Does Policy Switching Matter in Determining Output in Nigeria?

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**Abstract**
This study examines the performance of Nigeria’s economy under the interest rate, exchange rate and price stability regime in the Pre-SAP, Post-SAP before democratic dispensation; and Post-SAP during democratic dispensation. It leans on the assumptions of the McKinnon-Shaw theory. The study employs the Chow test and Quandt-Andrews Unknown Breakpoint Test to establish that there were truly varying regimes as stated above. Descriptive analyses are used in this study to understand the nature of various monetary policy regimes in Nigeria. Also, ARDL model was used to examine the overall impact of monetary policy on Nigerian since her independence and OLS was used to determine the effect of various monetary policy regimes in Nigeria. It was discovered that exchange rate policy and the interest rate fixing policy adopted in Nigeria since her independence on average, enhanced the economy. Also, exchange rate policy and interest rate policy which are components of macroeconomic policy have significant impact on economic growth in the first regime (Pre-
SAP; 1960-1985). However, monetary policy regime in period 2 (Post-SAP before Democratic Dispensation; 1986-1999) was ineffective but monetary policy was effective in this third regime (Post-SAP after Democratic Dispensation; 2000-2015). We, therefore recommend that the government should develop various palliative measures in order to counter the short run shocks that might arise while implementing monetary policy.

**Keywords:** Monetary policy regimes, Chow test, ARDL, Quandt-Andrews unknown breakpoint test, Marshall-Lerner conditions, Purchasing Power Parity.

**JEL Classification:** E42, E43.

1. **Introduction**

Monetary policy is an effective tool in achieving macroeconomic objectives (such as price stability, favourable balance of payment and natural rate of unemployment). Various schools of thought (for example classicalists and Keynesians) have developed frameworks which monetary authorities can use in stimulating economic growth and development. In Nigeria, monetary policy has been used since the Central bank of Nigeria was saddled the responsibility of formulating and implementing monetary policy by Central bank of Nigeria (CBN) Act of 1958. During the formative years of CBN (1959-1962), the most active policy instrument was the interest rate and notable actions taken during this period included the issuance of the Nigerian currency and introduction of the first money market instrument (treasury bills). Yet, the first era of the period (1962 – 1975) witnessed the amendment of the 1962 Act that strengthened the CBN for effective monetary policy promotion (Akinjare, Babajide, Isibor & Okafor, 2016).

Unfortunately, the aftermath of the three years civil war propagated high inflation rates and the CBN consequently embarked on some direct control measures in order to restore
price stability in the economy. Again, the period (1975 – 1992) has been described as the direct control era where monetary authority imposed quantitative interest rate and credit ceilings on the then money deposit banks and sustained sectoral credit allocation policy to preferred sectors.

However, direct controls, pervasive government intervention in the financial system resulting in stifling competition and resource misallocation necessitated the introduction of Structural Adjustment Programme (SAP). The SAP reforms which focused on structural changes, monetary policy, interest rate administration and foreign exchange management, encompassed both financial market liberalization and institutional building in the financial sector (Nwaobi, 2012).

In addition, between 1986 and 1993, the central bank made efforts to create a new environment for the introduction of indirect approach to monetary management. Under this framework, a major action taken as part of the monetary reform programme was the initial rationalization and eventual elimination of credit ceilings for selected banks. Equally, the CBN liberalized the interest rate regime and adopted the policy of fixing only its minimum rediscount rate to indicate the desired direction of interest rate.

Following the promulgation of CBN decree 24 and the banks and other financial institutions decree (BOFID) 25 of 1991, the period of indirect instrument of monetary control commenced. Specifically, in 1994, direct interest rate control was restored. These and other controls had negative economic effects; total deregulation of interest rate was again adopted in the last quarter of 1996. As part of the reforms, the foreign exchange market was liberalized with the reintroduction of the Dutch Auction System (DAS) in 2002, with the objectives of realigning the exchange rate of the naira, conserving external reserves, enhancing market transparency and curbing capital flight from the country.
(Nwaobi, 2012). In 2005, the central bank launched a new monetary policy framework with the aim of achieving lower (single digit) inflation rate, gradual reduction in the cost of borrowing, maintenance of monetary stability and sustaining exchange rate stability. However, the period 2006-2008 (referred to as the period of post-banking consolidation) was characterized by the gradual run-down of the CBN holding of treasury bills. As at December 2006, the monetary policy committee of the CBN adopted a new Monetary Policy Rate (MPR) to replace the Minimum Rediscount Rate (MRR).

