Inflation and Macroeconomic Indicators in Postcolonial Nigeria: An Empirical Analysis Using VAR Granger Causality Test

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The examination of inflation behavior in Nigeria, after the independence from British colonial rule, is a topical issue in light of the global inflation observed recently. The study investigates several possible explanations by focusing on the causal relationships between GDP per capita, inflation rate, money supply, and exchange rate in Nigeria. It employs annual time-series data from 1961 to 2020 and utilizes a vector autoregression Granger causality test technique. The results show that there is causality running from money supply to inflation rate, with no significant feedback effect. Other variables indicate no evidence of significant causal relationships. The study thus concludes that money supply is the most crucial factor influencing the inflation rate in Nigeria, with the recommendation that money supply should be effectively controlled to make the macroeconomy efficient.

Introduction

Fiscal and monetary policies are tools used to effect desired changes within the macroeconomy of a country. The fiscal policies that the government can employ are not limited to government expenditure and taxation, while the monetary policies which the central bank can adopt include the adjustment of interest rates and the control of money circulating in the economy. Thus, the major goal of these policies is to influence the economy and attempt to make the economy tend towards a particular direction of growth and development, and last but not the least stabilize inflation. The extent to which the expectations are achieved can depend on various factors and events within the nation, and in this case, Nigeria. The major focus of this study, therefore, is to examine the history of Nigeria's fiscal and monetary events since the end of the Second World War. To have an analytical view of the Nigerian economy, some of the variables discussed are used in carrying out econometric analysis using the VAR Granger causality technique. The period studied for the analysis is 1961 to 2020, subject to the availability of data.

Evolution of GDP Per Capita

Nigeria gained independence in the year 1960 and the attempts for a better future must have been the aspiration of not just the government, but also the populace of the nation during

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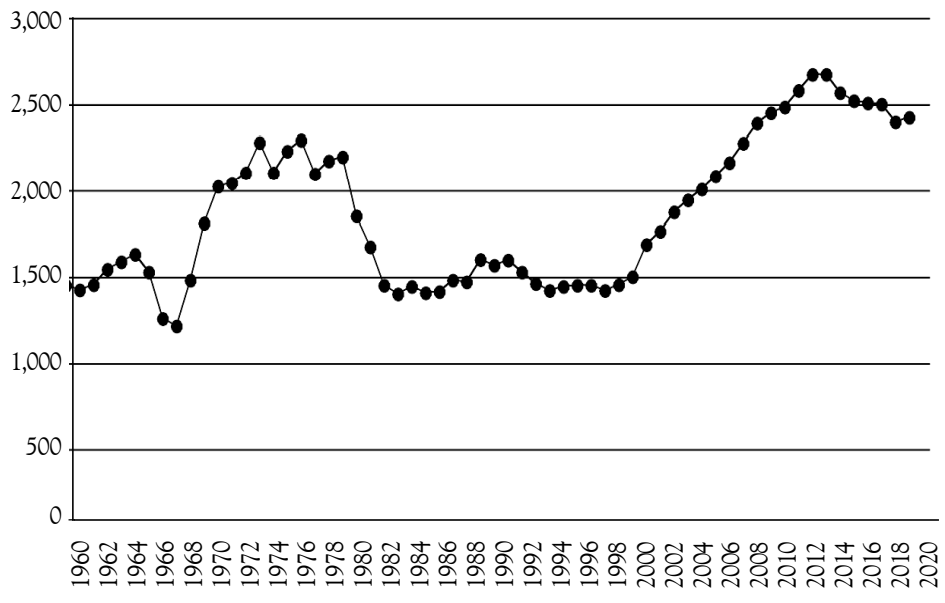
the period. To sustain and grow the economy, exporting agricultural products became the major avenue through which foreign currency could be acquired. There was also the need to come up with diverse development plans to boost economic welfare, with the first development plan being unveiled in 1962 to cover a period of seven years (1962-1968). The objective of the plan was to ensure public sector investment intended to promote economic growth and development by creating an ideal economic climate for the expansion of all sectors, both public and private. Diverse monetary and fiscal policies were being followed at the time, including credit easing and tax holidays (Ajayi, 1996). Growth in GDP per capita was relatively achieved for the early part of this period, thereby making the plan relatively successful to some extent.

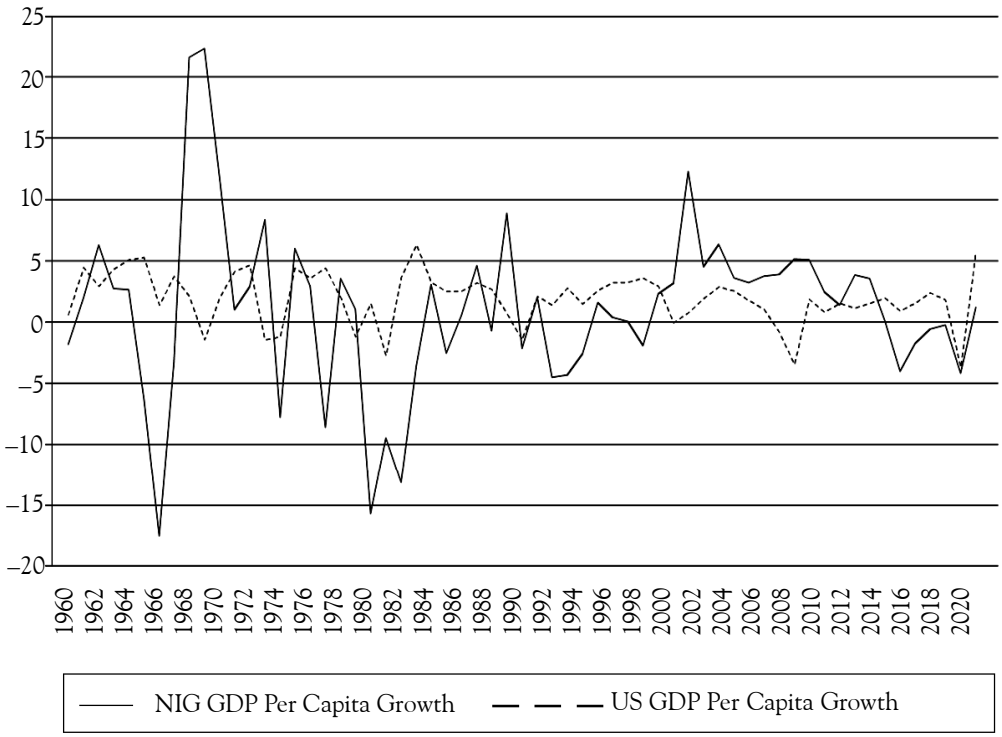
The trend of GDP per capita has been mixed over the years, as shown in Figure 1 as well as Figure 2 (based on percentage of GDP), with periods of growth as well as decline. As shown in the figures, the early 1960s experienced growth in GDP per capita. The macroeconomic environment was however adversely affected by the occurrence of a coup in 1966 as well as a civil war which affected the implementation of fiscal and monetary policies and consequently led to a sharp decline in GDP per capita between 1966 and 1968. The macroeconomy's operating platform and its operational philosophy were all permanently affected by that act of commission or omission. It also caused a wide range of disruptions since wars by nature hinder growth.

Figure 1: GDP Per Capita (Constant US$), 1960-2021



Source: World Bank Development Indicators (2023)

Figure 2: GDP Per Capita Growth (Annual %), 1960-2021



Source: World Bank Development Indicators (2023)

The 1969 to 1974 period was a period of rapid GDP per capita growth largely attributed to the oil price boom (Warren, 1979). However, in the 1980s and parts of the 1990s, Nigeria experienced a GDP per capita decline which can be linked to some factors including high inflation, which will be discussed later in this study. Nigeria began to improve in the 2000s with gradual increases in GDP per capita with another decline noted since 2014 due to fluctuations in oil prices (Figure 3) as well as economic recession effects. Covid-19 also has a role to play in the decline of GDP per capita observed in 2020, with some recovery noted in 2021 due to the reducing Covid-19 effect.

In comparison with the US GDP per capita growth, it is observed that Nigeria's GDP per capita is more volatile. This is shown in Figure 2 by different trends with two economies exhibiting diverse economic structures. In other words, the growth in GDP per capita for the US is steadier due to the well-developed infrastructures apparent in the nation coupled with high skilled workforce among other factors which are not present in Nigeria. However, Nigeria relies heavily on oil exports subject to fluctuations in global oil prices. It is also worth noting that Nigeria is a developing country faced with diverse economic challenges, impacting the shape of the GDP per capita growth. Both economies nevertheless were influenced by the impact of Covid-19 in 2020, leading to a decline in GDP per capita.

