6.053^a	−2.079^n	−6.053^a	I(1)	2011	−6.6963^a	−7.5044^a	I(0)
FDI	−3.832^a	−5.451^a	−3.766^a	−14.34^a	I(0)	1995	−4.8842^b	−10.0321^a	I(0)
GFCF	−3.711^a	−4.584^a	−3.711^a	−4.610^a	I(0)	2017	−4.1190^n	−5.0928^a	I(1)
INFR	−2.978^b	−2.934^a	−2.847^c	−10.14^a	I(0)	2004	−6.3718^a	−11.1946^a	I(0)
INTR	−2.858^c	−2.707^a	−2.497^n	−6.973^a	I(1)	1995	−3.2059^n	−5.7041^a	I(1)
PINV	3.107^n	−3.210^a	−3.224^b	−10.28^a	I(0)	2018	−4.0011	−9.8706^a	I(1)

Source: Author's computation 2023 using E-views 12 statistical package.
Notes: a, b and c denote the rejection of the null hypothesis at 1, 5 and 10% significance levels, respectively, while n denotes Not Significant.

of time. The ability to veto a false unit root null hypothesis will be limited if this break is not explicitly addressed during the unit root review process (Glynn et al., 2007). The Zivot-Andrews (1992) unit root test was used to fully account for unobserved heterogeneity in the variables under study and demonstrate how susceptible the estimated results are to structural changes. The Zivot and Andrews test makes use of a number of dummy variables and an endogenous ordered test to identify any possible break in the entire sample. Table 3 displays the outcomes of the traditional and structural breakpoint unit root tests.

As can be seen in Table 3, the outcomes of the conventional and structural breakpoint unit root tests were comparable. At levels and the first difference, the variables under consideration were stationary, but none at the second difference. The dependent variable (RGDP) was also stationary at the first difference, demonstrating that the prerequisites for applying the ARDL method were fulfilled.

Bounds test to co-integration. After determining the optimal lag length using appropriate criteria such as (Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn Criterion (HQC), the F-test was used to test the joint significance of the lagged level variables stipulated in the model. It compared the null hypothesis stating that there is no long-run connection between the variables to the alternative hypothesis that the variables do have a long-run relationship. It is feasible to ascertain whether the variables are co-integrated or not using Narayan's upper and lower bounds F-statistics for a small sample size (30–80 observations). According to the rules, the null hypothesis should be accepted if the estimated F-statistic is less than the lower bound critical value and the upper bound critical value is exceeded at a level of significance of 5%, indicating a long-term relationship between the variables. The choice of the appropriate lag length has a significant impact on the validity of

the F-test results, so the optimal lag length was selected using the Akaike Information Criterion (AIC). The study uses yearly reports, a sample size of 40, and 8 parameters. The dependent variable and dynamic regressors were given a preferred lag length of 1, 2, which was determined in consideration of the limited number of observations and the requirement to maintain degrees of freedom. This made sure that serial correlation did not affect the selected model and that the dynamics of the model were not restricted by inadequate lags. In order to estimate Eq. (1), the lag structure (1, 1, 0, 2, 0, 2, 2, 2, 1) was found to be the most effective estimation model. The estimated F-test and ARDL bounds testing technique's outcomes are summarized in Table 4.

The estimated F-statistic value of 9.0222 exceeds the upper bound critical value of 4.10 at the one percent significance level, as shown in Table 4, demonstrating the validity of a long-term association between economic growth and the different investment indicators specified in the model. It implies that these variables move together over the long term, and any short-term variations in how they interact will return to equilibrium.

Long-run effects of investment determinants on economic growth in Nigeria. The study estimated the conditional ARDL long-run model for Eq. (1) to determine the long-run effects of determinants of investment on economic growth in Nigeria. Table 5 contains the long-run estimated results.

The long-run coefficient of economic liberalisation (ELB) is positively correlated with economic growth and statistically significant at one percent level. According to the findings in Table 5, increased liberalisation of the Nigerian economy is expected to boost economic growth by 15.29 percent. The result is consistent with the findings of Gitahi et al. (2013) who reported a significant positive impact of economic liberalisation on private investment and growth in Kenya.

