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The Effect of Saving-Investment Nexus on Current Account Balance in Nigeria: An Implication for the Life-Cycle Hypothesis

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Abstract

This paper explores the impact of both long- and short-term saving-investment nexus on Nigeria's current account balance. It examines the relationship between domestic savings, investments and current account balance by analysing the position of selected demographic variables in Nigeria, both in the short- and long-term, using the ARDL co-integration method, and a sample period from 1980 to 2018. The study tested whether there was empirical evidence supporting the life-cycle hypothesis (LCH) in Nigeria. However, the study revealed that the coefficient of error correction was negative and highly significant, as well as establishing a long-term cointegration. The study revealed a negative sign of life expectancy; and the ratio of total age dependence was found to be statistically significant, thus indicating that a unit increase in life expectancy and the ratio of total age dependence could result in a decline in current account balance in Nigeria by 1.2796 (127%) and 6.43038 (643%), respectively. This result supported the presence of the LCH theory on saving actions in Nigeria, since people could borrow. In addition, the population growth exhibited a positive relationship with current account balance. Therefore, a unit change in the population age structure is expected to influence saving, investment and current account balance; especially with an increase in population, because the current account is, by definition, equal to the saving-investment balance.

Keywords: current account balance, domestic savings, investment, ARDL bounds co-integration

JEL Classification: E21, F32, J13

1. Introduction

Current account balance has been considered as a macroeconomic indicator, and several reasons have been provided both in the theoretical and empirical literature on the importance of investigating its determinants (Brissimis et al., 2010), and also macroeconomic variables or indicators that are interrelated (Khundrakpam & Sitikantha, 2010). Several reasons adjudged include: it shows the degree at which an economy is internationally competitive, and the extent to which a country is living within its resources. Furthermore, it guides foreign investors in making investment decisions as it helps predict threats to macroeconomic stability. Also, it helps policy-makers determine macroeconomic policy continuity with the goal of maintaining a sustainable external position. It is also a key indicator used for

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calculating an economy's success in the external sector, and overall health. Therefore, identifying the determinants of current account is of considerable importance. This fact has also been documented by the development of a number of theoretical inter-temporal models in the literature over the past decade with respect to saving, investment, fiscal position, and demographic factors (Brissimis et al., 2010). In Nigeria, the determinants include trade openness, external debt, real exchange rate, and fiscal balances (Adegboyega et al., 2017). Besides, structural factors such as low level of production technology, import-dependent production, export structure, and a low level of domestic savings in a country may also contribute to the determinants of current account balances (Kim & Lee, 2006).

However, macroeconomic crises in developing countries have underscored the need to clearly identify factors determining a country's current account balance that gives a clear picture of the current extent of a country's industries, services and capital market activities. Thus, an interesting feature of a current account balance in the West African region is recurrent deficits of many countries in the region, Nigeria inclusive. These prolonged deficits in most of the countries have become unsustainable, resulting to crowding-out of domestic saving or economic instability (Opoku-Afari, 2005; Osakwe & Verik, 2007).

A number of factors explaining these imbalances have been identified. The key reasons for these were the drastic declines in oil prices in the 1980s and 1990s, global recessions in 1981–1982 and 1991–1992, and the latest economic recession of 2007–2008. In addition, the surge of interest in the continuation of current account deficit in many countries has sparked growing global imbalances. For instance, Nigeria has encountered both positive and negative balances in its current account, e.g., current account surplus declined sharply by 81.1% to ₦370.8bn despite increased earnings from crude oil exports. The development reflected, largely, the growth in import bills, deteriorating services, and income accounts. The trade (goods) balance decreased from a surplus of ₦3,773.3bn in 2009 to ₦3,030.4bn. The surge in import bills was traceable to the power sector financing and other economic infrastructures, as well as consumable imported goods. The deficit in the services account widened by 17.4%, driven by increased overseas travels, freight charges, and education expenses abroad. The deficit in the income account (net) expanded by 30.0% due to increased repatriation of dividends, coupled with lower earnings on external reserves. Current transfers (net), which comprised mainly of workers' remittances, increased by 8.1% to ₦3,008.7bn (CBN, 2010). Furthermore, current account to GDP in Nigeria averaged 1.61% from 1980 till 2014, reaching an all-time high of 37.90% in 2007/2008 (Oshota & Badejo, 2015).

The International Monetary Fund (IMF) report (2016) noted that the Nigerian economy is facing substantial challenges. While the non-oil sector accounts for 90% of the GDP, the oil sector plays a central role in the economy. Lower oil prices have significantly affected fiscal and external accounts, decimating government revenues to just 7.8% of GDP, and resulting in the doubling of the general government deficit to about 3.7% of GDP in 2015. Exports dropped about 40% in

2015, pushing the current account from a surplus of 0.2% of GDP to a deficit projected at 2.4% of GDP. With foreign portfolio inflows slowing significantly, reserves fell to $28.3bn at the end of 2015.

The prediction of the life-cycle hypothesis forecasts that the saving rate by homes depend on the age profile of the agent (household) (Kim & Lee, 2006; Park & Shin, 2009). If a household's job income profile is sumptuous, it is higher when young and then increases at old age, so customer smoothing means that their active middle ages save at high rates, while young and old save at low levels. Therefore, for any economy, the theory predicts that the saving rate tends to be lower when the shares of the youth-age and old-age dependents in the total population become higher. However, among the key drivers of economic growth includes aggregate labour supply, productivity, consumption, and savings; which are in relations to where most people fall in the life-cycle. Other things being equal, a country with large cohorts of youth and elderly is likely to experience slower growth, reflecting a deteriorating current account balance. Also, the economic theory suggests that certain economic and demographic variables will influence the level of savings and investment across countries over time; and that demographic factors should also influence investment rate (Bloom & Canning, 2011).

The position of demography has long been limited to the effects of population size and population development in researching the causes of economic growth. But in East and South-east Asia, Central and Eastern Europe, many emerging economies are expected to enter into the same rapid aging cycle by 2020 (IMF, 2004). According to Kim & Lee (2007), across all major industrial economies, the demographic transition is expected to accelerate over the next couple of decades, with the most drastic across Japan and Western Europe; and to a lesser degree in the US. On the contrary, in the various stages of demographic change, developed countries have experienced lower dependency and increased labour-intensity share.