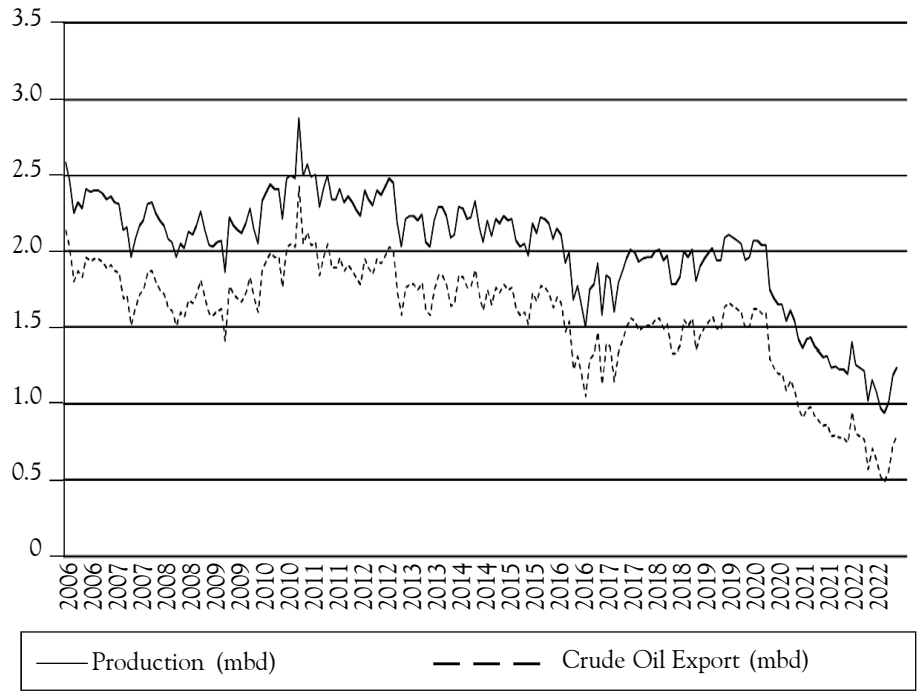
Figure 3: Crude Oil Price (Monthly US$/Barrel), 2006-2022

Source: Central Bank of Nigeria (CBN) Statistics (2023)

Economic Relations with Crude Oil Resources

In 1970, Nigeria attempted to unite itself following the Civil War by undertaking programs for rebuilding the devastated territory of the nation and raising the standard of living for its people. Fortunately, Nigeria is endowed with oil resources, which served as the major source of the country's needed expansion and development. Nigeria benefitted in the 1970s from oil shocks, with two major shocks occurring around 1974 and 1979 (Ajayi, 1996), leading to the accumulation of wealth for the country. Growth and development in the Nigerian context cannot be said to be complete without referring to the impact of the oil production and export earnings from oil on the nation. It should be noted that data on these variables are sparse, with the available data on crude oil price shown in Figure 3 and crude oil production and export shown in Figure 4. Highly volatile fluctuation in crude oil prices is observed in Figure 3, as nearly all the crude oil produced in the nation is exported (due to non-functional refineries within the country), showing great dependence on crude oil export. Apart from oil income prosperity, two development plans were adopted during this period: 1970-1974 and 1975-1980, with the primary goals being to mobilize domestic savings, increase investment and achieve other favorable goals. In line with the development ideology, the government has not only passed laws to regulate prices and distribute foreign currency, but also established public enterprises. Overall, there was a heavy reliance on oil revenue to fund government expenditure, with the oil boom serving as the major engine of growth, taking the place of agriculture.

Figure 4: Crude Oil Production and Export (Monthly mbd), 2006-2022



Source: Central Bank of Nigeria (CBN) Statistics (2023)

A crucial event worth mentioning in 1982 was the establishment of the Stabilization Act aimed at restoring economic vitality and safeguarding the balance of payments, after the collapse of oil prices in 1979 (Pinto, 1987). Important policies were followed to control the exchange rate amid rising taxes. However, the same period witnessed the oil market crisis with the crumbling of oil prices and raised interest rates, which inevitably led to increases in the inflation rate and a decline in GDP per capita growth for 1982. These occurrences made the economy deteriorate as the foreign exchange reserves also depleted and economic growth declined. Exchange control measures, including restrictions on import licenses, an increase in taxes, and the start of an import deposit scheme were crucial among the measures, along with fiscal and monetary control measures. Even after the 1982 Stabilization Act, things in the economy only got worse (Ajayi, 1996). It should be noted that there is some amount of correlation between the growth of oil prices and budget balance, as shown in Table 1. Also, to

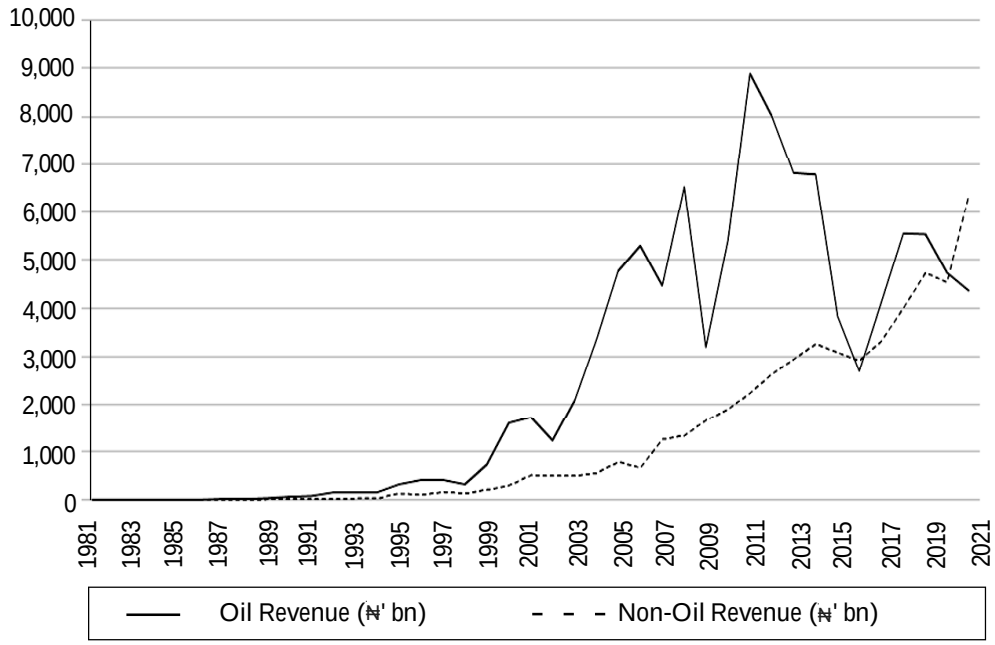
Table 1: Pairwise Correlation – Oil Price Growth and Budget Balance (2007-2021)

	Oil Price Growth (%)	Budget Balance (% of GDP)
Oil Price Growth (%)	1.0000	
Budget Balance (% of GDP)	0.2651	1.0000

Source: Authors' Computation Using Stata (2023)

prove the high reliance on oil revenue, the trends of oil revenue and non-oil revenue for Nigeria are depicted in Figure 5. Oil revenue exceeds non-oil revenue for many of the years considered.

Figure 5: Oil and Non-Oil Revenue (LCU Billion), 1981-2021



Source: Central Bank of Nigeria Statistical Bulletin (2021)

Structural Adjustment Program (SAP)

In the mid-1980s, it was apparent that Nigeria's economy could not keep up with current trends, which led to the country's growing external debt and other macroeconomic distortions like inflation. As a result, Nigeria implemented the SAP in 1986, to revive and restore the lost glory of the economy. The implementation of the program marked yet another significant turning point in the macroeconomic climate of Nigeria. The goal of the SAP was to address economic distortions and open the door to the necessary economic expansion and development (Nwankwo, 1988). The macroeconomic environment of Nigeria was once again significantly altered because of the SAP adoption.