Indeed, the outcomes of monetary policy in Nigeria have been influenced by the general macroeconomic environment such as the stance of fiscal policy. Over the years, there has been the problem of fiscal dominance which often hampers the effective implementation of monetary policy. From inception, the CBN has implemented two major monetary policy frameworks: exchange rate targeting (1959 – 1973) and monetary targeting (1974 – 2012). Also, two broad policy regimes were adopted in the implementation of monetary policy frameworks: direct and indirect monetary control regimes. Notably, these policy regimes operated on short term basis (annually) up to 2001 and subsequently transited to medium term monetary policy framework till date. Yet, as at 2010, monetary management was conducted within the framework of monetary targeting; and the major instrument of monetary policy remained open market operations, discount window operations and foreign exchange market interventions.

During the period of regime shifting of monetary policy, there has been contraction and expansion of the economy but evidently, the reported growth has not been sustainable as there is evidence of growing poverty among the populace. The questions that come to mind are: could the period of growth be attributed to appropriate monetary policy regimes? And during the period of democratic and military dispensations, were the monetary policy
regime adopted potent enough to influence the performance of the economy? What is the efficacy of monetary policy regimes before the adoption of structural adjustment programme, after structural adjustment programme; before the democratic dispensation and during the democratic dispensation?

Therefore, this study seeks to examine the performance of Nigeria economy under the interest rate, exchange rate and price stability regime in the Pre-SAP, Post-SAP before democratic dispensation and Post-SAP during democratic dispensation. It contributes to existing literature by considering the post-SAP period before democratic dispensation and the post-SAP period during democratic dispensation separately to evaluate their effectiveness and impact on the economy’s growth. The remaining parts of the paper focus on review of literature, methodology and model specifications, empirical findings and conclusion.

2. Review of Literature
2.1 Theoretical Framework
Exchange rate changes as a monetary policy tool and its impact on output has long been recognized in the literature but there is however, no consensus as to the direction of its effects. The traditionalists have strongly argued that exchange rate depreciation enhances trade balance, alleviates balance of payments difficulties and then increases output with employment. However, this can only occur as long as the Marshall-Lerner conditions are met. The Marshall-Lerner (1923) states that depreciation will increase output if the sum of price elasticity of demand for export and the price elasticity of demand for imports is greater than unity. On the other hands, the monetarists argued that exchange rate changes have no effect on real variables in the long run as it only affects real magnitudes mainly through real balance effect in the short run but leaves all real variables unchanged in the long run provided that the purchasing power parity (PPP) holds, Domac (1977).
McKinnon (1973) and Shaw (1973) in Odili and Ede, (2015) criticized the dominant neo-classical monetary theories and the Keynesian counter arguments. Odili and Ede (2015) further opine that the neo-classical monetary growth models postulate that high-positive interest rate has a direct impact on savings and investment. Within this school of thought, Odili and Ede (2015) were of the view that money is regarded as a substitute for physical assets and productive investments. Keynesian economists on the other hand, argue that low-interest rate increases investment, income and eventually savings. McKinnon (1973) and Shaw (1973) advanced arguments in favour of a complementary relationship between financial and physical assets as opposed to the substitutability theory by the neoclassical theory of interest rate. On a general note, the barometers for measuring the performance of the economy include among others real GDP growth rate, interest rate, rate of inflation, exchange rate, fiscal position and debt position. Of these, interest rate is believed to have a strong effect on stock market activity as they impinge directly on the state of corporate activity in any country. This is because interest rate is the financial price for credit thereby affecting the allocation of resources, prices as well as profitability. Ultimately, fluctuations in interest rate are believed to be reflected in the prices of shares – an indicator of market performance. For instance, lowering of interest rate on demand and savings deposits will improve returns to investment holding factors such as risk, transaction costs, etc. constant. This of course, has a multiplier effect on the demand and share prices of affected listed equities. On the basis of the above, this study is hinged on the assumptions of the McKinnon-Shaw theory (1973).

2.2 Empirical Evidence

On the empirical side, the controversy of the effect of exchange rate variation is equally unresolved, although many researchers found evidence for contractionary effect of depreciation (Pierrer-Richard, 1991; Kandil, 2004; Yaqub, 2010; Bakare, 2011; and

Martin, Michaelis and Siklos (2016) examined the role of various exchange rate regimes on financial crises and economic activity of G20 countries. The economic activity was captured by real per capita GDP growth while financial crisis was measured by incidence of the crises. It was discovered that different exchange rate regimes have positive spillover effects on economic growth. Martin, Michaelis and Siklos (2016) further discovered that by disaggregating the economy into regions, exchange rate regimes’ impact yielded significantly different result from the other stated above. They concluded that by pegging the exchange rate at a particular rate is suitable for emerging economies while flexible regimes deliver the greatest boost to economic growth in the G20. Further, it was asserted that the positive impact which exchange rate has on growth was crowded out during economic meltdown and financial crises. Another important conclusion of the study is that during recession, fixed exchange rate regime will exert greater negative impact on economic growth. The study provides a guideline empirically on the type of exchange rate that is best suited during recession and for emerging economies like Nigeria.