Dependency ratios are often taken as the substitute indicators of population age structure to measure the social burden of a country.[1] Hence, a slower growth of a working-age population will slow down economic growth, which will reduce the returns to investment. Similarly, the higher the dependency rates, the bigger effect on saving than investment (Graff et al., 2012; Jong-Won et al., 2014); and also, demographic transition toward older populations would lead to a significant deterioration of the current account (Park & Shin, 2009).

Notably, demographic shift would have a negative impact on investment demand as the rates for returns on investment are reduced by slower labour growth and lower projected production growth. Therefore, any rise in the rate of dependence causes domestic saving to fall above domestic spending, and result to current

[1] The youth dependency ratio is the number of persons 0 to 14 years per one hundred persons 15 to 64 years. The old-age dependency ratio is the number of persons 65 years and over per one hundred persons aged 15 to 64 years. The total dependency ratio is the number of persons under age 15 plus persons aged 65 or older per one hundred persons aged 15 to 64 years.

account balance deterioration (Kim & Lee, 2007; Wilson & Ahmed, 2010; Prati et al., 2011; Ferrero, 2012). This implies that the magnitudes of implied effects across studies are not consistent.

In Nigeria, for instance, on one hand, studies on current account determinants have been investigated and the double-deficit hypothesis accepted: that wider fiscal deficit should usually be accompanied by wider current account deficits (Egwaikhide, 1997; Enang, 2011; Olanipekun, 2012). But on the other hand, according to Ghassan & El-Jeefri (2018), current account volatility is only influenced by local shocks. Contrary were the determinants of current account within the scope of oil-related variables, and Olumuyiwa (2008) and Uneze & Ekor (2012), find that oil price, oil revenue, and oil balance as the determinants of current account. In another study, Adegboyega et al. (2019) consider the causal relationships between macroeconomic factors, demographics, and current account balances in Nigeria, and shows that causality is not caused by current account balance, but by domestic saving and investment. Therefore, there was no big trigger for current equilibrium, spending and domestic saving of the selected demographic variables. Also, Adegboyega et al. (2017) showed that both external and domestic macroeconomic factors contributed to the current account balance in Nigeria. The magnitude exhibited by the external economic environment on current account balance is more enormous than that of the domestic environment, especially the degree of trade openness.

Having regard to these claims, it can be seen that existing studies have yet, in particular, examined the long- and short-run nexus among demographic factors, domestic saving, investment, and current account balance in Nigeria, despite the fact that demographic factors matter in the determinants of saving-investment nexus.

The remainder of the paper is structured thus. Section 2 provides the theoretical and an empirical review of previous existing studies on the subject matter. Section 3 explains the methodology adopted, and the data used. Section 4 provides the empirical results; and section 5 concludes the paper with policy recommendations.

2. Brief Theoretical and Literature Review

There are two major strands of theoretical models that have been exploited in explaining current account balance, and every model offer different predictions about factors underlying current account dynamics behaviour, and consequently provides different economic policy implications. The theories have a dichotomy of three basic frameworks that are commonly adopted in modelling the behaviour of current accounts: these are the elasticity approach, absorption approach, and the intertemporal approach. The elasticity approach treats current account balance as the sum of trade balance and the net international investment income. In a typical elasticity approach, current account balance is mainly determined by real exchange rate, domestic output, and foreign output. This approach is largely applied to evaluate the effect of currency depreciation or appreciation on current account balance. In particular, it is used to examine if currency depreciation can help improve current account balance. It also highly emphasises the role of exchange rate and trade flows in current account adjustments. Many economists and policymakers take this approach as granted, and use it to construct current account models due to its general appeal and simplicity. In short, the elasticity approach explains that current account balance depends on the price elasticity of demand for imports and for exports, vis-à-vis movements in the exchange rate. However, the deficiency of the approach is that it is a partial equilibrium-based analysis. In particular, it only looks at traded goods market, and ignores the interaction of other various markets in an economy.

Second, the absorption approach considers current account balance as the difference between income and absorption, or equivalently, the difference between savings and investment: also known as the saving-investment balance approach. This approach is a macroeconomics-oriented approach. It investigates the effect of exchange rate change on trade balance through the absorption channel, whereby income and relative prices change and adjust. It also states that if an economy spends more than it produces (i.e., absorption exceeds income), it must import from other countries for its excess consumption and spending, and thus runs a current account deficit. On the other hand, if an economy spends less than it produces (i.e., income exceeds absorption), it runs a current account surplus. Since the sum of current account and capital account must equal zero, ex-post in a flexible exchange rate regime, shocks that occur first in capital account will obviously affect current account, and vice versa. Therefore, the absorption approach argues that it is necessary to include determinants of capital account balance when modelling the behaviour of current account. In other words, the absorption model considers current account balances as a function of what is produced and consumed in the economy. There is also the Mundell-Fleming model, which emphasises the exchange rate and interest rate regimes as well as the national output, positing that through the combination of monetary and fiscal policy, a current account balance may eventually be determined by the exchange rate regime in place.

The monetary approach has been exploited to explain changes in current account balances. The idea behind the monetary model is that any disequilibrium in the money market produces an effect on aggregate expenditure. The proponents of the monetary model, therefore, argue that surplus in balance of payments results from an excess in the stock of money demand that is not met by monetary authorities. On the other hand, the portfolio balance approach expands the monetary model by incorporating financial instruments. The approach postulates that a current account adjustment may operate through changes in the size of a portfolio, or through changes in the composition of a country's portfolio. It argues that exchange rate is unimportant in current account adjustments (Krugman, 1987).

The intertemporal approach, which derives from the absorption approach, also considers current account balance from the saving-investment perspective. The approach suggests that an economy runs a current account surplus if national income is temporarily high, or investment temporarily low. However, the intertemporal approach is a microeconomics-based analysis, while the absorption approach is a macroeconomics-based analysis. To be more specific, the former recognises current account balance as a result of economic agents' "… collective optimisation behaviour based on the expected values of various macroeconomic factors under the inter-temporal budget constraint." The approach achieves a synthesis between the trade and financial flow perspectives by recognising how macroeconomic factors influence future relative prices, and how relative prices affect saving and investment decisions (Obstfeld & Rogoff, 1995). The economic theory underpinning this study stems from the intertemporal approach to current account, which was initially proposed by Sachs (1981) and Buiter (1981); and later extended by Obstfeld and Rogoff (1995).