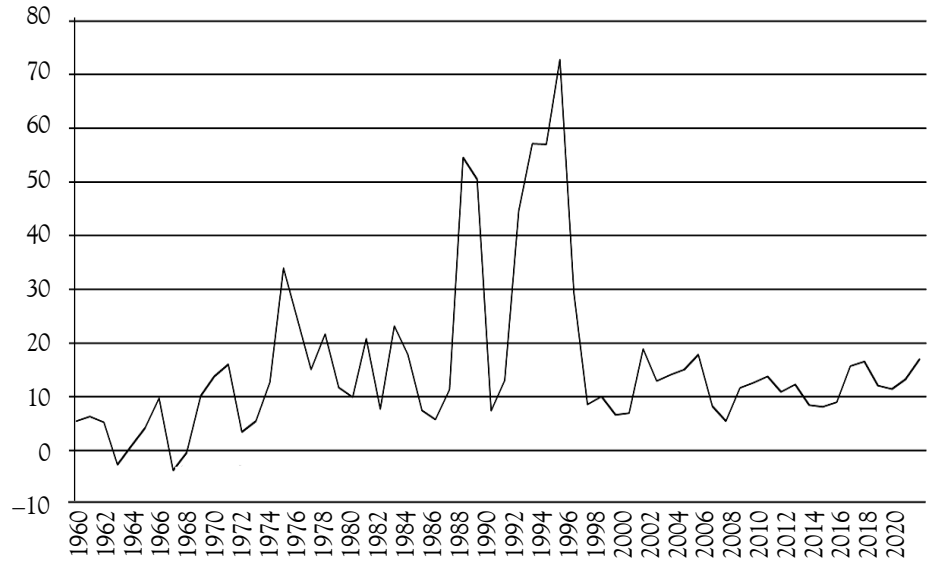
The distinguishable strategies adopted for SAP, as noted by Olukoshi (1991), were the privatization of some government-owned organizations, reduction of public expenditure on social services, adoption of tight fiscal policy, and currency devaluation. The SAP led to the retrenchment of many government staff in the affected agencies and departments during the period. This was one of the many adverse problems that followed the use of SAP in Nigeria.

Other challenges witnessed include inflation, currency depreciation, and high interest rates. Some of these macroeconomic challenges are evaluated further.

The Forces of Inflation

The graphical representation of the inflation rate for Nigeria over the years is shown in Figure 6. It can be observed that inflation fluctuated erratically throughout the period studied, with the highest rate being 72.84% in 1995, while the deflation was 3.73% in 1967. The last episode of deflation in Nigeria coincided with the period of Civil War in 1966, which spilt over to 1967, after which inflation has been persistent. This can be linked to the scarcity of goods and services within the economy, which was triggered because of the crisis, lowering productive activities in the nation. In other words, a scarce supply of resources will prompt prices to rise in the presence of higher demand, which can lead to a lowered standard of living.

Figure 6: Inflation Rate (Annual %), 1960-2021



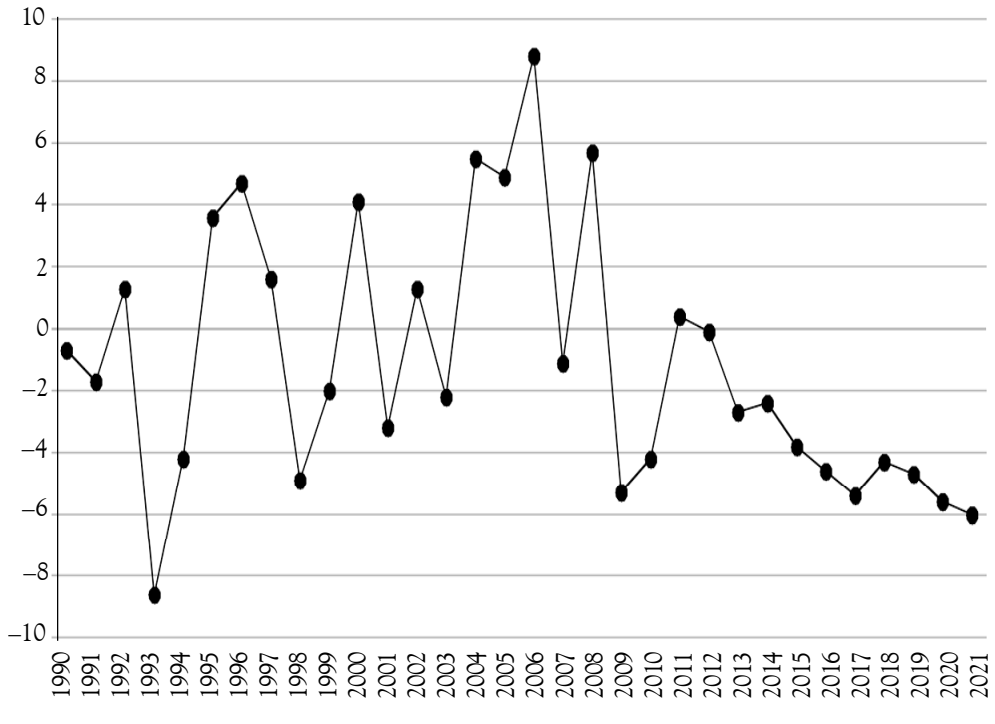
Source: World Bank Development Indicators (2023)

The rate of inflation peaked in 1975 (33.96%) and continued to fluctuate minimally until 1988 when the inflation rate rose to 54.51%. The inflation rate continued to be over 50% in the subsequent year before it fell to 7.36% in 1990. It should be noted that before 1995, with the highest rate of inflation, the then-military government of Nigeria enacted tightly regulated and austerity economic policies, which adversely affected the economy, coupled with the debt crisis persistent within the economy (Obansa, 2005), thus causing high inflation. Many forces contribute to the persistence of inflation in Nigeria, with some of the most prominent ones being budget deficit, money supply, and foreign exchange rate, which are discussed below.

Evolution of Budget Balance

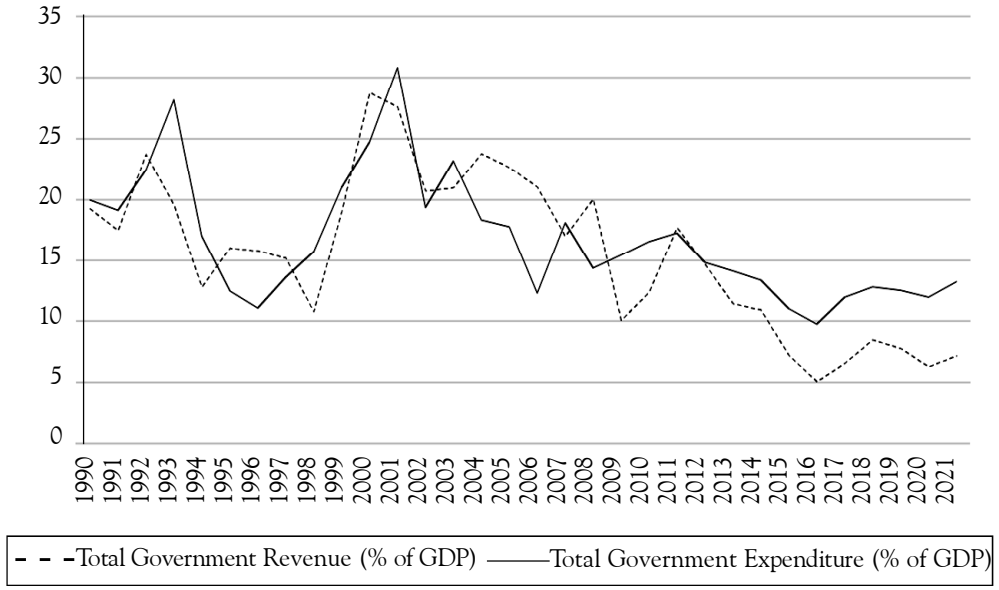
Periods in which Nigeria ran a budget surplus coincide largely with periods of oil boom, with large revenue earned as a result. The revenue can be used to finance government expenditure alongside borrowing and money printing, which can cause inflation. This situation is reflected in the budget balance in Figure 7, which is the difference between government revenue and expenditure (Figure 8). The figures show a mixture of budget surplus and deficit witnessed between 1990 and 2011, while only budget deficit was witnessed from 2012 to 2021, attributable to oil price decline in the period (Figure 3) as well as inflation (Figure 6). As noted, one of the causes of budget deficit is reliance on oil revenue, which is subject to price inconsistency, with a low compliance rate in tax payment in the economy due to many SMEs that are unprepared to pay taxes. In addition, wasteful spending, debt servicing, and mismanagement of funds can lead to a shortfall in revenue and thus a budget deficit. The correlation between inflation and budget balance is given in Table 2, showing a very weak correlation. Thus, for Nigeria, the fiscal theory of inflation can be rejected. Quantitatively, the budget story explains 5% of inflation behavior over the period. Nevertheless, it is worth noting that inflation has led to higher borrowing costs for Nigeria, and borrowing to finance budget deficit causes a buildup of public debt (Folorunso, 2013).