Adelowokan, Adesoye and Balogun (2015) on the effect of exchange rate volatility on investment and growth in Nigeria using the vector error correction method found that exchange rate volatility has a negative effect with investment and growth while exchange rate volatility has a positive relationship on inflation and interest rate in Nigeria. Owoundi (2015) examined the effects of currency misalignments on growth in Sub-Saharan Africa (SSA) countries. Currency misalignments and economic growth was assessed using Bayesian estimation techniques. The study concluded that undervaluation of exchange rate has insignificant
effect on output while a change in the regime has no significant impact on economic growth.

Using the ordinary least square estimation techniques within the error correction model (ECM) framework, Fapetu, and Oloyede (2014) investigated the impact of foreign exchange management on Nigeria’s economic growth from 1970 to 2012. The study reveals that managing the economy’s foreign exchange rate does affect quite a number of economic variables, which in turn affect growth.

Eze and Okpala (2014) carried out a quantitative analysis of the impact of exchange rate policies on Nigeria’s economic growth. They used the Chow test procedure (a test of stability of parameter estimates) to determine the structural stability of the relationship between exchange rate and output of goods and services. Their study reveals that, apart from government expenditure (GEX), both exchange rate (EXR) and money supply (M2) are highly significant in the determination of Nigeria’s economic growth. Also, the Chow test showed that the nexus between exchange rate and economic growth in Nigeria has not undergone any significant structural changes. The implication is that no exchange rate regime, whether fixed or flexible is preferred but effectiveness of management matters. Nigeria can substantially improve on its economic growth performance through improvements in the overall management of its exchange rate policy.

Benhima (2012) showed that in developing countries and emerging markets, the announcement of the introduction of fixed exchange rate and de facto stability in exchange rate normally have positive effects on growth. He opines that given that a currency is pegged to the US dollars only, it may hinder economic growth/development; this is because the higher the degree of dollarization, the more likely it will exhibit a negative effect on growth. It is worthy to note that Vita and Kyaw (2011) argued
that the choice of exchange rate regime does not have direct effects on the long term growth in developing countries. That is, in the long run, market-based or fixed exchange rate dynamism does not have significant impact on growth.

Bakare (2011) carried out an empirical analysis of the consequences of the foreign exchange rate reforms on the performances of private domestic investment in Nigeria with the ordinary least square multiple regression analytical method. The multiple regression results show a significant but negative relationship between floating foreign exchange rate and private domestic investment in Nigeria. The findings and conclusion of the study support the need for the government to dump the floating exchange rate regime and adopt purchasing power parity which has been considered by researchers to be more appropriate in determining realistic exchange rate for naira and contributing positively to macroeconomic performances in Nigeria.

The study of Bleaney and Francisco (2007) also pays attention to the regime classification. It utilizes de-facto classification carried out by previous studies, including 91 developing countries over the period 1984-2001. They regressed the growth rate on its lagged value, exchange-rate dummies and time dummies excluding high inflation-periods. The empirical findings indicate that pegs are associated with significantly slower growth than soft pegs or floats. However, no theory-consistent growth framework is applied; there are many insignificant variables, suggesting that the specification might suffer from high level of collinearity and endogeneity. It could be argued that it pays too much attention to the classification schemes at the expense of other important issues.

Using annual data on real and nominal measures of the effective exchange rate for Iran between 1959 and 2003, Bahmani-Oskooee and Kandil (2007) examined the effects of exchange rate fluctuations on output in oil-producing countries. The study
finds no evidence of co-integration between output growth and the parallel rial-dollar exchange rate, real & nominal exchange rate; and that currency appreciation is contractionary in the long run and expansionary in the short-run.

Miles (2006) argued that the effect of fixed exchange rates on growth in emerging markets is not direct, but rather contingent on the existence of macroeconomic imbalances and other distortions in the domestic economies. He opines that his results seem to conform more closely to exchange rate theory, which mostly is positive, and few negative channels for pegged currencies to impact growth in the long run.