Table 4 ARDL bounds test for co-integration results.

Model	F-statistics	K	Critical values			Decision
LOGRGDP=f(ELB, FDI, GFCF, INFR, INTR, LOGCAPEX, LOGCPS, LOGPINV)	9.0222	8	%	Lower bound I(0)	Upper bound 1(1)	Reject H$_O$ and accept H$_A$. Series are co-integrated
			1%	2.79	4.10	
			2.5%	2.48	3.70	
			5%	2.22	3.39	
			10%	1.95	3.06	

Source: Author's computation 2023 using E-views 12 statistical package.

From Table 5, the long-run coefficient of foreign direct investment inflow (FDI) showed evidence of an inconsequential negative effect on economic growth in Nigeria during the review period. The negative sign of the coefficient indicate that FDI is limiting growth in Nigeria during the review period. Nigeria needs significant inflows of foreign direct and portfolio investment to propel growth because it is a developing nation with weak domestic capital formation and a shortage of necessary infrastructure. Due to rising insecurity, a lack of essential infrastructure, and the displacement of multinational corporations to nearby nations, the country has lost its appeal to foreign investors.

The long-run coefficient of domestic investment (GFCF) displays a positive effect on economic growth that is significant at one percent level, suggesting that increased domestic capital formation is required to engender growth. The findings indicate that a percentage increase in domestic investment, all else being equal, stimulated an increase in economic growth of about 0.7 percent. Gross fixed capital formation, also referred to as domestic investment, is a key factor in determining economic growth. It is essential for expanding the economy's supply-side ability to produce, which leads to greater production and exports. The findings support earlier hypotheses, Solow's (1956) growth theory, which explains the connection between capital formation and economic growth, as well as recent studies by Apanisile and Okunlola (2014), Babu et al. (2020) and Daniel (2022), which found an important beneficial association between domestic capital formation and long-term economic growth in Nigeria. Kazakhstan, Poland, and Sub-Saharan African nations come in that order.

Table 5 indicated a negative influence of inflation rate (INFR) on economic growth that is significant at five percent level. Accordingly, a percentage increase in the inflation rate, while other explanatory variables remain constant, results in a 0.25 percent decrease in economic growth. In order to maintain macroeconomic stability, inflation must be kept under control. High inflation, driven primarily by food and fuel prices, creates uncertainty for investors, reduces consumer welfare, and dampens growth. The results show that unrestrained rapid price hikes reduce the value of assets, reduce disposable income, and force people into poverty. As incomes are decimated by rising prices, people's capacity to purchase goods and services declines, which lowers their standard of living and slows economic growth (Abdulkarim and Mohd, 2022). The results are in line with those of Akinlo and Oyeleke (2018) and Nguyen (2020), who found an important negative correlation between the rate of inflation and economic growth in Vietnam and Nigeria, respectively.

From the results in Table 5, the long-run coefficient of effective interest rate (INTR) is positively related with economic growth and statistically significant at one percent level, acknowledging that an efficient and relatively stable financial system is vital for investment and inclusive growth. Explicitly, a percentage increase in interest rate other things remaining equal, triggered an increase

Table 5 ARDL long-run estimated results.

Variables	Coefficients	Std. error	t-statistic	P-value
ELB	0.1529	0.0379	4.0388	0.0008***
FDI	−0.0195	0.0129	−1.5139	0.1474[NS]
GFCF	0.0073	0.0022	3.3134	0.0039***
INFR	−0.0025	0.0010	−2.4387	0.0254**
INTR	0.0141	0.0041	3.4045	0.0032***
LOGCAPEX	−0.1957	0.0481	−4.0709	0.0007***
LOGCPS	0.3451	0.0299	11.5161	0.0000***
LOGPINV	0.0396	0.0182	2.1811	0.0427**

Source: Author's computation 2023 using E-views 12 statistical package.
Note: (**) Significant at the 5%, (***) Significant at the 1% and (NS) Not Significant.
R-squared = 0.8880, Adjusted R-square = 0.7819, F-statistics = 8.3701, Prob. (F-statistics) = 0.0000, Durbin-Watson (DW) statistics = 2.1586.