Figure 7: Budget Balance (% of GDP), 1990-2021



Source: IMF WEO (2023)

Figure 8: Total Government Revenue and Expenditure (% of GDP), 1990-2021



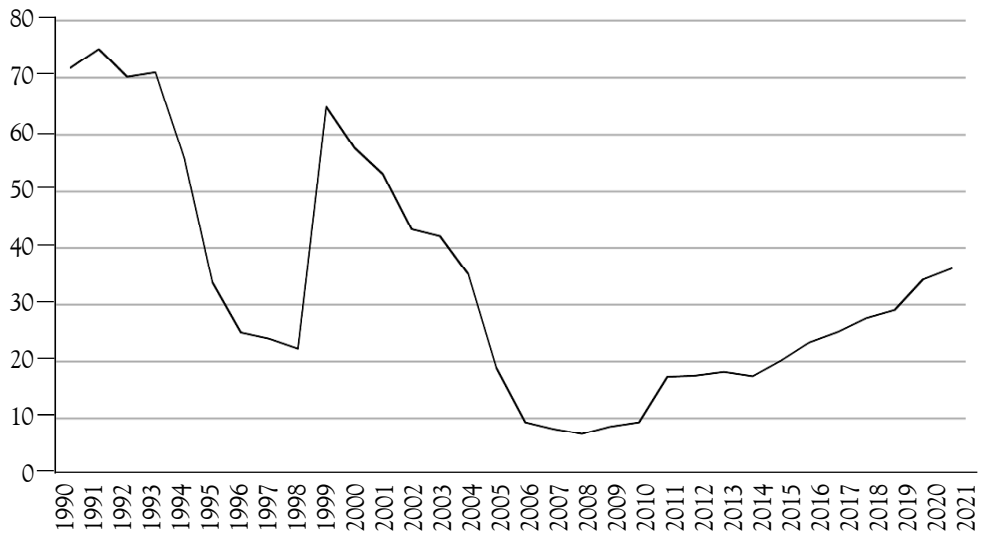
Source: IMF WEO (2023)

Table 2: Pairwise Correlation – Inflation and Budget Balance

	Inflation Rate (%)	Budget Balance (% of GDP)
Inflation Rate (%)	1.0000	
Budget Balance (% of GDP)	–0.0440	1.0000

From the foregoing, increasing debt payment costs reduce the amount of money available for economic initiatives like infrastructure, healthcare reforms, and educational reforms. The trend of public debt in Nigeria is shown in Figure 9. It is observed to be relatively above 70% in the early 1990s with a sudden increase noted in 1998 before declining from 1999 during the tenure of President Obasanjo (1999-2007), who ensured the realization of a debt relief plan in 2005, leading to the cancelation (or waive-off) of a huge amount of debt, as well as repayment of a large portion of the debt burden. The decline is relatively sustained by the subsequent administration until 2010 when a steady rise in public debt is observed thereafter due to macroeconomic instability. Macroeconomic instability including currency volatility, inflation, and financial catastrophe are all consequences of high debt levels. Achieving debt sustainability remains a challenge in Nigeria given its infrastructure and development needs (Fajana, 1993). Nigeria's public debt and budget balance have a weak and negative correlation, which implies that budget deficits tend to rise when public debt declines and vice versa, as indicated in Table 3. In other words, when the public debt declines, the government has a propensity to spend more than its revenue, leading to a

Figure 9: Public Debt (% of GDP), 1990-2021



Source: IMF WEO (2023)

Table 3: Pairwise Correlation – Public Debt and Budget Balance

	Public Debt (% of GDP)	Budget Balance (% of GDP)
Public Debt (% of GDP)	1.0000	
Budget Balance (% of GDP)	–0.1520	1.0000

budget deficit. The weak correlation between public debt and budget balance, however, suggests that there are more factors affecting the budget balance. Table 4 further shows that debt has been positive and negative for Nigeria over time. From 1990 to 2011, the government has been able to pay back a large portion of the debt owed, resulting in a lower overall debt level. More recently, however, there have been increases in the amount of debt owned by the government, with the government borrowing more than it has paid back. Overall, the effect of debt through the budget stance might be explaining another sixth (15%) of the observed inflation behavior.

Table 4: Budget Accounting – Averages of Change in Public Debt

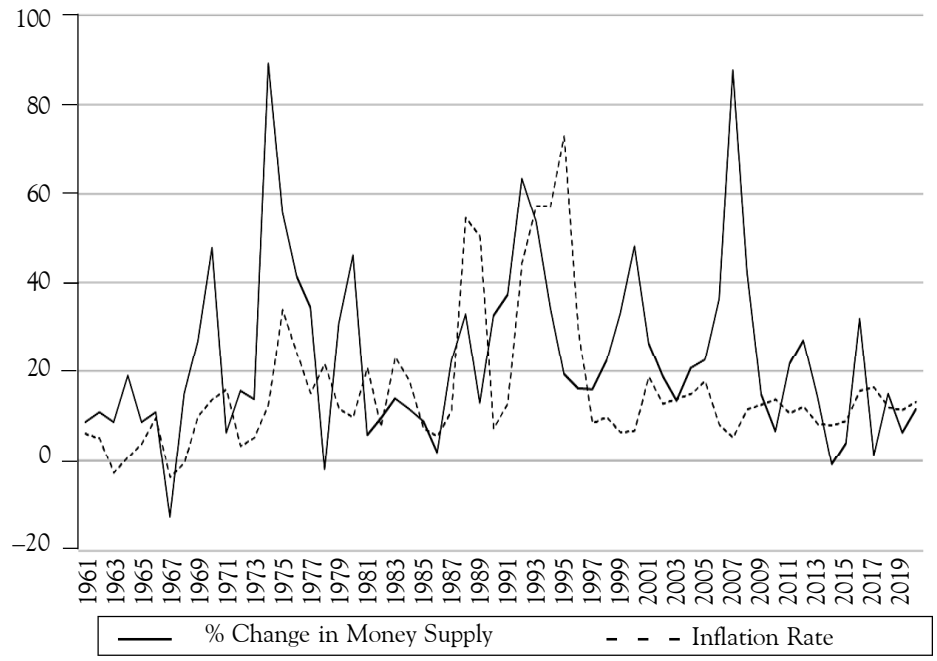
Period	1990-2000	2001-11	2012-21
Change in Debt (%)	–4.50	–2.07	2

The Unfolding of Money Supply

Inflation can occur in an economy where the money supply grows more quickly than the output of goods and services. The Central Bank of Nigeria (CBN) and the government have boosted the money supply in Nigeria through money printing and increased public spending, consequently resulting in higher inflation, in support of the quantity theory of money (Duck, 1993). Over the years, the CBN has increased the money supply in Nigeria for a variety of reasons, including promoting economic growth and funding public expenditures, particularly when there are budget deficits. The economy, however, may suffer inflation and currency depreciation resulting from expanding money supply. The structure of the economy, the level of government spending, and external factors are only a few examples of the variables that might affect how well the CBN's monetary policy performs.

Figure 10 shows the relationship between the change in money supply and inflation, with rising oil prices serving as a factor that has an impact on this relationship. Additionally, the money supply in one period usually influences inflation in the next period. For instance, if CBN raises the money supply, this could result in a rise in the overall demand for goods and services, which, all else being equal, could raise the price level in the subsequent period. Since there is typically a lag between changes in the money supply and their impact on inflation, the impact of the money supply on inflation in Nigeria may not be immediate. The time it takes for changes in the money supply to spread throughout the economy is just an example of the many causes of this lag.

Figure 10: Money Supply Growth (%) and Inflation Rate (%), 1961-2020



Source: World Bank Development Indicators and Author's Computation (2023)

For instance, Figure 10 shows that because of a rise from 37% to 63% in money supply between 1991 and 1992, inflation rates increased from 45% in 1992 to 57% in 1993 on average. A reduction in the money supply growth in 1996 to 16% triggered a decline in inflation to 9% in 1997. This can be observed in Table 5 with a better correlation between money supply in one period and inflation in the next period in comparison with the weaker correlation between money supply and inflation taken in the same periods. This suggests that changes in the money supply may not have an immediate effect on inflation in Nigeria and that there is typically a delay before changes in the money supply have an influence on inflation. Overall, the monetary story explains the inflation behavior between a quarter and a half.

Table 5: Pairwise Correlation Results

	Variables in the Same Period	
	% Change in Money Supply	**Inflation Rate**
% Change in Money Supply	1.0000	
Inflation Rate	0.2368	1.0000
	Variables in Different Periods	
	% Change in Money Supply (Period *t*)	**Inflation Rate (Period *t*+1)**
% Change in Money Supply (Period *t*)	1.0000	
Inflation Rate (Period *t*+1)	0.4701	1.0000

Source: Authors' Computation from Stata (2023)

Table 6 represents Nigeria's change in real money, averaging between 0 and 1 over the years. This indicates a minor improvement in the country's money supply's purchasing power. This means that prices have not increased considerably in relation to the money supply, which is a healthy trend. However, it is important to note that real money is not the only determinant of the state of the economy.