Huang and Malhorta (2004) examined the relationship between exchange-rate regime and growth by paying attention to two aspects: exchange-rate-regime classification and differentiation between developing and developed economies. The study uses 12 developing Asian countries and 18 advanced European economies over the period 1976-2001. It utilized descriptive statistics and regression variables such as per capita growth, financial crisis; openness; government consumption; initial GDP; fertility rate; secondary school enrolment ratio; and exchange rate dummies. They found that the exchange-rate regime matters for developing economies while fixed and managed floating regimes outperformed the others in terms of growth. However, for advanced economies, no significant regularity is discovered.

Levy-Yeyati, and Sturzenegger (2003) using a new de facto classification of regimes based on the actual behaviour of the relevant macroeconomic variables find out that for developing countries, less flexible exchange rate regimes are associated with slower growth, as well as with greater output volatility. However, the findings indicate that no regimes appear to have any significant impact on growth in industrial countries. Rogoff, Husain, Mody, Brooks, and Oomes (2003) study the evolution and performance of exchange rate regimes using recent advances
in the classification of exchange rate regimes. Their study finds no support for the popular bipolar view that countries would over time tend to move to the polar extremes of free float or rigid peg. Rather, intermediate regimes have shown remarkable durability. The analysis suggests that as economies mature, the value of exchange rate flexibility rises. For countries at a relatively early stage of financial development and integration, fixed or relatively rigid regimes appear to offer some anti-inflationary credibility gain without compromising growth objectives. As countries develop economically and institutionally, there appear to be considerable benefits to more flexible regimes. For developed countries that are not in a currency union, relatively flexible exchange rate regimes appear to offer higher growth without any cost in credibility.

Apart from the controversy surrounding the effect of exchange rate variation on output that exists in empirical and theoretical literature, it must be stated that a lot of works have been done on the impact of exchange rate on economic growth in Nigeria and outside Nigeria. But the authors are not aware of any study which examines the link between exchange rate regimes and economic growth in Nigeria in different periods and also considering the common problems of exchange rate regimes classification as well as endogeneity of exchange rate regimes. This study finds it expedient to fill this gap in the literature.

3. **Methodology**

This section elucidates the methodology for carrying out the research. Several empirical studies on the monetary policy regimes have often adopted the regression technique for estimating the relationship between monetary policy regimes. Following this conventional approach, we also adopt the econometric approach to derive the empirical estimates of the impact of monetary policy regime on macroeconomic stability. As earlier stated the literature on monetary policy regime as a topic in macroeconomic theory provides very robust framework
through which the impact of monetary policy variables can be used to investigate the impact of monetary policy regime on macroeconomic performance and stability. Thus having this in mind, the empirical model is formulated in line with previous studies with some modification in order to adequately capture the current research topic.

The fundamental objective of this is to explore the impact of different monetary policy regimes on macroeconomic performance of the Nigerian economy over the period of study. The model we have chosen is a simple linear one and it allows an easy analysis providing transparent results. We strongly believe that the model is adequate enough in terms of dynamics. Further, it catches a lot of characteristics of the macroeconomic policies. The model uses a short-term interest rate as instrument of monetary policy and includes an autoregressive expectations Phillips curve. The two equations for the inflation and output targeting estimation of the models closely follow that of Rudebusch and Svensson, (1998). Thus we specify:

$$\pi_t = \alpha_0 + \alpha_1 \pi_{t-1} + \alpha_2 (\gamma_t - \gamma^*) \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1)$$

$$\gamma_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 (\pi_t - \pi^*) \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

Equations (1) and (2) are the output gap and inflation targeting equation due to Phillips with some modifications that have come to be imputed in recent works (Svensson, 1999; Bleaney & Francisco, 2007). In the preceding specification $\pi_t$ and $\gamma_t$ are the present rate of inflation and output growth respectively, while $\pi_{t-1}$ and $\gamma_{t-1}$ are the past (lagged values) of inflation and output growth respectively in the model. Hence, it can be seen that the preceding equation is an autoregressive model since a lagged value of the dependent variable also enters the equation as an explanatory variable. Similarly, $\pi^*$ and $\gamma^*$ are the average or expected value of inflation and output respectively. These variables can also be thought of as trend value or long run value equilibrium upon which the variables fluctuate around.
The study also adopted the ARDL bound testing approach used extensively by Pesaran, Shin and Smith (2001) to examine the relationship between exchange rate and real sector output. This involves estimating the conditional error correction version VAR model. The choice of the ARDL approach is based on the consideration that co-integration analysis is unbiased and efficient. This technique has a number of advantages. First, it is useful in estimating the short and long-run components of a model simultaneously, removing problems associated with omitted variables and autocorrelation (Narayan, 2004). Second, the ARDL co-integration approach could be used regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. This implies that the ARDL approach avoids the pre-testing problem associated with standard co-integration, which requires that the variables are already classified into I(I) (Pesaran et al., 2001). Thirdly, the ARDL approach to co-integration is preferable to the Johansen approach because it avoids the problem of too many choices that are to be made in Johansen method (1995). These include the treatment of deterministic elements, the order of VAR and the optimal lag length to be used. Finally, the ARDL approach variables could have different lag lengths, whereas in the Johansen method (1995) this is not permissible. The ARDL approach requires two steps. In the first step, the existence of any long run relationship among the variables of interest is determined by using the F-test. The second stage requires the estimation of the long run relationship between dependent and explanatory variables; and to determine their values thereafter, the short run elasticity of the variables with the error correction representation of the ARDL model.