of ~1.41 percent in economic growth. The availability of financial services, including a productive interest rate, is a critical component for encouraging healthy and equitable economic growth. According to McKinnon (1973), financial repression caused by low real interest rates frequently results in the withdrawal of funds from the banking sector as well as a disincentive to save. It decreases the availability of bank credit, which reduces investment and growth. According to the McKinnon-Shaw financial liberalization hypothesis, high real deposit interest rates boost financial savings, which induces a rise in the size and quality of domestic investment, thereby encouraging growth. The result is consistent with the findings of Nonvida and Amegnaglo (2017), Miftahu (2019) and Babu et al. (2020) who found significant evidence of a positive effect of interest rate on economic growth in Benin, Nigeria and Sub-Saharan Africa, respectively.

According to Table 5, the long-run coefficient of government capital expenditure (LOGCAPEX) displayed a negative effect on economic growth that is significant at one percent level suggesting that government capital expenditure has not been productively invested in the development of basic economic infrastructures and social overhead capitals that can motivate private investment and stimulate positive growth. From the results, a percentage increase in government infrastructure spending activated a decrease in economic growth of about 19.57 percent suggesting inefficiency in government capital spending. Nigeria's fiscal experience over the years explains the challenges of implementing effective fiscal policy responses in an environment with highly volatile revenue flows. Over-dependence on uncertain oil revenue flows tend to reduce the quality and efficiency of government expenditures in Nigeria, while private investments tend to be reduced (Blanchard and Perotti, 2002).

A procyclical spending pattern combined with poor oil earnings management has not been reasonable to finance productive public investment which increases public capital stock

and raises aggregate production. The volatility of government infrastructure spending is limiting the fiscal space and government ability to invest in critical infrastructures that reduce the cost of doing business and drive long-term growth. Sustainable growth and poverty reduction are unattainable without a significant reduction in volatility of government revenue and spending pattern. The result agrees with the findings of Quashigah et al. (2016) and Ogar et al. (2019) who in their studies found evidences indicating a significant negative effect of capital expenditure on economic growth in Ghana and Nigeria, respectively, but in contrast with the views of Keynes (1936), Easterly and Rebello (1993) and Solow (1956) and Swan (1956) who argued that government capital spending through its multiplier effects can stimulate investment and economic growth.

The long-run coefficient of domestic credit to private sector (LOGCPS) in line with a priori expectation is positively related to growth and statistically significant at one percent level. According to the results in Table 5, a percentage increase in credit to private sector is associated with an increase in economic growth of ~34.51 percent. Credit is the main channel through which savings are transformed into investments. Access to credit at low interest rate enables an individual to build up finances that can support productive investment in various enterprises and private sector inventiveness that is important for growth and poverty reduction. The result is in accord with extant studies of Micheal et al. (2017) and Vincent et al. (2018) who reported a significant positive impact of credit to private sector on economic growth in Nigeria.

The long-run coefficient of foreign portfolio investment (LOGPINV) generated a positive impact on economic growth that is statistically significant at five percent level. Based on Table 5, a percentage increase in foreign portfolio investment, while holding other explanatory variables constant, elicited a rise in economic growth of around 3.96 percent. In light of the growing gap between their domestic capital stock and capital requirements, emerging nations are feeling the need for foreign capital to augment domestic resources. An important method for boosting the amount of funds available for domestic investment is through foreign capital inflow. To close the savings and foreign exchange shortfalls related to the quick wealth generation and growth required to end the pervasive poverty in developing nations, foreign capital inflow is necessary. In addition, foreign investors favour developing nations over developed nations due to the higher rates of return on investment in these countries. The result is in harmony with existing studies of Ezeanyanji and Ifeako (2019) and Ozigbo (2021) who reported a significant positive impact of foreign portfolio investment on economic growth in Nigeria.

Short-run impact of investment determinants on economic growth in Nigeria. Utilizing the most effective lag length, the researchers estimated an unrestricted error correction model (ECM) linked to the long-run relationship from Eq. (1) to scrutinize the model's short-run dynamics. Table 6 presents a summary of the short-run properties of the model's transition to equilibrium.