Table 6: Budget Accounting – Real Money

Period	1960-74	1975-89	1990-2000	2001-11	2012-21
Change in Real Money (%)	0	0	0	0	1

History of Exchange Rate

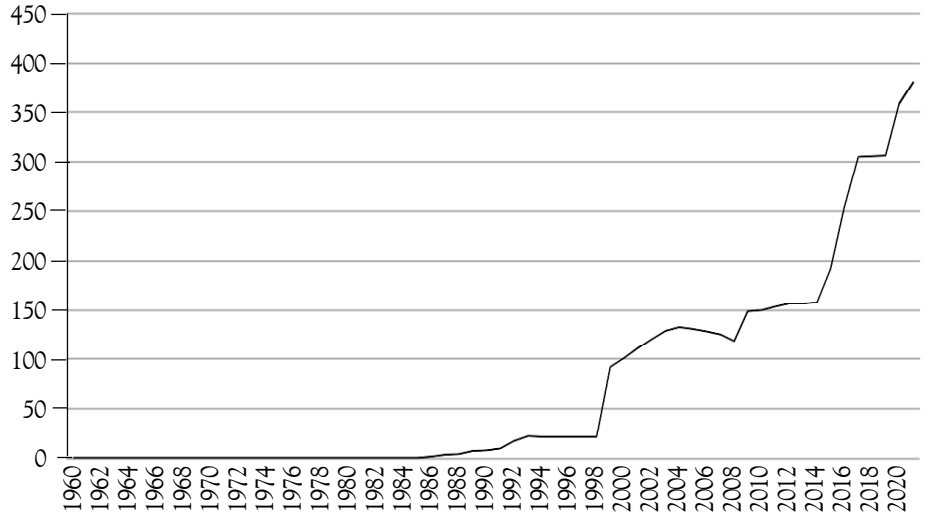
Nigeria depends heavily on imports, and as a result, inflation may result from a decline in the value of the Nigerian currency. As a result of the implementation of the SAP in 1986, diverse reforms were utilized. The setting of market-determined exchange rates, deregulation of interest rate structures, and regulation to reform and liberalize the banking and financial sector, among other efforts, were made by the government. The paradigmatic features of the financial system were interest rate restrictions, usage of reserve requirements, and other direct and indirect monetary control devices. The period also witnessed the liquidation of some financial institutions while the apex bank took over the operation of certain struggling

ones. With the removal of exchange controls and the establishment of a market-based independent foreign exchange market, the foreign exchange market underwent reform in 1986. Beginning in 1988, Bureaux de Change were permitted to operate (Ogujiuba and Obiechina, 2011). The autonomous market has thus coexisted with a set official exchange rate since then.

Exchange rates have had an impact on inflation over time in Nigeria since they are a key factor in determining the cost of imported commodities, which can have a big impact on the level of prices throughout the economy. For many consumer items, Nigeria is strongly dependent on imports, and the costs of these imports are frequently expressed in foreign currencies. The cost of importing goods rises when the value of the naira, Nigeria's currency, declines against these other currencies, raising prices for consumers. Nigeria's exchange rate has fluctuated significantly over the years, frequently falling against the major international currencies (Figure 11). The inflation rate in Nigeria has been significantly impacted by these changes, with currency devaluation causing greater inflation rates. For instance, the naira depreciates dramatically with spikes in oil prices, which causes inflation rates to soar. The naira has declined in value against major foreign currencies, particularly the US dollar, contributing to greater inflation rates in Nigeria (Figure 12), with extreme depreciation (approximately 322%) observed in 1999.

Table 7 shows the correlation between the exchange rate and the inflation rate, which is very weak, implying that other factors are also responsible for inflation, besides exchange rate, in Nigeria. Still, inflation rate as a factor adds another 2% to the inflation story.

Figure 11: Official Exchange Rate (LCU per US$, Period Average), 1960-2021



Source: World Bank Development Indicators (2023)

Figure 12: Exchange Rate Growth (%) 1960-2021

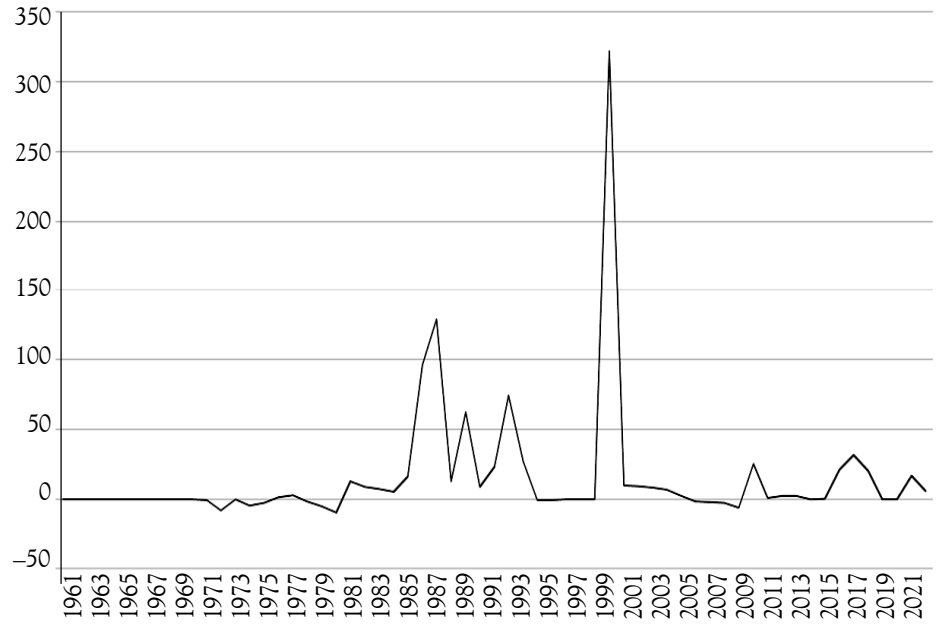


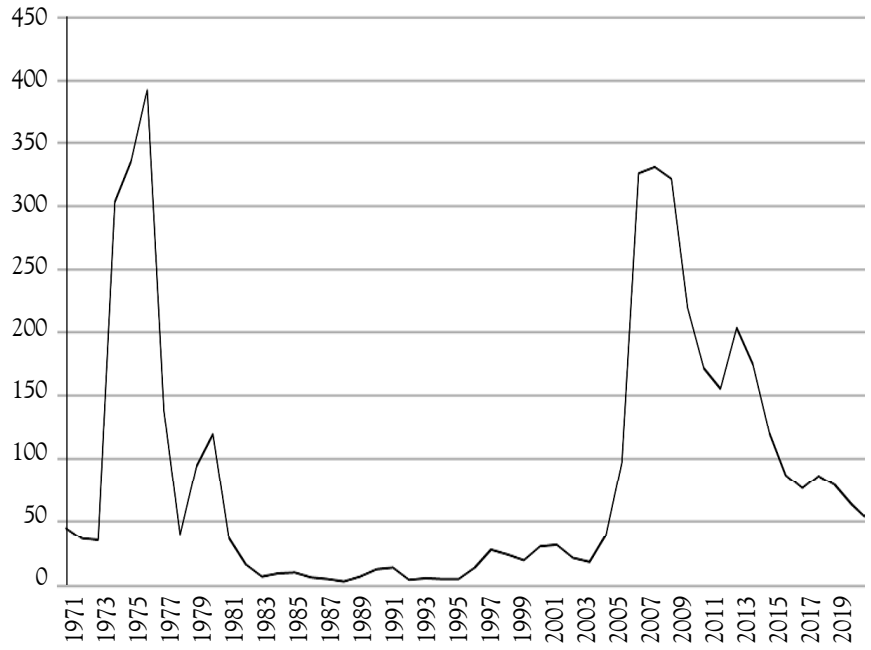
Table 7: Pairwise Correlation – Exchange Rate and Inflation

	Exchange Rate Growth (%)	Inflation Rate (%)
Exchange Rate Growth (%)	1.0000	
Inflation Rate (%)	0.0198	1.0000

There are several factors influencing the exchange rate condition in Nigeria. These are not limited to:

Foreign Exchange Reserves: When necessary, the CBN can interfere in the foreign exchange market, thanks to its foreign exchange reserves. Nigeria's international reserve (% of total external debt) was low in the 1980s and 1990s, which was a result of the nation's substantial external debt load and low level of foreign exchange revenues. However, after a sizable portion of Nigeria's external debt was canceled in 2005, the nation's international reserves started to rise. This improvement is depicted in Figure 13. However, Nigeria's international reserve significantly decreased because of the 2008-2009 Global Financial Crisis, which also saw a decline in oil prices and a decline in foreign exchange earnings. In a similar vein, Nigeria's international reserve continued to decrease due to the drop in oil prices in 2014-2015 (Figure 3). Importantly, the sale of international reserves increases the supply of domestic currency, which increases inflation by weakening the currency.