3.1 Model Specification
It should be recalled that the core of this study is to examine the role of exchange rate liberalization on macroeconomic stability. This is, of course, is not unconnected with the model from different empirical studies on cross country analysis; where the effects different from monetary policy regimes and relative prices
on such macroeconomic variables. As domestic inflation dynamics, output gap trade balance, and balance of payments position in each country demonstrate different response paths thus signaling the importance of country specific factors especially in the developing countries (Bahmani-Oskooee and Kandil, 2007). Thus following previous studies such as Adeniran, Yusuf and Adeyemi (2014), Oyinlola et al (2010), and Osinubi and Amaghionyediwe (2010), we specify the following models for the study:

\[
\pi_t = f(i_t, \epsilon_t X_t') \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3)
\]

\[
\gamma_t = f(i_t, \epsilon_t, Y_t') \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4)
\]

Equations (3) and (4) can be stated in the traditional econometric form for ease of estimation using regression approach. Hence, we rewrite the equations in the standard econometric forms as:

\[
\pi_t = \alpha_0 + \alpha_i i_t + \rho \epsilon_t + \delta_i X_t' + \mu_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (5)
\]

\[
\gamma_t = \beta_0 + \beta_i i_t + \beta \epsilon_t + \eta_i Y_t' + \nu_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (6)
\]

Equations (5) and (6) are the empirical basis for estimating the research objective.

In the specified model the dependent variables \(\pi\) and \(\gamma\), are the rate of inflation and output gap respectively. The explanatory variables in the equation include \(\epsilon\) which is the exchange rate and remains the same in all equations. The notations \(X_t'\) and \(Y_t'\) are row vectors subsuming other monetary policy variables such as interest rate, exchange rate, and money supply. Finally, \(\mu\) and \(\nu\) are the stochastic error term also known as the regression residual which is used to capture the effect of unobserved or unmeasured variables in the model.

We assume as usual in the econometric literature that the stochastic terms \(\mu\) and \(\nu\), are white noise. That is they are independent and non-correlated with the regressors; thus, satisfying the exogeneity assumption of the Ordinary Least Square (OLS) technique. This can be stated more explicitly as: \(\mu\) and \(\nu\) iid \((0, \sigma)\).
3.2 Data Sources and Scope
In order to achieve the stated objective of the study, annual time series data of the variables identified in the model were used. The study utilized data that are sourced from the Central Bank of Nigeria Statistical Bulletin of various years and the World Bank Indicators (WDI, 2016).

4. Empirical Findings
4.1 Descriptive Statistics
This section examines empirically, the different monetary policy regimes we have in Nigeria. The variables used in the analysis are first described by conducting a descriptive statistics, the result is however presented in table 1.

Table 1: Descriptive Statistics of Variables

<table>
<thead>
<tr>
<th></th>
<th>GDP Growth Rate (%)</th>
<th>Exchange rate (%)</th>
<th>Inflation rate (%)</th>
<th>Interest rate (%)</th>
<th>Broad money supply (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.081189</td>
<td>44.88387</td>
<td>15.94546</td>
<td>5.200934</td>
<td>20.48282</td>
</tr>
<tr>
<td>Maximum</td>
<td>33.73578</td>
<td>192.4405</td>
<td>72.83550</td>
<td>11.06417</td>
<td>43.26613</td>
</tr>
<tr>
<td>Minimum</td>
<td>15.74363</td>
<td>0.546781</td>
<td>-3.726337</td>
<td>0.316667</td>
<td>9.208348</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>25.62694</td>
<td>10.24797</td>
<td>55.58939</td>
<td>2.213666</td>
<td>2.699531</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000003</td>
<td>0.005952</td>
<td>0.000000</td>
<td>0.330604</td>
<td>0.259301</td>
</tr>
<tr>
<td>Observations</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
</tbody>
</table>