Table 6 lagged error term coefficient or adjustment speed (ECT(-1)) is, as expected, negative, less than one and particularly significant at the one percent level, further supporting the existence of a unique long-term relationship between the indicators of investment and economic growth in Nigeria. About 87.86% of the short-run disequilibrium brought on by shocks in previous years returns to long-run equilibrium in the current year. The economy should recover from any short-run outliers and return to its long-run optimal growth path in about 1.14 years due to the relatively quick pace of adjustment.

Table 6 ARDL short-run estimated results.

Variables	Coefficients	Std. error	t-statistic	P-value
D(ELB)	0.0792	0.0293	2.7043	0.0145**
D(FDI)	−0.0152	0.0063	−2.4140	0.0266**
D(GFCF)	0.0032	0.0019	1.6771	0.1108[NS]
D(GFCF(−1))	−0.0038	0.0018	−2.1839	0.0424**
D(INFR)	−0.0022	0.0005	−4.9315	0.0001***
D(INTR)	0.0022	0.0021	1.0663	0.3004[NS]
D(INTR(−1))	0.0064	0.0029	−2.2306	0.0387***
D(LOGCAPEX)	−0.0179	0.0215	−0.8341	0.4151[NS]
D(LOGCAPEX(−1))	0.1042	0.0282	3.6906	0.0017***
D(LOGCPS)	0.1072	0.0435	2.4628	0.0241**
D(LOGCPS(−1))	−0.1046	0.0458	−2.2862	0.0346**
D(LOGPINV)	0.0109	0.0065	1.6748	0.1113[NS]
C	12.2399	1.5619	7.8363	0.0000***
ECT(−1)	−0.8786	0.1123	−7.8228	0.0000***

Source: Author's computation 2023 using E-views 12 statistical package.
Note: (**) Significant at the 5%, (***) Significant at the 1% and (NS) Not Significant.
R-squared = 0.8880, Adjusted R-square = 0.7819, F-statistics = 8.3701, Prob. (F-statistics) = 0.0000, Durbin-Watson (DW) statistics = 2.1586.
Cointeq = LOGRGDP - (0.1529***ELB - 0.0195*FDI + 0.0073***GFCF - 0.0024**INFR + 0.0141***INTR - 0.1957***LOGCAPEX + 0.3451***LOGCPS + 0.0396** LOGPINV.

From Table 6, the short-run coefficient of present level of Economic Liberalisation D(ELB) in Nigeria in agreement with the long-run results motivated a positive impact on the current level of economic growth that is significant at one percent level. Clearly, an increase in the present rate of deregulation of the Nigerian economy is expected to produce an escalation of about 7.92 percent in the current level of economic growth. This variable's positive sign indicates that increased deregulation of the Nigerian economy will open up more sectors of the economy to private sector participation and result in greater efficiency in resource allocation, thereby stimulating private investment and inclusive growth.

From Table 6, the current level of foreign direct investment inflow D(FDI) in covenant with the long-run result is inversely related to the current level of economic growth in Nigeria and statistically significant at five percent level. Clearly, a percentage increase in the present rate of foreign direct investment inflow is associated with about 1.52 percent decline in current level of economic growth. Foreign direct investment (FDI) is frequently asserted as a viable vehicle for economic growth because it is thought to be less vulnerable to crisis since investors typically have better investment arrangements and comprehend the host country's economic complexities. While it appears that FDI can provide greater technology transfer to host economies, the results indicate that Nigeria has not successfully attracted FDI commensurate with its vast resources or accomplish a high growth rate because it failed to develop the absorptive capacity to benefit from foreign investment. The amount of FDI inflow has decreased as Nigeria's level of insecurity has risen. The government's apparent inability to provide a safe and secure environment for people, property, and the conduct of business and economic activities is what is causing an increasing exodus of foreign direct and portfolio investment from Nigeria to other West African nations, which has a detrimental effect on revenue generation and economic growth.