Figure 13: International Reserves (% of Total External Debt), 1971-2020

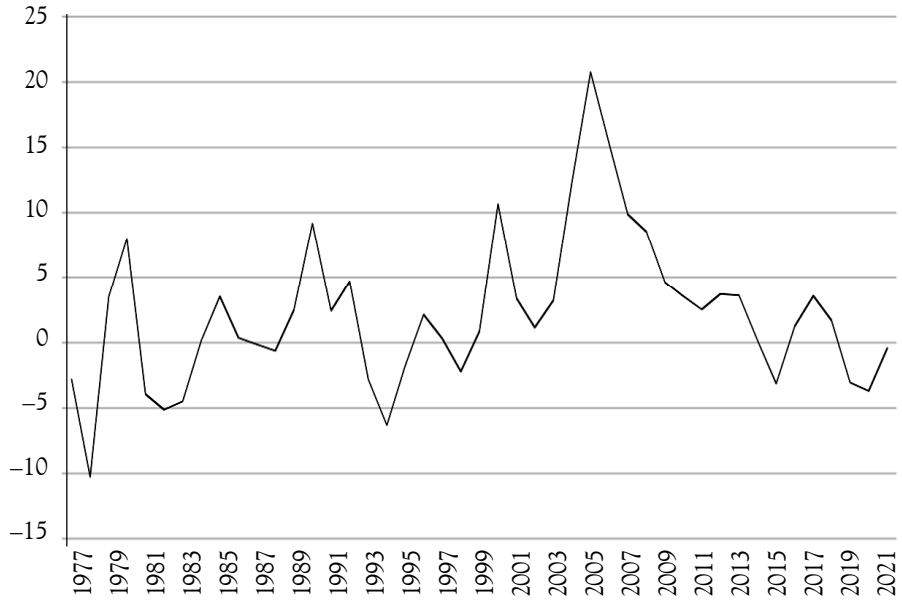


Source: World Bank Development Indicators (2023)

Nigeria relies heavily on the export of crude oil, whose prices are volatile, as well as on the importation of goods and services, subject to high prices. Nigeria's international reserves often decrease owing to a current account deficit, since the central bank uses its reserves to finance the deficit. On the other hand, as the central bank builds up foreign currency assets from a current account surplus, it raises the nation's foreign reserves. For instance, Nigeria had a sizable current account surplus in 2005, which allowed the government to build up sizable foreign reserves (see Figure 14) as well as a series of current account deficits.

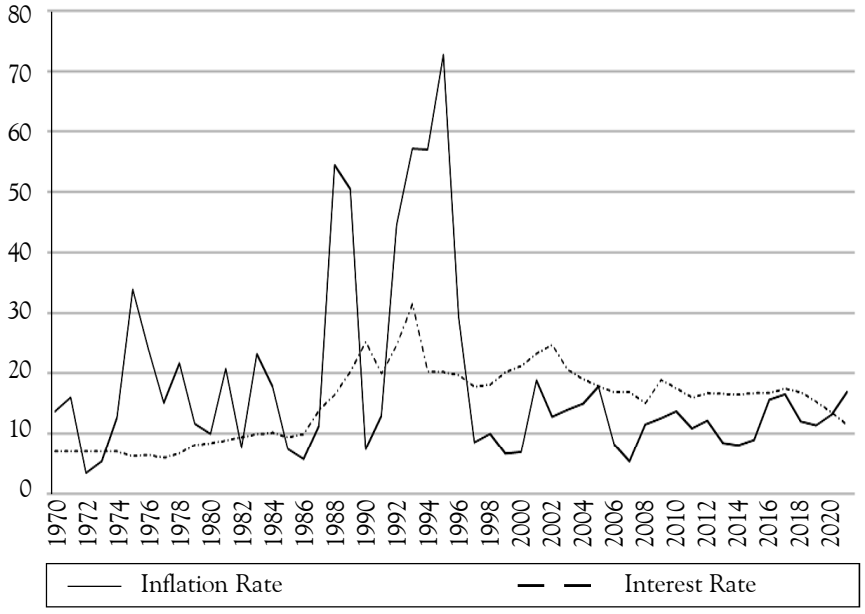
Interest Rates: When the CBN reduces interest rates in Nigeria, it may deter foreign capital inflows and weaken the currency, and vice versa. Nigeria's interest rate has experienced substantial swings over the years due to a variety of economic factors, including inflation, currency exchange rates, and monetary policy. Nigeria had relatively high interest rates in the early 1990s as it dealt with the fallout from a period of high inflation and economic instability. Figure 15 depicts this graphically. By the late 1990s, however, interest rates started to drop as inflation subsided and the government put in place economic policies meant to stabilize the economy.

Figure 14: Current Account Balance (% of GDP), 1977-2021



Source: World Bank Development Indicators (2023)

Figure 15: Interest Rate (%) and Inflation Rate (%), 1970-2021



Source: World Bank Development Indicators (2023)

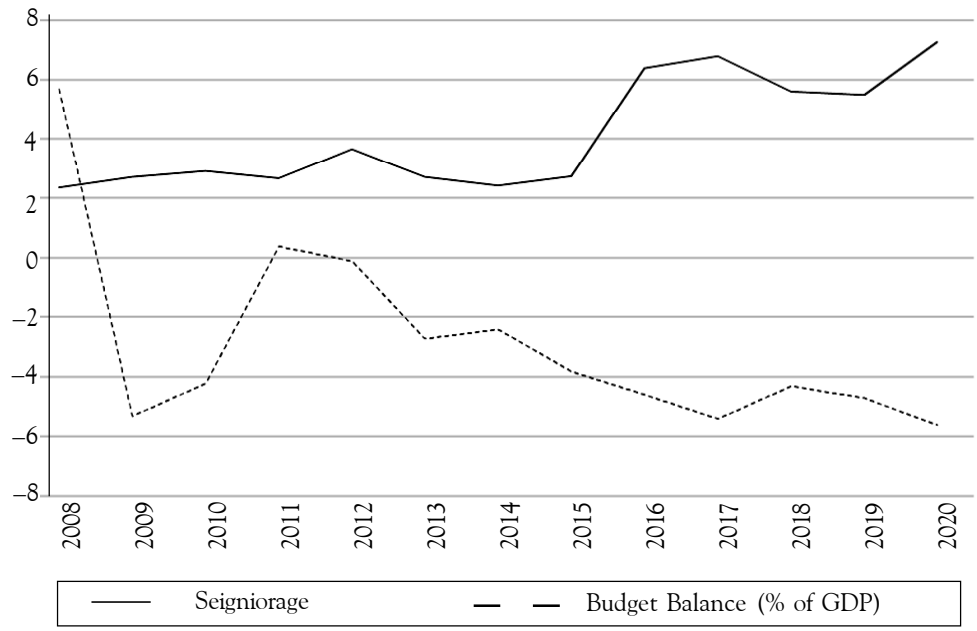
Seigniorage and Budget Deficit/Surplus

In times of budget deficits, when there is a shortfall in revenue compared to expenditure, the government relies on seigniorage as a source of revenue to finance its spending. Seigniorage and budget deficits in Nigeria can have a complicated relationship that depends on several factors. Typically, to finance government spending when there is a budget deficit, the government will borrow or can print money. This might raise the amount of money in the economy, increasing inflation and serving as more seigniorage income. Figure 16 shows that Nigeria's budget fluctuated between surplus and deficit from 1990 to 2008, making seigniorage at the time largely ineffective. This suggests that there is no need to increase the money supply because seigniorage is mostly utilized to support budget deficits rather than surpluses. As shown in Figure 17, the budget is persistently deficit from 2012 to 2021, making seigniorage relevant. It should be noted that the seigniorage graph is compressed and expressed in "unit form" to capture the relation with the budget balance (% of GDP) trend more clearly, since the seigniorage for Nigeria is too large. Hence, the seigniorage units multiplied by 100 will give the percentage form. Seigniorage can cause inflation and a loss in the value of the currency, which decreases the value of foreign investment and raises the price of imports, as is the case in Nigeria presently. Note that there is a higher degree of correlation between seigniorage and budget deficit for the 2008-2020 period, which constitutes more of a budget deficit, than for the 1990-2008 period, which constitutes more budget surplus than budget deficit (Table 8).

Figure 16: Budget Balance (% of GDP) and Seigniorage (Unit), 1990-2008

Source: IMF WEO (2023) and Authors' Computation (2023)

Figure 17: Budget Balance (% of GDP) and Seigniorage (Unit), 2008-2020



Source: IMF WEO (2023) and Authors' Computation (2023)

Table 8: Pairwise Correlation Results – Seigniorage and Budget Balance

	Period 1990-2020	
	Seigniorage (%)	**Budget Balance (% of GDP)**
Seigniorage (%)	1.0000	
Budget Balance (% of GDP)	–0.4407	1.0000
	Period 1990-2008	
	Seigniorage (%)	**Budget Balance (% of GDP)**
Seigniorage (%)	1.0000	
Budget Balance (% of GDP)	0.3810	1.0000
	Period 2008-2020	
	Seigniorage (%)	**Budget Balance (% of GDP)**
Seigniorage (%)	1.0000	
Budget Balance (% of GDP)	–0.5552	1.0000

As illustrated in Table 8, depending on the particular period, inflation revenue is responsible for 38-56% of the observed budget balance. In other words, due to some institutional problems connected with fiscal capacity, as well as the size of the informal sector, Central Bank of Nigeria (CBN) might be optimally using inflation to generate seigniorage revenue and thus help the fiscal side.