Source: Author, Data extracted from WDI, 2016

Table 1 shows that GDP growth rate from 1960 to 2015 remained on an average of 4.08% and has experienced fluctuations reaching an all-time low of 15.74% and all time increase in 2004 which stood at 33.74%. The table further reveals that exchange rate of Nigerian currency to a US dollars experienced an all-time increase in 2015 and was exchanged at ₦192.44 on annual average to a dollar. In this same economy, a point in time came when exchange rate was exchanged at ₦0.55 to a dollar, this shows the level of depreciation the naira has experienced over the years due to various exchange rate policies adopted over the
period. Interest rate from table 1 remained on average of 5.2% over the period examined and this was not left without volatility. It should be noted that this interest rate is just the monetary policy rate which is the lending rate of Central Bank of Nigeria to commercial banks; the cost of borrowing by investors however inculcated the inflation rate and other service charges which definitely increased the lending rate. Inflation rate however has remained at 15.95% on average over the years studied and experienced an all-time high in 1995 at 72.84%. Broad money supply as a percentage of GDP remained at 20.48% on average over the period studied. It then implies that over the years, the money supplied bought up 20.48% of the goods produced on average.

Having considered the central tendency measures of the data sued, it is then paramount that we consider the trend analysis of the data as presented in figure 1.
Figure 1: Trend Analysis of Monetary Policy Variables (1960-2015)

Source: Author, Data extracted from WDI, 2016

It is observed in figure 1 that exchange rate skyrocketed since 1999 and reached its all-time high in 2015 and the exchange rate was relatively constant before the SAP period but inflation rate continued to experience ups and downs and this was due to domestic shocks and external shocks. On average, the figure 1 shows that broad money supply remained relatively stable over the period of study.
4.2 Unit Root Test

Regression of a non-stationary time series data on another non stationary time series may cause a spurious regression or nonsense regression. That is, they may indicate a relationship between variables which do not exist. Since a spurious regression is not desirable, thus testing for stationarity is a prerequisite when working with time series data. In order to test for the stationarity of the series and examine the order in which they are integrated, Augmented Dickey Fuller method is applied to each variable. The result of the test is presented in table 2 below.

Table 2: Unit Root Test (Augmented Dickey Fuller Test Result)

<table>
<thead>
<tr>
<th>Variable</th>
<th>At level [I(0)]</th>
<th>At first difference [I(1)]</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate</td>
<td>1.35 (0.9986)</td>
<td>-6.32** (0.0000)</td>
<td>I(1)</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>-3.44* (0.0138)</td>
<td>-</td>
<td>I(0)</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-2.17 (0.2202)</td>
<td>-7.80** (0.0000)</td>
<td>I(1)</td>
</tr>
<tr>
<td>Broad money supply</td>
<td>-2.50 (0.1220)</td>
<td>-6.61** (0.0000)</td>
<td>I(1)</td>
</tr>
<tr>
<td>Gross Domestic product</td>
<td>-0.52 (0.8780)</td>
<td>-5.29** (0.0000)</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

** Significant at 1% level, * Significant at 5% level. Probability values are in parenthesis.

Source: Author, Data extracted from WDI, 2016

Table 2 reveals that exchange rate, interest rate, broad money supply and gross domestic product are integrated of order one and only inflation rate is integrated at level. Hence, given that the variables are integrated at different orders, it is not erroneous to employ an autoregressive distributed lag model (ARDL) as proposed by Peseran (2001). Before applying the ARDL model testing technique, some conditions have to be fulfilled. These assumptions are that the error of the model must be serially independent and the model must be dynamically stable. These conditions are necessary for bound testing to be possible.
Table 3: Breusch-Godfrey Serial Correlation LM Test

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.772946</td>
<td>0.5151</td>
</tr>
<tr>
<td>Observations*R²</td>
<td>2.639468</td>
<td>0.4506</td>
</tr>
</tbody>
</table>

Source: Author, Data extracted from WDI, 2016

With a null hypothesis of no serial correlation and a probability chi-square is 45.06% and probability of F-statistics is 51.51%, which is more than 5%, means that it is not significant; that is, we do not have enough evidence to reject the null hypothesis, meaning that our ARDL model has no serial correlation.