Several authors have established a close empirical correlation between demographic changes and the accumulation of macroeconomic variables. These include contributions by Taylor (1995), Behrman et al. (1999), Higgins and Williamson (1997), and Bloom and Williamson (1998). Their findings vary substantially by country and periods, but a fair summary seems to be that demographic changes of past years are associated with an increase in income per capita of around 1% per year in developing regions (Bloom et al., 2004).

For example, Bloom et al. (1997) showed that demographic variables played a large role in the East Asian economic success. According to the study, the demographic transition that caused a change from high to low rates of mortality and fertility were more dramatic in East Asia during the twentieth century than in any other region or historical period. However, the study pointed out that the favourable demographic characteristics had a purely transitional effect on economic growth. That is, the effect of demographic change on economic growth operates only when the dependent and working age population is growing at different rates in a nation. Therefore, the authors predicted that economic growths in East Asia will likely slow down in the future because of the stabilization of fertility rates at their current low levels. Also, there will be an increase in the dependency ratio as the population ages increases. Similarly, Bloom and Williamson (1998) find that age structure has a transitional impact on an economy. Based on a cross-sectional analysis of 78 Asian and non-Asian countries, they concluded that the growth of the working age population had a powerful and positive impact on GDP per capita growth.

Jong-Won et al. (2014) demonstrated to what extent do demographic variables change over time using OECD and developed economies, thereby investigating their effect on macro-economic variables. They emphasized the need to take into account interactions in macroeconomic policy decision between population dynamics and macroeconomic variables on macroeconomic policy decisions, and concluded that population growth had a negative, but in many cases negligible, effect on real economic variables. Population dynamics have a very mixed impact on fiscal policy variables, whereas population growth has a positive effect on prices. Nguyen (2015) analysed the effects of fiscal deficit and broad money supply (M2) on inflation in Asian economies, namely Bangladesh, Cambodia, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam during 1985–2012 period. They found that M2, fiscal deficit, government expenditure, and interest rate were statistically significant determinants of inflation in these economies.

Oshota and Badejo (2015) investigated the determinants of current-account balance in West Africa using dynamic fixed effect (DFE) and pooled medium group (PMG) panels ARDL. Their finding revealed that current account has a long-term relationship to its determinants (per capita GDP, savings, M2, and dependency ratio), which were all found to be positive. In fact, per capita growth in GDP and M2 raises the balance on current account in the long-term, but in the short-term spending has positive effects on current account balance on both dynamic fixed effect (DFE) and pooled medium group (PMG); while an increase in real exchange rate (REER) has a significant negative effect on current account balance.

Hahn and Park (2009) considered fertility rate, working-age population ratio, and population growth rate as the three alternative demographic indicators of economic growth in a cross-sectional study. For each indicator, the author constructed a measure of the speed of demographic transition. They also considered three specifications as the standard regression models. On their part, using an extended modelling system, Graff et al. (2008, 2012), focused on the national income theory, which accounts for the worldwide total of zero external balances. The authors showed that saving and return on investment are broadly compatible with current account balance, but failed to find strong proof on the impact of age on current account balance. Wilson and Ahmed (2010) employed the OLS panel to investigate the links between demographics, growth, and current account balance. They found that the position of current account depends on the stage of life of the residents of a country: if the people are passing through the 'prime saving' age of 35-69 years, they will save more. So, a tendency to save more across an economy will translate into pressure for current account surpluses and a flow of capital to other countries. Because a people's saving behaviour generally varies at different points in their life, people in the young age have fewer tendencies to save, hence putting adverse effects on current account balance.

With a VAR model, Gurleen (2018) employed the Johansen cointregration technique and Granger causality tests to establish the nexus between fiscal deficit and inflation in India for the period 1970–2015. The study results showed that there exists a long-run relationship between fiscal deficit, money supply, exchange rate volatility and inflation rate. Also, the Granger causality test outcome failed to confirm the causality running from fiscal deficit to inflation. In a similar study conducted in India, Khundrakpam and Pattanaik (2010) investigated the relationship between fiscal deficit and inflation over the period 1953–2009. They employed ARDL estimation techniques to find how fiscal deficit responds to domestic economy, and found that a one%age point rise in a fiscal deficit level could results to a quarter of a%age point increase in a Wholesale Price Index (WPI). Therefore, they emphasise the importance of fiscal space in the specific context of India not in relation to the usual fiscal policy output stabilisation role, but the need for the use of fiscal measures to contain inflationary pressures that always come from temporary but large shock of supply. The overall impact of fiscal deficit on inflation, in turn, could operate through both increases in aggregate demand, as well as associated growth in broad money.

In Nigeria, for instance, the foremost study on the component of balance of payments is by Egwaikhide (1997), who examined the relationship between budget deficit, domestic credits, aggregate demand, price level, and balance of payment. The study found that a budget deficit contributes to a deterioration of the current account, based on a macro-econometric model that tracks the links between government budget growth, credit creation, and current account balance. Similarly, Egwaikhide et al. (2002) examined the relationship between government expenditure deficit/ excess and current account balance using a community of African countries, including Nigeria. The main result was that causality varies from the balance of current account to the budget. Furthermore, using the ARDL approach, Olanipekun (2012) investigated the relation between Nigeria's budget deficit and current-account balance. The findings revealed that there were persistent variances and imbalances since independence in budget deficits and current account balances.

Enang (2011) carried out a study to explore Nigeria's current account activity in terms of macro-economic, non-political, and financial sector variables; employing the vector auto-regressive (VAR) analytical approach. The findings showed that the value of macroeconomic variables influencing current-account balance are exchange rate, monetary policy, and budget deficits. This also indicates that there are two-way relations between balance of current account and budget deficit. Contrarily, Okojie (2005) revealed that exchange rate, domestic interest rate, and trade balance in export ratios were the main determinants of Nigeria's current account balance. The report further revealed that Nigeria's current account deficits resulted from increased foreign investment revenue, increasing exports imports, and trade balance deficits for services.

Moreover, using the VAR method, Uneze and Ekor (2012) examined the relation between a number of oil-related variables and current account balance; and also the long-term relationship between current account balance and oil related variables between 1970 and 2008. The study revealed that oil variables play a crucial role in explaining the current account position in the long-run, while oil price was a key variable explaining current account balance in the short-run in Nigeria. Also, there was no evidence of a long-term current account balance-fiscal balance relationship in the country.