Model Estimation

From the foregoing, it is imperative to observe the analytical view of the Nigerian economy by using some of the elements discussed in an empirical investigation. The causal relationship among GDP per capita growth, inflation rate, money supply growth, and exchange rate growth for the period 1961-2020 is thus estimated. The causal relationship between the variables is studied using the Granger causality test, emanating from the multivariate VAR model, which allows for each variable to exert an influence on every other variable in the model. These variables are sourced from The World Bank (2023) development indicators.

Descriptive Statistics

The descriptive statistics of the dataset spanning 1961 to 2020 are detailed in Table 9. The variables are positively skewed, and the kurtosis statistics are greater than 3, making the variables leptokurtic relative to a normal distribution. The variables are also observed to have a low correlation, with a negative correlation between GDP per capita growth and inflation rate as well as between GDP per capita and exchange rate (see Table 10).

Table 9: Descriptive Statistics

	GDP Per Capita Growth (%)	Inflation Rate (%)	Money Supply Growth (%)	Exchange Rate Growth (%)
Observations	60	60	60	60
Mean	1.066537	15.95744	23.25667	15.53607
SD	6.915602	15.34186	19.75775	46.95103
Minimum	–17.5003	–3.72634	–12.6587	–9.47447
Maximum	22.2886	72.8355	89.19787	321.9049
Skewness	0.222326	1.970683	1.321348	5.09948
Kurtosis	5.207767	6.593739	5.180503	32.05783

Table 10: Correlation Matrix

Variable	*gdp*	*infl*	*ms*	*exc*
gdp	1.000			
infl	–0.132	1.000		
ms	0.293	0.236	1.000	
exc	–0.105	0.020	0.044	1.000

Note: *gdp* represents GDP per capita growth (%), *infl* is inflation rate (%), *ms* is money supply growth (%), and *exc* is exchange rate growth (%).

Unit Root Test

The lag length required for estimating the model is presented in Table 11, with all criteria being in preference of lag 1 as the ideal lag length. The unit root test was carried out using the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests as shown in Table 12. All the

Table 11: Lag Length Selection				
Lag	**FPE**	**AIC**	**SBIC**	**HQIC**
0	1.00E+10	34.3856	34.4417	34.5302
1	5.6e+09*	33.7956*	34.0761*	34.519*
2	7.20E+09	34.0392	34.544	35.3412
3	7.30E+09	34.0318	34.7609	35.9125
4	7.80E+09	34.0533	35.0067	36.5126

Note:* indicates lag order selected by the criterion. FPE = Final prediction error criterion, AIC = Akaike information criterion, SBIC = Schwarz information criterion, and HQIC = Hannan-Quinn information criterion.

Table 12: Unit Root Result						
Variables	**Augmented Dickey-Fuller**		**Decision**	**Phillips-Perron**		**Decision**
	Level	**1st Diff.**		**Level**	**1st Diff.**	
gdp	–4.627*	–7.473*	I(0)	–4.797*	–8.830*	I(0)
infl	–4.102*	–7.959*	I(0)	–3.765*	–7.379*	I(0)
ms	–4.562*	–7.080*	I(0)	–4.999*	–9.462*	I(0)
exc	–4.906*	–8.709*	I(0)	–6.907*	–12.922*	I(0)

Note: * denotes statistically significant at 1% level.

variables are observed to be stationary at both levels and the first difference for both tests. Therefore, the VAR model can be estimated.

Vector Autoregressive (VAR) Model

The estimated VAR result for the relationship between GDP per capita, inflation rate, money supply, and exchange rate is presented in Table 13. The result shows that only money supply has a significant impact on inflation rate. No other significant impact is observed in the

Table 13: VAR Results					
Dependent Variable	**Regressors**	**Coefficient**	**SE**	**z**	**P>z**
gdp	*gdp* – L1	0.496776	0.124757	3.98	0.000
	infl – L1	0.016416	0.05473	0.3	0.764
	ms – L1	–0.05719	0.044235	–1.29	0.196
	exc – L1	0.012422	0.017104	0.73	0.468
	_cons	1.427757	1.402973	1.02	0.309

Table 13 (Cont.)

Dependent Variable	Regressors	Coefficient	SE	z	P>z
infl	*gdp* – L1	–0.14387	0.214169	–0.67	0.502
	infl – L1	0.539144	0.093955	5.74	0.000
	ms – L1	0.276739	0.075938	3.64	0.000
	exc – L1	0.03383	0.029363	1.15	0.249
	_cons	0.644191	2.408462	0.27	0.789
ms	*gdp* – L1	0.076043	0.359784	0.21	0.833
	infl – L1	–0.06974	0.157835	–0.44	0.659
	ms – L1	0.396043	0.127568	3.1	0.002
	exc – L1	0.076794	0.049327	1.56	0.120
	_cons	14.0517	4.045999	3.47	0.001
exc	*gdp* – L1	–0.25019	0.950881	–0.26	0.792
	infl – L1	–0.12088	0.417147	–0.29	0.772
	ms – L1	–0.08012	0.337153	–0.24	0.812
	exc – L1	0.087903	0.130367	0.67	0.500
	_cons	18.53845	10.69326	1.73	0.083

Note: L1 is one lag length.

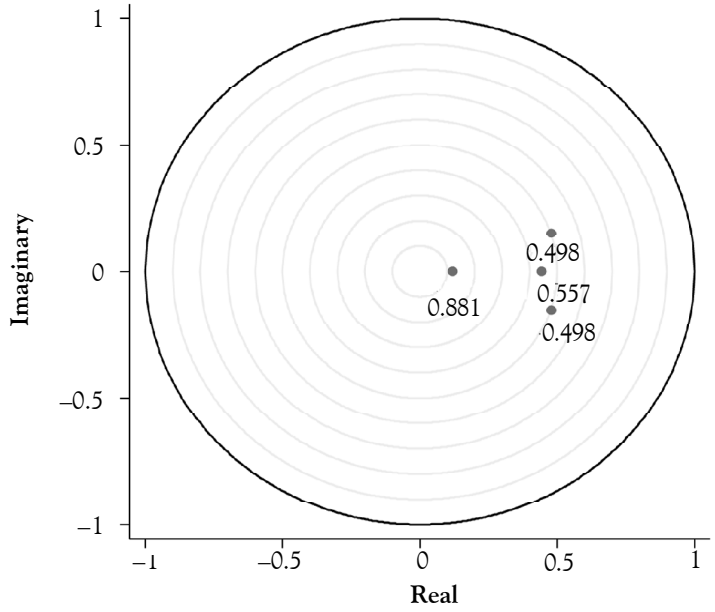
model. On average, the first lag of money supply has a positive impact on inflation rate at 1% significance level.

Diagnostic Tests

Table 14 represents the autocorrelation and normality test results for the estimated model. The Lagrange-multiplier result indicates that the null hypothesis of no autocorrelation in the model cannot be rejected since there is no evidence of autocorrelation at both lag 1 and lag 2 (p-value > 0.05). The Jarque-Bera test, skewness, and kurtosis test give evidence for the

Table 14: Autocorrelation and Normality Tests				
Lagrange-Multiplier Test				
Lag		χ^2	**df**	**Prob. > χ^2**
1	–	15.155	16	0.51332
2	–	24.8044	16	0.07335
Jarque-Bera Test				
Equation		χ^2	**df**	**Prob. > χ^2**
gdp	–	17.506	2	0.0001
infl	–	34.589	2	0.000
ms	–	64.994	2	0.000
exc	–	2314.604	2	0.000
All	–	2431.692	8	0.000
Skewness Test				
Equation	**Skewness**	χ^2	**df**	**Prob. > χ^2**
gdp	0.42206	1.752	1	0.185
infl	1.0451	10.74	1	0.001
ms	1.5633	24.031	1	0.000
exc	5.0399	249.776	1	0.000
All		286.298	4	0.000
Kurtosis Test				
Equation	**Kurtosis**	χ^2	**df**	**Prob. > χ^2**
gdp	5.5315	15.754	1	0.00007
infl	6.1147	23.849	1	0.000
ms	7.082	40.963	1	0.000
exc	31.982	2064.828	1	0.000
All		2145.394	4	0.000

Figure 18: Stability Test



rejection of the null hypothesis of normality in the model (p-value < 0.05). The Eigenvalues in Figure 18 satisfy the stability condition as the values lie within the unit circle.