Gross fixed capital formation in the current period D(GFCF) had a negligible positive impact on the current level of growth, whereas its one-year lag value D(GFCF(-1)) was negatively related to the current level of economic growth and significant at the 5 percent level. As a result, a percentage increase in the variable's one-year lag value reduces the current rate of economic

growth by ~0.38 percent. Pervasive and structural security issues generate economic risks and uncertainties that change people's saving, investing, and consumption habits, skewing the equilibrium resource allocation within a nation. Infrastructure damage brought on by terrorist actions can disrupt commerce and increase a nation's cost of doing business. Reduced profits as a result of these higher costs translate into a lower return on investment. Because of its blatantly detrimental effects on inclusive growth, insecurity in Nigeria hinders and undermines domestic investment. All of these obstacles impede Nigeria's growth by suppressing domestic capital formation and private investment.

The short-run coefficient of present inflation rate in Nigeria D(INFR) in concord with the long-run result initiated a negative influence on the current level of economic growth that is significant at one percent level. Evidently, a percentage increase in the present inflation rate will stimulate a decline of ~0.22 percent in the current rate of economic growth. Monetary policy, in contrast to fiscal policy, can address the problem of economic shocks very quickly. Monetary policy goals include managing a variety of monetary targets, such as fostering economic growth, achieving full employment, stabilizing prices, preventing economic crises, and maintaining real exchange rates and interest rates. However, as rising prices reduce disposable income and push people into poverty, the significance of maintaining pricing stability is frequently emphasized. Consumers' decreasing purchasing power as a consequence of income erosion brought on by price increases leads to a drop in standard of living.

The coefficient of present rate of effective interest rate D(INTR) initiated a marginal positive impact on the current level of economic growth, whereas the one-period lag value of the variable D(INTR(-1)) initiated a significant negative impact on the current rate of economic growth, which is significant at the one percent probability level. According to Table 6, a percentage increase in the previous interest rate is associated with a 0.64 percent decrease in the current rate of economic growth. By influencing the size of macroeconomic variables like capital flows, investment, exchange rate, and credit demand, the interest rate has the capacity to have an effect on the entire economy. The McKinnon-Shaw hypothesis stipulates that a high deposit rate is a necessary policy tool for galvanizing financial savings for investment. It can, however, be self-defeating if executed during inflationary periods because the relatively high real lending rate impedes investment spending.

An effective and largely stable financial system is essential for investment and growth, as is widely acknowledged in the empirical literature. Low interest rates are thought to facilitate capital accumulation or encourage investment spending. Contrary to the McKinnon-Shaw hypothesis, the Neo-Keynesians hold that financial liberalization is bad for investment and growth. They stress that saving is determined by investment, not the other way around, and that a high interest rate may lower saving by suppressing investment. Besides, financing working capital with borrowed money at high interest rates may result in cost-push inflation. They place more value on the possibility of profit and a plentiful and flexible supply of credit for the private sector than on prior saving. According to the study's findings, high interest rates caused short-term financial hardship and economic stagnation even though they seem to have improved economic performance over the long term.

The current level of government capital expenditure D(LOG-CAPEX) in consonance with the long-run results, is inversely related to the current level of economic growth and statistically significant at five percent probability level. A percentage increase in current capital spending provoked a 1.79 percent increase in the current rate of economic growth. In contrast to the long-run result, the coefficient of the one-period lag of government infrastructure spending D(LOGCAPEX (-)) reinforced a positive and significant impact on the current level of growth at the one percent probability level. As a result, a percentage increase in previous levels of infrastructure spending resulted in a 10.42 percent increase in current economic growth. Increased government spending on infrastructure facilities lowers businesses' overhead and per unit cost of production, stimulating private investment growth and lowering poverty levels. Improved government spending is frequently designed to support growth and its use must be both economically and politically efficient and effective. As a result, effective management of social regulations is required so that government expenditure policies remain optimal, efficient, and effective in stimulating economic growth. However, the study result indicated that government infrastructural spending in Nigeria has been inefficient and retarding growth during the review period.