On his part, Olumuyiwa (2008) investigated how macroeconomic indicators have been used to assess the size and sustainability of current account deficit in Nigeria, before and after the SAP. The study found that preceding the 1986 external crisis, the unsustainability of current account deficit is accounted for by macroeconomic indicators, and that structural weaknesses contributed to the unsustainable current account deficits and external crisis in Nigeria. Also, Oseni and Onakoya (2013) examined the effects of fiscal policy shocks on current account, as well as the dynamic interactions among fiscal policy shocks and current account with other macroeconomic variables, using structural VAR. The result shows a positive effect on production and exchange rate; and a negative impact on current account balance and interest rate as a consequence of expansionary fiscal policies shock.

Using data from 1980 to 2007, Nwakeze and Omoju (2011) examined the effect of population growth on savings in Nigeria, employing an econometric methodology encompassing the error correction model of regression analysis. They showed that population growth could lead to increased savings by the effect of growth, or a reduction in savings by the effect of dependence. Furthermore, they found that income and rapid population growth have positive and negative significant impacts, respectively, on savings in Nigeria. On their part, Adegboyega et al. (2017) used the autoregressive distributed lag model (ARDL), as one of the major workhorses in dynamic single-equation regressions, to analyse and establish which of the macroeconomic variables were the driving force of Nigeria's current account balance. They found that macro-economic factors—both foreign and domestic—contributed to Nigeria's current account balance; but the magnitude shown on the current account balance by the foreign financial context is much bigger than that of the current account balance. They concluded, however, that Nigeria's current account balance was driven by free trade, foreign debt, real exchange rates, and fiscal balance, which were consistent with earlier studies.

From the related empirical review, it is evident that most studies have considered current account balance from different perspective, but little has been done to examine the role played by demographic variables. Also, no study has examined the life-cycle hypothesis (LCH) in the context of the Nigeria economy. This study intends to fill in these gaps.

3. Methodology and Data

This study adopted inter-temporal approach to current account balance as described by Obstfeld and Rogoff (1995) in accordance with the life-cycle hypothesis of saving as pioneered by Modigliani and Brumberg (1954); and Ando and Modigliani (1963) to examine the long- and short-term relationship among demographic variables, domestic saving, investment, and current account balance in Nigeria. The reason for the life-cycle and dependency hypothesis is that it is a special case of an inter-temporal optimization model of consumer behaviour. Furthermore, the study followed the approaches of Barnes et al. (2010). The functional form of the model is specified as:

$$\begin{aligned} CABGDP_t &= \alpha_0 + \alpha_1 INT_t + \alpha_2 TDR_t + \alpha_3 LLE_t + \alpha_4 POPGR_t + \alpha_5 INCG_t \\ &+ \alpha_6 CPSGDP_t + \alpha_7 DSAVGDP + \alpha_8 INVTGDP_t + \alpha_9 GDPG_t \\ &+ \alpha_{10} EXCH_t + \varepsilon_t \qquad (1) \end{aligned}$$

where, *CABGDP* is the balance of the current account as part of GDP; *INVTGDP* is the gross capital accumulation as a share of GDP; *DSAVGDP* refers to private and public investments, which are the share of GDP; *LLE* refers to life expectancy; *TDR* refers to a total population dependence ratio between 0 and 14 years and a population of 65 or more; *POPGR* denotes population growth, all of which is a reference to the identified demographic variables. *INCG* is the income growth indicator as GDP per capita growth by%age; *CPSGDP* is a metric for financial development measured as domestic credit to the private sector in%age of GDP; *GDPG* is per capita income and output per capital GDP, *EXCH* is the projected inflation calculated by the consumer price index; and *INT* is the interest rate and calculates as the nominal interest rate on savings deposits.

All the details used are from the World Development Indicator (2018); the Central Bank Statistical Bulletin and the National Statistics Office (NBS) released for several years are indicated by the CBN. All information is available in annual time series.

Table 1: Definitions and Sources of the Variables

Variables	Measurements
Current account balance (CABGDP)	Current account balance in% of GDP
Investment (INVTGDP)	The gross rate of capital formation as a%age of GDP
Domestic SavingDSAVTGDP)	The sum of private and public saving as a%age of GDP
Total age dependency ratio (YDR)	The sumpopulation that is between 0 and 14 year and the number of population 65 years and above
Life expectancy (LLE)	Life expectancy at birth (total) in years
Population growth (POPG)	Population is the number of residents living within a geographical boundary,e.g., a town, a nation or the world.
Financial development (CPSGDP)	Domestic credit to private sector in% of GDP
Income growth (INCG)	The gross domestic product per capita growth in%
Per capita Income (GDPG)	Gross domestic product per capital
Interest Rate (INT)	Interest rate is defined as the nominal rate of interest on savings deposits
Exchange Rate (EXCH)	Expected inflation measured by consumer price index

Note: WDI = World Development Indicators; CBN = Central Bank Statistical Bulletin and National Bureau of Statistics (NBS) publications of the several years.

3.1 ARDL Bounds Test

The ARDL, put forward by Pesaran et al. (2001), examined cointegration among variables in equation (1). This approach is advantageous because it is used irrespective of the order of stationarity of variables [I(0) or I(1)]. Although there is no need for unit root pre-testing, it is necessary as the approach does not capture variables that are integrated of order two [I(2)]. In the absence of previous knowledge on the course of long-term in equation (1), and following the Pesaran et al. (2001), the unrestricted error correction version of the ARDL model pertaining to the variables in equation (1) is re-specified as below:

$$\begin{aligned}\Delta CABGDP_t = {} & \alpha_0 + \alpha_1 CABGDP_{t-1} + \alpha_2 INT_t + \alpha_3 TDR_t + \alpha_4 LLE_t + \alpha_5 POPGR_t \\ & + \alpha_6 INCG_t + \alpha_7 CPSGDP_t + \alpha_8 DSAVGDP_t + \alpha_9 INVTGDP_t + \alpha_{10} GDPG_t \\ & + \alpha_{11} EXCH_t + \sum_{i=1}^{n} \gamma_i \Delta CABGDP_{t-1} + \sum_{i=0}^{o} \beta_i\, \Delta INT_{t-1} + \sum_{i=0}^{p} \epsilon_i \Delta TDR_{t-1} \\ & + \sum_{i=o}^{q} \partial_i \Delta LLE_{t-1} + \sum_{i=0}^{r} \emptyset_i \Delta POPGR_{t-1} + \sum_{i=0}^{s} \vartheta_i \Delta INCG_{t-1} \\ & + \sum_{i=0}^{t} \sigma_i\, \Delta CPSGDP_{t-1} + \sum_{i=0}^{u} \ni_i\, \Delta DSAVGDP_{t-1} + \sum_{i=0}^{v} \delta_i \Delta INVTGDP_{t-1} \\ & + \sum_{i=0}^{w} \pi_i \Delta GDPG_{t-1} + \sum_{i=0}^{x} \varphi_i \Delta EXCH_{t-1} + \mu_t \qquad (2)\end{aligned}$$

Equation (2) is ARDL (*n, o, p, …, x*) model, and the lag length is chosen by one lag length selection. Where Δ is the difference operator; $\alpha_1, \alpha_2, \alpha_3, \ldots, \alpha_{11}$ are long-run estimates; $\gamma_i, \beta_i, \in_i, \partial_i, \emptyset_i, \vartheta_i, \sigma_i, \ni_i, \delta_i\ \pi_i$ and φ_i are short-run estimates; and μ_t is the error term at time t.

Aside from the aforementioned attribute of the ARDL, another attribute is its re-parameterisation to researchers as error-correction model (ECM); of which uses have increased over time (Engle & Granger, 1987). By determining the order of integration of the variables and forming a linear combination of the non-stationary data, all variables are transformed equivalently into an EC model with stationary series only. This methodology, in addition to other benefits already mentioned, allows researchers to explore correct dynamic structures. It allows for inferences on long-run estimates that are not possible under alternative co-integration procedures. Finally, the ARDL model can accommodate a greater number of variables in comparison to other vector autoregressive (VAR) models (Pesaran & Shin, 1995).

Furthermore, the F-Statistics analysis helps to assess the co-integration of variables by analysing the value of lagging variables. The null hypothesis of no cointegration between equation variables (2) is set as H_o: $\alpha_1 = \alpha_2 \ldots = \alpha_{11} = 0$ against alternative hypothesis H_1: $\alpha_1 \neq \alpha_2 \neq \cdots \neq \alpha_{11} \neq 0$. Two asymptotic values—namely upper and lower bound—are generated based on Pesaran et al. (2001). Compared with the two asymptotic value, the calculated F-statistic system is compared, where the computed F-statistic < lower bound critical value is taken to mean no cointegration. At the other hand, the decisions for the alternative hypothesis are also dismissed, although there are long-term relationships between the variables when the F-Stat measure > upper limit critical value. The outcome is thus inconclusive when the measured F-Stat drop between upper and lower bound critical values. However, the error correction model (ECM) is assessed and therefore presented below when cointegration is defined, according to Pesaran et al. (2001).

$$\begin{aligned}\Delta CABGDP_t &= \rho_1 + \sum_{i=1}^{n} \gamma_i \Delta CABGDP_{t-1} + \sum_{i=1}^{n} \beta_i\, \Delta INT_{t-1} + \sum_{i=1}^{n} \epsilon_i \Delta TDR_{t-1} \\ &+ \sum_{i=1}^{n} \partial_i \Delta LLE_{t-1} + \sum_{i=1}^{n} \emptyset_i \Delta POPGR_{t-1} + \sum_{i=1}^{n} \vartheta_i \Delta INCG_{t-1} + \sum_{i=1}^{n} \sigma_i\, \Delta CPSGDP_{t-1} \\ &+ \sum_{i=1}^{n} \ni_i\, \Delta DSAVGDP_{t-1} + \sum_{i=1}^{n} \delta_i \Delta INVTGDP_{t-1} + \sum_{i=1}^{n} \pi_i \Delta GDPG_{t-1} \\ &+ \sum_{i=1}^{n} \varphi_i \Delta EXCH_{t-1} + \alpha ECM_{t-1} + \mu_t \qquad (3)\end{aligned}$$

The short-run estimate coefficients are γ_i, β_i, α_i, $\ni_i$, $\in_i$, θ_i, Π_i, ρ_i, o_i, and φ_i; while ECM_{t-1} is the error correction term, which confirmed the long-term equilibrium, and α is a parameter capturing change speed following a shock.

4. Discussion of Findings

The descriptive analysis is conducted with a view to ascertaining the statistical properties of the variables. The descriptive statistics of data series provide information about sample statistics such as mean, median, maximum value, minimum value, and the distribution of the sample captured by skewness, kurtosis, and Jarque-Bera statistics.

Table 2 presents the number of observations, minimum, maximum, standard deviation and the coefficient of variation for all variables from 1980 to 2018. The table shows that all the series are highly consistent as their mean and median values are perpetually within the maximum and the minimum values of these series, and further indicate that all the variables are normally distributed as the mean and median are approximately equal and fell between the maximum and minimum values. The standard deviations show that current account balance (*CABGDP*), domestic saving (*DSAVGDP*), investment (*INVTGDP*), credit to private sector (*CPSGDP*), exchange rate (*EXCH*), per capita GDP (*GDPg*), income growth (*INCG*), interest rate (*INT*), life expectancy (*LLE*), and total age dependency rate (*TDR*) are the most volatile in the time series; but per capita GDP (*GDPg*) is the highly volatile (197.13), while population growth rate (0.108) is the least volatile.

Also, the result shows that current account balance (*CABGDP*), domestic saving (*DSAVGDP*), investment (*INVTGDP*), credit to private sector (*CPSGDP*), income growth (*INCG*) and interest rate (*INT*) are leptokurtic relative to normal distribution, since the p-value is greater than 3; while, on the other hand, exchange rate (*EXCH*), per capita GDP (*GDPGDP*), life expectancy (*LLE*), population growth (*POPGR*), and total age dependency rate (*TDR*) are platykurtic, since the p-value is less than 3.