4.3 Co-integration Test

There is a practical difficulty that has to be addressed when we conduct F-test. Exact critical value for the F-test are not available for an arbitrarily mix of I(0) and I(1) variables. However, Peseran (2001) supplied bound for the critical value for the asymptotic distribution of the F-statistic. For various situations (e.g. different numbers of variables, (k+1)), they give lower and upper bound on the critical values. In each case, the lower bound is based on the assumption that all the variables are I(0), and the upper bound is based on the assumption that all the variables are I(1). If the computed F-statistic falls below the lower bound, we would conclude that the variables are I(0), so no co-integration is possible, by definition. If the F-statistics exceeds the upper bound, we conclude that we have co-integration. Finally if the test statistic falls between the bounds, the test is inconclusive. Hence, the ARDL bound test co-integration is used and the result is presented in table 4.
Table 4: ARDL Bound Co-Integration Test

<table>
<thead>
<tr>
<th>Level of significance</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2.45</td>
<td>3.52</td>
</tr>
<tr>
<td>5%</td>
<td>2.86</td>
<td>4.01</td>
</tr>
<tr>
<td>2.5%</td>
<td>3.25</td>
<td>4.49</td>
</tr>
<tr>
<td>1%</td>
<td>3.74</td>
<td>5.06</td>
</tr>
</tbody>
</table>

Estimated Model: \( GDP_t = f(GDP_{t-1}, RXR_t, INFL_t, INTS_t, MS2_t) \)

Optimal Lags: (1, 0, 0, 0)

F-Statistics: 5.23*

Source: Author, Data extracted from WDI, 2016

Table 4 shows that the F-statistics is greater than the 5% lower and upper bound test and we can therefore conclude that there is co-integration; hence the variables are co-integrated in the long run.

4.4 Overall Impact of Monetary Policy on the Economy

Table 5: ARDL Estimated Result

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP_{t-1}</td>
<td>0.929**</td>
<td>0.0000</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>1.238*</td>
<td>0.0108</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>0.430</td>
<td>0.7033</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-10.022</td>
<td>0.3187</td>
</tr>
<tr>
<td>Broad money supply</td>
<td>-5.348*</td>
<td>0.0287</td>
</tr>
<tr>
<td>C</td>
<td>236.138*</td>
<td>0.0297</td>
</tr>
</tbody>
</table>

R-squared 0.93  
Adj R-squared 0.92  
F-Statistic 135.56**

** Significant at 1% level, * Significant at 5% level of significance.

Source: Author, Data extracted from WDI, 2016
Table 5 shows the overall impact of monetary policy on the economy for the period 1960 – 2015. The coefficient of determination shows that about 92% variations in the gross domestic product is explained by the independent variables. The result further reveals that there is a positive impact of exchange rate on economic growth over the period of study and this is significant at 1%. This result conforms to apriori expectation as it is theoretically supported that exchange rate depreciation (devaluation) representing rising exchange rate stimulates exports which increases nation’s earnings. Hence, it can be concluded from the study that the exchange rate policy taken up for the period 1960 – 2015 on average, stimulates growth.

Examing interest rate, it can be seen that there is a negative impact of interest rate on economic growth and this is expected based on apriori expectation. Also, the result shows that rising interest rate impacts economic growth negatively; this occurs by rising cost of borrowing making investment expensive. Rising interest rate possess constraint to growth. Broad money supply as a percentage of GDP reported a negative impact on GDP and this does not conform to apriori expectation. A possible reason to this could be the effect of inflation as rising money supply simultaneously increases price, making import to be relatively cheaper and hence, output is affected.

4.5 Monetary policy Regimes and their Impact on the Economy

Following our proposition earlier stated that Nigeria’s monetary policy regime can be divided into three regimes: Period 1: Pre-SAP regime (1960-1985), Period 2: Post-SAP before democratic dispensation (1986-1999), Period 3: Post-SAP regime after democratic dispensation (2000-2015), this section examines the different monetary policy regimes’ impact on the economy. However, it is important that we examine if there exists any structural break for the selected periods. For the economy to be broken down into different regimes; it is important that structural
break exists; the existence of a structural break implies that there has been major structural changes in monetary policy within these periods. To test for structural breaks, we employ the Chow Test and Quandt-Andrews unknown breakpoint tests. The Chow test examines the null hypothesis that there is no breaks at specified breakpoints while Quandt-Andrews unknown breakpoint tests the null hypothesis that there is no breakpoints within 15% trimmed data. The results are presented in the tables below.