The current level of domestic credit to private sector D(LOGCPS) has a significant positive influence on economic growth at the 5% probability level, in line with the long-run result. Specifically, a percentage point increase in current private sector credit stimulated a 10.72 percent increase in current economic growth. The coefficient of the one-year lag of private sector credit D(LOGCPS(-)) variance with the long-run result, on the other hand, is associated with a negative and significant impact on the current level of economic growth, which is significant at 5 percent. As a result, a percentage increase in previous levels of private sector lending motivated a drop in current economic growth of around 10.46 percent. For both new and existing businesses, the private sector may apply for credit to increase labour productivity. Consequently, a company's assets have a lower value due to lower labour productivity. Investments in physical capital, human capital, and technological research and development to increase the capital-to-labour ratio have an impact on labour productivity. Nigeria has insufficient domestic savings, which may make it difficult for financial institutions and markets to meet domestic credit demand solely through savings. These gaps imply that additional funding sources, such as foreign capital inflows, may be needed to supplement domestic savings in order to meet the private sector's credit demand. However, the risks associated with the financial system's information asymmetry could limit the amount of money available to the financial intermediaries and credit demanders. Potential credit supply restrictions for investments in human and physical capital—the drivers of higher labour productivity—are brought on by the restriction, which affects funds from both domestic and foreign sources.

According to Table 6, the current rate of foreign portfolio investment D(LOGPINV), in tandem with the long-run results, caused a positive but statistically insignificant impact on the current rate of economic growth in Nigeria during the evaluation period. Foreign capital enhances domestic resources by advancing capital stock, technology, managerial aptitude, entrepreneurial prowess, brands, and market access. Consequently, increasing the inflow of foreign capital should improve the economic well-being of the country's economic agents.

Econometric diagnostics checks. A number of diagnostic tests, including normality, serial correlation, heteroscedasticity, and specification error, were used to assess the reliability, stability, and fulfilment of the desirable probabilistic presumptions of a viable ARDL model. The residuals were examined for normality to ensure they are normally distributed, the regressors were checked for serial correlation to assure they did not share a serial correlation, and the model was validated for heteroscedasticity to make

Table 7 Diagnostics tests results.

Problem	Test	Probability	Conclusion
Normality	Jarque Bera	0.3892	Normality exists
Serial correlation	Breusch-Godfrey LM test	0.1146	No serial correlation
Heteroscedasticity	Breusch-Pagan-Godfrey	0.2385	No heteroscedasticity
Specification error	Ramsey RESET	0.7746	Correctly specified

Source: Author's computation 2023 using E-views 12 statistical package.

certain there is no ARCH effect. In addition, CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMsq (Cumulative Sum of Squares of Recursive Residuals) were used to evaluate the reliability of the ARDL model. The results of the diagnostics tests are presented in Table 7.

The model's residuals are normally distributed and do not show any issues with multi-collinearity, serial correlation, heteroscedasticity, or model misspecification error, according to the diagnostic tests statistics in Table 7. The aforementioned characteristics are desirable for OLS models, so the estimated model is considered as being adequately defined. The CUSUM and CUSUM of squares tests, which are depicted in Figs. 1 and 2, also confirmed that the estimated results are accurate and sufficient for economic prediction and choice-making in addition to demonstrating that the estimated parameters are generally robust over an array of structural tweaks.

Conclusion and recommendations

Due to low levels of income and domestic savings, Nigeria has a very large gap between investment and saving. In order to increase job creation, combat poverty, and foster growth, the nation has opened up several economic sectors to foreign investors and provided a number of investment incentives after realizing the ineptitude of domestic capital. The study therefore, conducted a disaggregated analysis of the impact of various investment indicators on economic growth of Nigeria over a 40-year period from 1981 to 2020. Domestic investment was disaggregated into private and public investment while foreign investment was disaggregated into foreign direct and portfolio investment. Credit to private sector, inflation, interest rates and economic liberalisation were adopted as control variables and their relative effects on economic growth were tested using the ARDL methodology.