Finally, the probability that the Jarque-Bera (J-B) statistic test exceeds (in absolute term) the observed value indicates that domestic saving (*DSAVGDP*), interest rate (*INT*), population growth (*POPGR*), and total dependency rate (*TDR*) are normally distributed because the p-values are greater than 0.05, i.e., ($p > 0.05$); while current account balance (*CABGDP*), investment (*INVTGDP*), credit to private sector (*CPSGDP*), income growth (*INCG*), exchange rate (*EXCH*), per capita GDP (*GDPG*) and life expectancy (*LLE*) are not normally distributed because the p-values are less than 0.05, i.e., ($p < 0.05$). Based on the above, it can be concluded that the variables employed were normally distributed.

For the variables used during the study period, Table 3 presents the correlation matrix. There is no multicollinearity between the variables, in view of the weak correlation between the explanatory variables domestic saving (*DSAVGDP*), expenditure (*INVTGDP*), credit to private sector (*CPSGDP*), exchange rate (*EXCH*), per capita GDP (*GDPg*), income growth (*INCG*), interest rate (*INT*), life expectancy (*LLE*) and total age dependence rate (*TDR*), population growth (*POPGR*) and the dependent variable current account balance (*CABGDP*).

Table 2: Descriptive Analysis

	CABGDP	*DSAVGDP*	*INVTGDP*	*CPSGDP*	*EXCH*	*GDPG*	*INCG*	*INT*	*LLE*	*POPGR*	*TDR*
Mean	5.06011	22.48559	12.50405	14.96316	67.87622	710.0218	1.139712	17.8417	47.77538	2.614317	88.63783
Median	2.541	21.68434	11.55206	13.20962	89.30145	608.9434	1.615891	18.433	46.33476	2.592725	88.50992
Maximum	32.54304	39.31757	34.02084	38.38656	113.2	1109.876	30.34408	31.65	52.49978	2.861355	91.97303
Minimum	-7.282	1.829658	5.467015	8.70966	0.741667	494.239	-15.4583	8.43	45.5478	2.495284	85.93836
Std. Dev.	8.889863	7.818471	6.047894	6.109247	41.92179	197.1312	7.384196	5.204881	2.287768	0.108377	1.999079
Skewness	1.281546	0.012489	1.889877	2.485311	-0.56665	0.7633	1.139494	-0.03263	0.98044	0.656891	0.275261
Kurtosis	4.30731	3.309979	7.046622	9.361399	1.588368	2.070671	8.731167	3.230004	2.332883	2.164904	1.808519
Jarque-Bera	12.41776	0.145066	45.99253	97.76173	4.915583	4.791243	57.06009	0.085743	6.435143	3.635116	2.584052
Probability	0.002011	0.930035	0.000000	0.000000	0.085624	0.091116	0.000000	0.958035	0.040052	0.162422	0.274714
Sum	182.1639	809.4813	450.1459	538.6738	2443.544	25560.78	41.02963	642.3012	1719.914	94.11542	3190.962
Sum Sq. Dev.	2766.038	2139.497	1280.196	1306.302	61510.27	1360124	1908.422	948.1776	183.1859	0.411098	139.871
Observations	39	39	39	39	39	39	39	39	39	39	39

Source: Authors' Computation

Table 3: Correlation Matrix

	CABGDP	*DSAVGDP*	*INVTGDP*	*CPSGDP*	*EXCH*	*GDPG*	*INCG*	*INT*	*LLE*	*POPGR*	*TDR*
CABGDP	1.0000										
DSAVGDP	0.00746	1.00000									
INVTGDP	-0.388	0.35663	1.00000								
CPSGDP	0.14336	-0.2996	0.06593	1.00000							
EXCH	0.35387	-0.0838	0.18428	0.27237	1.00000						
GDPG	0.58707	0.12026	0.19852	0.30821	0.60878	1.00000					
INCG	0.47949	-0.0727	-0.446	-0.0419	0.18024	0.28704	1.00000				
INT	0.12124	-0.0168	-0.433	-0.2573	-0.3524	-0.1381	0.34578	1.00000			
LLE	0.59761	0.02804	0.02928	0.30871	0.49902	0.92229	0.30815	0.08129	1.00000		
POPGR	0.35989	0.28957	0.34359	0.23526	0.44175	0.85101	0.04939	-0.3328	0.70274	1.00000	
TDR	-0.4098	0.33593	0.36952	-0.1696	-0.6231	-0.274	-0.3748	-0.2282	-0.3055	0.00707	1.00000

Source: Authors' Computation

There is a positive correlation between domestic saving (*DSAVGDP*), private sector loan (*CPSGDP*), exchange rates (*EXCH*), GDP per capita (*GDPg*), income growth, interest rates (*INCG*), life expectancy (*LLE*), population growth rates (*POPGR*) and current account. Investment correlations between investments are not important with total age-dependent ratios (*TDR*) and current account balance (*CABGDP*). The findings also showed a strong positive association between population growth and GDP per capita, and life expectancy and GDP per capita at 85% and 92%, respectively.

In addition, among the selected demographic variables (life expectancy, total dependency rate, and population growth rate), only total dependency rate exhibits a negative relationship with current account balance (r = -0.40). Therefore, this is consistent with the *a priori* expectation as a rise in the total dependency rate (i.e., old age and working age) is expected to decrease income and domestic savings, and thus the current balance is deteriorated. More so, there exists a positive correlation between each of life expectancy and current account balance; population growth and current account balance, which accounted for r = 0.59 and r = 0.35, respectively. In summary, the result shows that there is no or little multicollinearity among the variables.

Table 4 presents the Augmented Dickey Fuller (ADF) unit root test, which is based on the decision rule that, if the absolute value of the ADF test is greater than 5% critical value, then the tested value is stationary. On the other hand, if the absolute value of the ADF test is less than 5% critical value, then the tested variable is non-stationary. If the p-value is less than 5% for the ADF test, then the result is stationary.