Granger Causality

The Granger causality result in Table 15 indicates that the growth of money supply influences that of inflation rate in Nigeria. Inflation rate, money supply, and exchange rate do not have a significant impact on GDP per capita. Other outcomes are detailed in the table.

Table 15: Granger Causality Test

Dependent Variable	Regressor	χ^2	Decision
gdp	*infl*	0.08997	*infl* does not Granger-cause *gdp*
	ms	1.6715	*ms* does not Granger-cause *gdp*
	exc	0.5274	*exc* does not Granger-cause *gdp*
	All	2.0665	No joint Granger causality
infl	*gdp*	0.45128	*gdp* does not Granger-cause *infl*
	ms	13.281*	*ms* Granger-causes *infl*
	exc	1.3274	*exc* does not Granger-cause *infl*
	All	15.589	No joint Granger causality

Table 15 (Cont.)

Dependent Variable	Regressor	χ^2	Decision
ms	*gdp*	0.04467	*gdp* does not Granger-cause *ms*
	infl	0.19522	*infl* does not Granger-cause *ms*
	exc	2.4237	*exc* does not Granger-cause *ms*
	All	2.6593	No joint Granger causality
exc	*gdp*	0.06923	*gdp* does not Granger-cause *exc*
	infl	0.08397	*infl* does not Granger-cause *exc*
	ms	0.05648	*ms* does not Granger-cause *exc*
	All	0.29812	No joint Granger causality

Note: * indicates significance at 1% level.

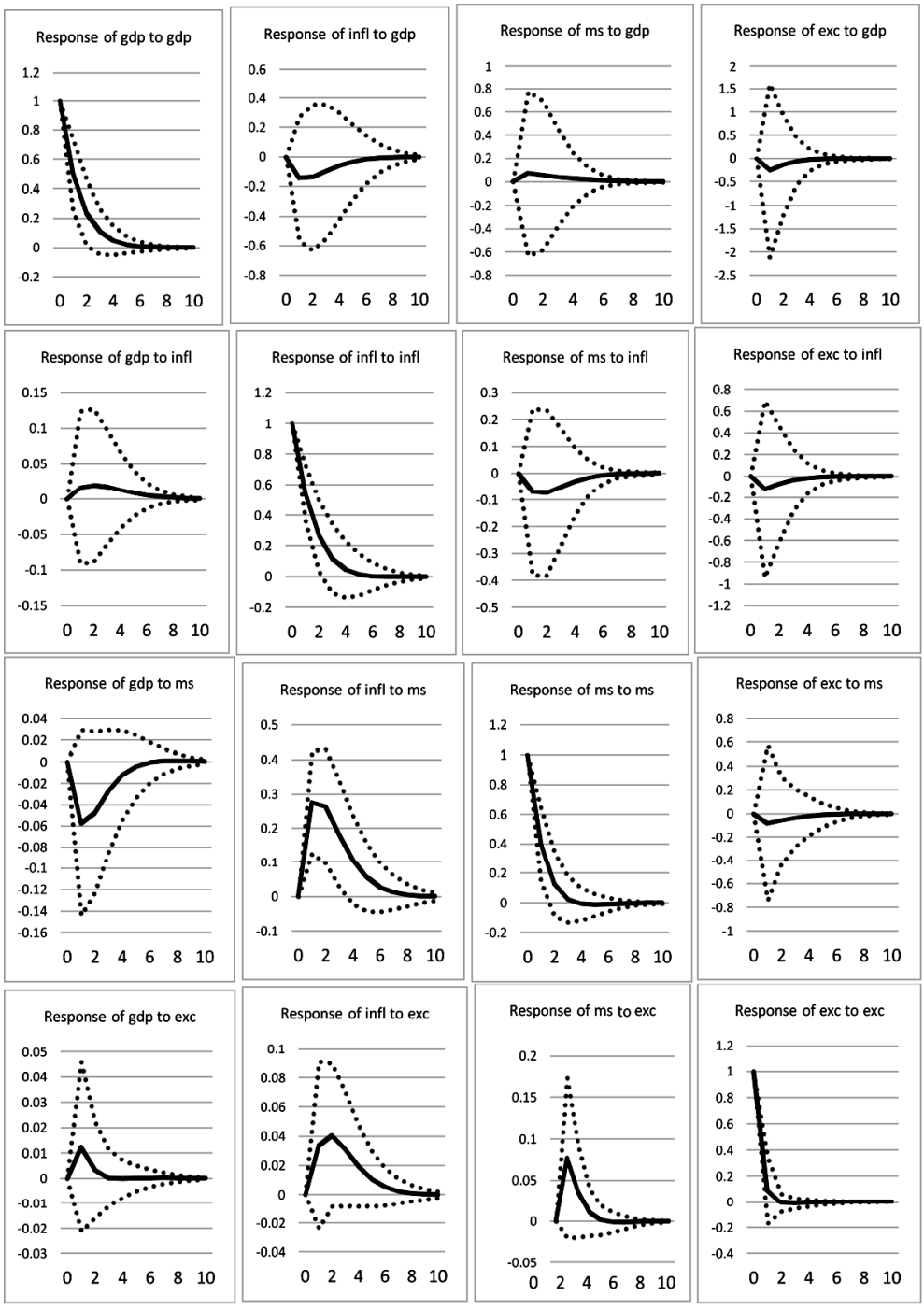
Impulse Response Function

Figure 19 shows the impulse response functions for the model. The response of GDP per capita to its own one standard deviation shock declined over time from 1 to the steady state value as expected. The reaction of the inflation rate and exchange rate to a one standard deviation impulse in GDP per capita started from the steady state level before becoming negative and moving to the steady state value in the long run. The negative response of the exchange rate to GDP per capita shocks can be due to capital flight and reduced foreign investments within the Nigerian economy.

GDP per capita responded positively to shocks from the inflation rate, while money supply and exchange rate reacted negatively to impulses from the inflation rate. The reaction of GDP per capita may be due to higher consumption levels in the Nigerian economy because of the increasing population. The negative reaction of money supply to impulse from the inflation rate can be influenced by concerns about the depreciation of the Nigerian currency, which makes the central bank intervene by reducing the money in circulation within the economy.

The response of GDP per capita to money supply impulses is observed to be negative, while the response of the inflation rate to money supply shocks is positive before fluctuating over time to the steady state value. The instability of the exchange rate can cause inflationary pressures in the economy, thereby reducing the value of the domestic currency and its purchasing power, all of which can cause negative response of GDP per capita to shocks from the money supply.

Figure 19: Impulse Response Function



The reaction of the inflation rate to a one standard deviation shock to the exchange rate is observed to be positive throughout the period studied. Positive responses are also reported for GDP per capita and money supply in relation to shocks from exchange rate.

Conclusion

In this study, the monetary and fiscal policies put in place after the Second World War in Nigeria were examined. It has been feasible to recognize the close and complicated relationship between fiscal policy and various macroeconomic indicators in Nigeria, and inflation in particular, through the discussions of the fiscal theory of price level. Because of the economy's composition, it is advised in the fiscal context that government revenue be increased through expanding the tax base and improving tax administration, while reducing wasteful spending and implementing policies to diversify the economy away from excessive reliance on oil. For monetary policy, it is essential to manage foreign exchange reserves, keep inflation under control, and strengthen the regulatory environment to maintain the stability of the financial system. The study further analyzed the causal relationship among GDP per capita, inflation rate, money supply, and exchange rate. The main finding is the presence of a unilateral causal relationship running from money supply to inflation rate, with no other causal link observed among the remaining variables. Conclusively, money supply is the most important factor influencing inflation in Nigeria.

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Appendix

Major Economic, Fiscal and Monetary Events, 1960 to 2021	
1960	Gained Independence from British Colonial rule
1962	Establishment of the Central Bank of Nigeria (CBN)
1966	Political instability (military coup) coupled with Civil War
1970	Second National Development Plan
1971	Joined the Organization of the Petroleum Exporting Countries
1975	Indigenization Decree
1979	Oil price boom
1982	Economic Stabilization Act
1986	Second-Tier Foreign Exchange Market (SFEM)
1986	Oil price collapse

Appendix (Cont.)

1986	Structural Adjustment Program (SAP)
1999	Democratic rule begins
2005	Debt-Relief Plan
2006	Financial System Strategy (FSS) 2020
2007	Fiscal Responsibility Act
2014	Oil Price Crisis
2016	Economic Recession
2017	Economic Recovery and Growth Plan (ERGP)
2020	Covid-19 pandemic
2021	Finance Act

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