The empirical findings confirm co-integration among the study variables and demonstrate a significant positive impact of economic liberalisation and credit to private sector on economic growth both in the long and short-term while domestic investment, foreign portfolio investment, and interest rate were efficient and associated with a significant improvement in economic growth only in the long-run. Furthermore, inflation rate significantly inhibited growth in the long and short-run, government infrastructure spending was ineffective and significantly suppressed growth in the long-run while foreign direct investment inhibited growth but significant only in the short-run. The error correction mechanism revealed a high adjustment process of the selected macroeconomic indicators of investment in Nigeria, as the speed of adjustment to long-run equilibrium was 87.86 percent approximately while the diagnostics and stability tests showed that the model is appropriately specified and dynamically stable over time.

As a result, the study advocated for effective fiscal and monetary policy coordination to lower the cost of doing business, incentivize and create an enabling environment for domestic and foreign investors, and improved infrastructure spending to generate jobs, alleviate poverty, sustain growth and achieve overall
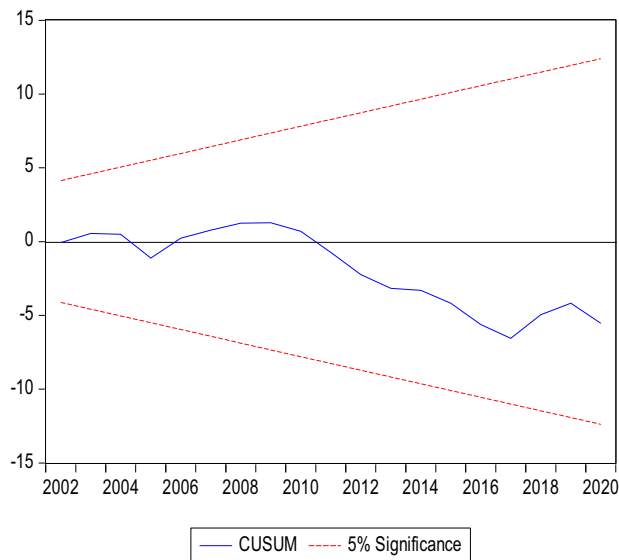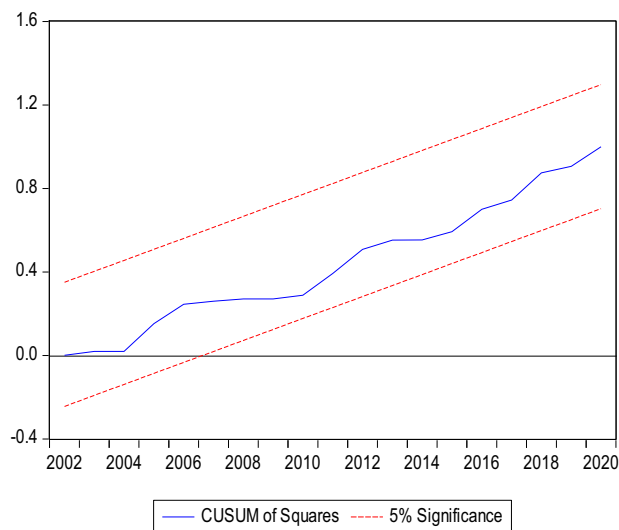

Fig. 1 CUSUM plot.

Fig. 2 CUSUM of squares plot.

macroeconomic stability. This study has important policy implications, including the need to liberalize the financial industry, improved access to credit and enhanced financial inclusion. According to McKinnon and Shaw, such liberalization entails getting rid of excessive reserve requirements, interest rate ceilings, and enforced credit distributions while also using the proper macroeconomic tools to secure price levels. Improved savings and investment are anticipated, along with a decrease in the profitability of investing in various economic sectors. The

study therefore suggests lowering the cost of governance, and deficit financing in order to reduce the negative effects of inflation, particularly in the long run.

Data availability

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Competing interests

The author declares no competing interests.

Ethical approval

This article does not contain any studies with human participants or animals performed by the author. The study uses secondary data sources obtained publicly from the Central Bank of Nigeria and World Development Indicators statistical database and is not sensitive in any way to any vulnerable group(s).

Informed consent

The article does not contain any studies with human participants performed by the author.

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