Table 4: Unit Root Test Using Augmented Dickey-Fuller Techniques

	Level		**First Difference**		
Variables	***Constant***	***Constant, Linear Trend***	***Constant***	***Constant, Linear Trend***	***Order of Integration***
CABGDP	-2.09099	-3.51157	-5.5216*	-5.4785*	I(1)
CPSGDP	-3.2482*	-3.2994	-5.0028*	-4.1976*	I(1)
DSAVGDP	-4.4608*	-4.4218*	-5.1213*	.5.1078*	I(1)
GDPG	0.5917	-2.7316	-4.9592*	-5.8237*	I(1)
INCG	-53074*	-5.5687*	-5.2770*	-5.1847*	I(1)
EXCH	-1.60813	-2.40328	-3.9459*	-4.0995*	I(1)
INT	-2.6705	-2.4589	-2.5048	-2.6273	I(0)
INVTGDP	-2.8618	-2.4486	-5.1173*	-6.1283*	I(1)
LLE	-2.9192	-4.77064*	-1.6635	0.5006	I(0)
TDR	-0.49124	-1.87858	-3.2597*	-2.14775	I(1)
POPGR	0.5886	-1.5049	-1.17359	-8.9860*	I(1)

Note:*Implies 5% significance level respectively.

Source: Authors' Computation

The result suggests that the variables for this study are integrated of different orders. The current account balance (*CABGDP*), domestic saving (*DSAVGDP*), investment (*INVTGDP*), credit to private sector (*CPSGDP*), exchange rate (*EXCH*), per capita GDP (*GDPGR*), income growth (*INCG*), and total age dependency rate

(*TDR*) are integrated of order one I(1), while life expectancy (*LLE*) and interest rate (*INT*) are integrated of order zero I(0) in nature at 5% level of significance. The implication of this is that, the series have long- and short-run relationship.

The essence and properties of the above-mentioned sequence have been established, and the long- and short-term relationship must be defined for the analysis. The autoregressive distributed lag model (*ARDL*) has therefore been used for the estimation of regression. This means that the relationship between current account (*CABGDP*), domestic saving (*DSAVGDP*), investment (*INVTGDP*), private sector loans (*CPSGDP*), exchange rates (*EXCH*), per capita GDP (*GDPG*), growth in income (*INCG*), and total dependency rate (*TDR*), life expectancy (*LLE*), population growth rate (*POPGR*) and interest rate (*INT*) should be calculated over a longer period of time. The results of the bounds test co-integration are presented in Table 5. Given the lower and upper bound test-statistics of 2.06 and 3.24, respectively, at 5% level of significance, the F-statistics measure of 3.5377 is greater than the upper bound test, which informs that there is a long-run relationship among the variables in the model.

Table 5: Results of ARDL Cointegration Test

Test Statistics	Value	Lower bound @ 5%	Upper bound @5%
F-Statistic	3.5377 (0.0018)	2.06	3.24

Source: Authors' Computation

Table 6 shows that the coefficient of the error correction term was negative and statistically significant at 5% level of significance. However, it also shows that the model has a short-run relationship, and reveals that short-run change speeds are 59.23%. It also means a relatively high amount of change, and where a disruption occurs, the return to equilibrium was fairly swift with 59.2% of the transition in the first year. Consequently, for an initial error of 5%, 59.2% of error would be corrected in the first year. However, Bannerjee et al. (1998) noted that a highly significant error correction term is further proof of a stable long-run relationship; while Granger (1986), on the other hand, believed the existence of a major error term in at least one direction is a proof of causality.

Table 6: Statistical Output for the Short Run Estimate

Dependent Variable: *D(CABGDP)*	**Coefficient**	**Std. Error**	**t-Statistic**
D(CPSGDP)	0.001849	0.152836	0.012098
D(EXCH)	0.112318	0.06611	1.698973
D(GDPG)	0.058951	0.022736	2.592921*
D(DSAVGDP)	-4.908608	1.946304	-2.522016*
D(INCG)	0.139938	0.140688	0.994669
D(INT)	0.304813	0.237269	1.284669
D(INVTGDP)	-0.587106	0.265287	-2.213093*
D(LLE)	5.571875	4.505752	1.236614
D(POPGR)	19.001017	24.707816	0.769029
D(TDR)	0.667889	0.799538	0.835344
ECT(-1)	-0.592374	0.130303	-4.546115*

Source: Authors' Computation

Theoretically, it has been said that the expected sign for demographic variables should be negative irrespective of the size and composition of the demographic variables used. Meanwhile, Table 7 shows that the dependency rates (TDR) and life expectancy (LLE) are both found to be negative.The coefficient of the total dependency rate had a negative sign and is statistically significant (t = -2.48, p < 0.05) at 5% significance level; and likewise, the life expectancy rate also had a negative relationship and is statistically significant (t = -7.55, p< 0.05) at 5% significance level. This finding supports the LCH theory, and is in contrast to Park and Shin (2009) who recorded a positive relationship between life expectancy and investment levels, which also represent higher lifespan better conditions for general health. Similarly, Graff et al. (2012) and Jong-Won et al. (2014) concluded that, the higher the dependency rates, the bigger effect on saving than on investment. Furthermore, the negative relationship may be an outcome of a less stable and less efficient population that leads to unattractive investment. Also, shorter life span can make long-term investment goods unattractive for individuals as they cannot benefit much from it.

Table 7: The Estimated Long-Run Coefficients Results

Variable	Co-efficient	Standard Error	t-Statistic
Constant	207.0955	3.93413	61.0157*
Life Expectancy (*LLE*)	-6.43038	0.851201	-7.5545*
Total-age Dependency (*TDR*)	-1.2796	0.515728	-2.4812*
Population Growth (*POPGR*)	73.45502	12.81046	5.7339*
Domestic Saving (*DSAVGDP*)	-0.00601	0.063571	-0.0945
Credit to Private Sector (*CPSGDP*)	-0.05788	0.075927	-0.7623
Exchange Rate (*EXCH*)	-0.00728	0.021458	-0.3393
Per capita Income (*GDPG*)	0.047171	0.011418	4.1313*
Income growth (*INCG*)	-0.06794	0.082153	-0.8269
INVTGDP	0.422824	0.115908	3.6479*
Current Account Balance (*CABGDP*(-1)	-0.24591	0.076217	-3.2265*

Note: * implies 5% significance level
Source: Authors' Computation

A positive and statistically relevant relationship is observed in population growth rates (POPGR) of 5% (t = 5.73, p < 0.05). This effect is statistically and economically important, leading to a unit increase in population growth rate (*POPGR*), which thus raises the current account balance by 73.45502%, thereby leading to an increase in the dependence rate; while life expectancy leads to a decrease in investment rate and thus a decrease in current account balance in Nigeria by 1.2796 (127%) and 6.43038 (643%), respectively. The negative impact of the dependency ratio and life expectancy in Nigeria signifies that the country depends more on imports, and thus the importance of population growth for current account balance becomes more significant. Thus, the demand for imports will increase with the increase in inactive population, leading to a depletion of foreign exchange reserves, and in turn worsened current account balance. According to the LLCH, the tendency of people towards saving differs at different stages of life. Hence, with an increase in population growth, the ratio of inactive dependent population increases; and this causes a reduction in the saving rate. Therefore, population growth could be a considerable determinant behind deviation of saving rate from investment requirement in the economy, which may ultimately disturb current account balance. Also, given that people tend to dissave during their retirement years, an increase in the age dependency ratio (the sum of youth age dependency and old age dependency ratio), reduce domestic saving if saving will be a trade-off for consumption.