Table 6:  Chow Break Point Test

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>Prob. F(10,41)</th>
<th>Prob. Chi-Square(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>10.09803</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Log likelihood ratio</td>
<td>69.55849</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Wald Statistic</td>
<td>100.9803</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Break point periods: 1985 and 1999
Source: Author, Data extracted from WDI, 2016

Table 7:  Quandt-Andrews Unknown Breakpoint Test

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum LR F-statistic (1984)</td>
<td>10.25311</td>
<td>0.0000</td>
</tr>
<tr>
<td>Maximum Wald F-statistic (1984)</td>
<td>51.26553</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

No of breakpoints compared
Test Sample: 1969 - 2007
Source: Author, Data extracted from WDI, 2016

Table 6 suggests the existence of a structural break for the periods 1985 & 1999 and from 1960 to 2015 as the Chi-square statistic is significant leading to the rejection of the null hypothesis. The implication of this is that for the periods of 1985, there was a change in monetary policy and also a change in monetary policy tactics in 1999. Table 7 further supports the evidence in table 6 that indeed there were structural changes for the periods examined.
Given that there is an empirical evidence of the existence of various monetary policy regimes, we therefore estimate the impact of these variant monetary policy regimes on the economy using OLS estimation technique and the results are presented in table 8.
Table 8: Impact of Monetary Policy Regimes on Economic Growth
Method: Ordinary Least Square (OLS) Technique

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Prob</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>-2.09**</td>
<td>0.0013</td>
<td>-0.0006</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>0.008*</td>
<td>0.0401</td>
<td>-0.0007</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-0.115</td>
<td>0.0819</td>
<td>0.0110</td>
</tr>
<tr>
<td>Broad money supply</td>
<td>-0.007</td>
<td>0.2417</td>
<td>0.0029</td>
</tr>
<tr>
<td>C</td>
<td>9.220**</td>
<td>0.0000</td>
<td>7.0522**</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.60</td>
<td></td>
<td>0.58</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.52</td>
<td></td>
<td>0.51</td>
</tr>
<tr>
<td>F-Statistic</td>
<td>7.856**</td>
<td></td>
<td>0.462</td>
</tr>
</tbody>
</table>

** Significant at 1% level, * Significant at 5% level. Probability values are in parenthesis
Source: Author, Data extracted from WDI, 2016
Table 8 presents the variant monetary policy regimes in Nigeria since independence. It can be seen that for period 1, exchange rate has a significant impact on economic growth. The result shows that in the first regime, exchange rate positively spurs economic growth and this is expected based on apriori expectation. Also, inflation rate has a positive and significant impact on economic growth. It shows that an increase in inflation rate stimulates economic growth. Interest rate however in period 1 has negative impact on economic growth, although this was statistically insignificant. Broad money supply has negative impact on economic growth. It can therefore be concluded that from the study, that exchange rate and interest rate policies which are components of macroeconomic policy have significant impacts on economic growth in the first regime.

For period 2, the table however reveals that exchange rate has negative impact on economic growth and this is statistically insignificant. The result also reveals that interest rate has positive impact on economic growth meaning that rising interest rate characterized the period. Money supply as a percentage of GDP however, exerts positive pressure on growth rate but was statistically insignificant. It can therefore be concluded that the monetary policy regime in period 2 is ineffective. This is not surprising as the regime was characterized with instability in governance and frequent military interventions.

In addition, it is observed that exchange rate has positive and significant impact on economic growth, conforming to apriori expectation. The result further indicates that inflation rate has negative impact on economic growth although it is statistically insignificant. The result also shows that interest rate has a negative impact on economic growth although this was also statistically insignificant. A major conclusion drawn here is that monetary policy was effective in this third regime.
5. Conclusion and Recommendations
This study has examined the performance of Nigerian economy under the interest rate, exchange rate and price stability regimes in the Pre-SAP, Post-SAP before democratic dispensation and Post-SAP during democratic dispensation. It is concluded that exchange rate policy and the interest rate fixing policy adopted in Nigeria since her independence on average, enhanced the economy. Also, exchange rate policy and interest rate policy which are components of macroeconomic policy have significant impact on economic growth in the first regime (Pre-SAP; 1960-1985). However, monetary policy regime in period 2 (Post-SAP before democratic dispensation; 1986-1999) is ineffective but monetary policy was effective in the third regime (Post-SAP after democratic dispensation; 2000-2015).

Again, this study establishes the fact that exchange rate regime matters; and in fact suggests that regulated exchange rate regime spurred real sector growth than deregulated regime in Nigeria during the period under consideration. The implication of this for the regulators (especially the CBN) is to reappraise the monetary policy regime with the view of making various exchange rate policies support the developmental drives in the real sector; indicating that regulated and almost fixed exchange rate regime is suitable for Nigeria.
REFERENCES