The coefficient of growth of gross domestic product (*GDPG*) revealed that its growth has a positive influence on current account balance, and was found to be statistically significant at 5% significance level ($t= 4.13$, $p < 0.05$). Hence, investment will increase if the prevailing macroeconomic environment is stable, and consequently promote growth. The result was consistent with theoretical expectations that domestic economic growth accelerates demand for foreign goods and services, and consequently deteriorates current account balance (Wilson & Ahmed, 2010).

The ratio of current account balance to gross domestic product (*CABGDP*) lagged is negative and statistically significant ($t = -3.22$, $p < 0.05$) at 5% significance level. A unit increase in current account balance brings about a reduction in the investment rate by 2.4%. Hence, this would result to a reduction in the investment environment, likewise implying that current account balance do not contribute to investment, although the *CABGDP* is expected to add to the supply of available funds for investment.

The diagnostic test presented in Table 8 shows that the model is free of both serial correlation and heteroskedasticity problems. The series Breusch-Godfery correlation LM test shows that the model is non-relating ($p > 0.05$). With the same consequence, the heteroskedasticity test by Breusch-Pagan Godfrey shows a residual free of heteroskedasticity ($p> 0.05$). The normality test further shows that the series are normally distributed because the p-values are greater than 0.05.

Table 8: Statistical Output for Diagnostic Check

Test Name	F-Statistics	P-Value
Normality	0.0199	0.990051
Serial Correlation LM	1.65108	0.2138
ARCH test	2.57797	0.1179
Heteroscedasticity	0.047335	0.8291
Ramsey Reset	18.6677	0.0004

Source: Authors' Computation with E-View.

The Ramsey reset test shows that the model has an error problem. However, as the line in Figure 1 (i.e., +5 and -5) is within the borders and does not override the critical boundaries, the CUSUM recursive test confirms a reasonably high degree of stability for the model relationship, which indicates that the model is correctly specified; and the long-term coefficients are stable. Hence, the estimated models passed all diagnostic tests against the heteroscedasticity (ARCH test), serial correlation (Breusch-Godfrey test), normality (Jarque-Bera test), and function form errors (Ramsey regression equation specification error test (RESET)).

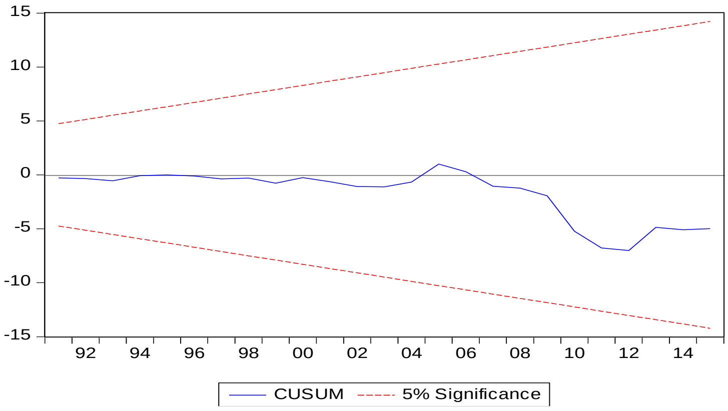

Figure 1: ***CUSUM Stability Test***

5. Summary of Findings and Conclusion

This study examined selected demographic variables, domestic savings, investment, and current account balance in Nigeria in the period 1980 to 2018. The ADF test was performed on the unit root, and the results showed that certain variables are stationary at levels, while at the first difference some of them are normal. This meant that the chosen demographic variables, domestic saving, investment and current account balance, could have both short- and longer-term relationships. This then led to the use of the ARDL technique to show the extent to which the variables were co-integrated.

From the result of the bounds test, it was shown that the lower and upper bound test-statistics of 2.06 and 3.24, respectively, are lower than the calculated F-statistics of 3.5377 at 5% significance level, which confirms the presence of co-integration among variables in the model. Further, the coefficient of the error correction term was negative and statistically significant at 5% level of significance. This, however, confirmed the existence of a short-run relationship in the model, and also revealed that the speed of adjustment from short-run relationship was 59.23%. However, Bannerjee et al., (1998) noted that a highly significant error correction term is a further proof of a stable long-run relationship, while on the other hand Granger (1986) believed the existence of a major error term in at least one direction is a proof of causality.

The negative impact of the dependency ratio and life expectancy in Nigeria signifies that the country is dependent more on imports, making the importance of population growth for current account balance more significant. Thus, an increase in inactive population will similarly increase the demand for imports, leading to a depletion of foreign exchange reserves, and consequently worsened current account balance. According to the life-cycle theory, the tendency of people towards saving differs at different stages of life. Hence, with an increase in population growth the ratio of inactive dependent population increases, which causes a reduction in the saving rate. Therefore, population growth could be a considerable determinant behind deviation of saving rate from investment requirement in the economy, which may ultimately disturb current account balance.

The study findings also revealed that Nigeria's output was affected by real GDP, real per capita income rise, current account balance, exchange rate, expenditure, and selected population variables. The findings further showed that economic growth is influenced by demographic factors. The value of domestic savings showed that the country's saving conduct was indifferent to interest rates. Most citizens save money to cover future expenditures such as schooling, marriage, etc.

Hence, a change in the population age structure is expected to influence saving, investment and current account balance, especially with increase in population. Also, the government needs to increase the level of saving and expenditure in the country by means of successful policies that takes into account the efficacy of the possible determinants. A reform of the financial system, therefore, is necessary to attract savings because the country's saving behaviour may be insensible to interest rate.

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