MONEY SUPPLY, INFLATION, AND ECONOMIC GROWTH IN NIGERIA: ERROR CORRECTION MODEL (ECM) APPROACH

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Abstract

The study examined the long-run equilibrium relationship between inflation, money supply on economic growth in Nigeria. The ECM model and Co-integration test were used and five variables such as of economic growth, broad money supply, inflation, real exchange rate and real interest rate were used for the study. The variables were tested for unit root using the Augmented Dickey-Fuller approach and were found to be stationary at levels and first difference. The co-integration and error correction mechanism were carried and the findings were: Broad money supply has positive and significant impact on economic growth. This implies that when central bank increases money supply with inflation checking, it will in turn lead to increase in economic growth in Nigeria. Inflation has a negative impact on economic growth in Nigeria. This implies that an increase in inflation will lead to a decrease in economic growth and also the result shows that it is statistically significant. Real exchange rate has a positive and significant impact on economic growth in Nigeria. The co-integration test reveals the existence of co-integration among variables; this implies that there is a long-run relationship between the variables in the model. The coefficient of ECM indicates that about 22.6% of disequilibrium in the short-run will be corrected in the long-run. The speed of adjustment indicates that the model will converge completely to its equilibrium system in 4.2years.The study recommends that Government through its monetary policy should maintain the price stability by controlling the growth of money supply in the economy. Effort should be made to enhance a policy that will encourage money supply in

order to boost the economic growth of Nigerian; this is a result of its positive and significant impact in economic growth.

Keywords: Inflation, Economic growth, Long-run equilibrium, ECM

1. INTRODUCTION

Demand pressures arising from expansionary fiscal policy (government spending and tax cuts) or expansionary monetary policy (increasing the money supply) put upward pressure on the price level thereby causing inflation in the economy (Udah, 2009). Therefore, inflation is a continuous process of rise in the general level of prices which can also be called a continuous reduction of the value of money. Specifically the bone of contention is, whether inflation and money supply granger cause changes in economic growth or it is detrimental to growth. World economic growth and inflation rates have been fluctuating. Inflation rates have been dominating to compare with growth rates in virtually many years and relationship between inflation and the economic growth continued to be one of the most macroeconomic problems. Ahmed (2012) observed that this relationship has been argued in various economic literatures and these arguments show differences in relation with the condition of world economy order.

In 1970s, countries with high inflation especially the Latin American countries begun to experience a decrease in growth rates and thus caused the emergence of the views stating that inflation has negative effects on the economic growth instead of the positive effects. Evidence showing relationship between inflation and economic growth from some of the Asian countries such as India showed that the growth rate of Gross Domestic Product (GDP) in India increased from 3.5% in the 1970s to 5.5% in the 1980s while the inflation rate accelerated steadily from an annual average of 1.7% during the 1950s to 6.4% in the 1960s and further to 9.0% in the 1970s before increasing marginally to 8.0% in the 1980s (Prasanna and Gopakumar, 2010). The experiences from East African countries, for example shows that Kenya had 5 years of very positive economic development with four consecutive years of growth above 4%. But average annual inflation of Kenya increased from 18.5% in June 2008 to 27.2% in March 2009, before falling marginally to 24.3% in July 2009 (Bakare, 2011). Uganda was one of the fastest growing economies in Africa with sustained growth averaging 7.8 % since 2000 with

the annual inflation rate decreasing from5.1% in 2006 to 3.5% in 2009 (Babatunde and Shuaibu, 2011). In Nigeria, inflation in the early 1990s was exceptionally high at 45 percent, 57 percent and 72 percent in 1992, 1993 and 1995 respectively, but the late 1990s witnessed a sharp reduction in the rate of inflation. Inflation rate was 12 percent on average from 2000 to 2008, and 10 percent from 2010 to 2015 (CBN Financial and Economic Review, 1990; CBN Statistical Bulletin, 2016). The GDP grew at an average of 5.01 percent from 2000 to 2008 and averaged 5.59 percent from 2010 to 2015. However, the economy was plunged into recession in 2016 with a growth rate of -1.51 percent (CBN Statistical Bulletin, 2016). Since late 1980s, Nigeria economy experienced many internal and external shocks. All sectors of the economy were affected by shocks, whose manifestations were, among others, large budget deficits and an imbalance between productive and non-productive activities. The signs closely associated with these were high rates of inflation, large balance of payments (BOP) deficits, declining domestic savings, growing government expenditure, falling agricultural produce and decreased utilization of industrial capacity which in turn hindered economic growth (Kilindo, 2014). The relationships between money supply, inflation and economic growth are core issues in developing counties due to the need to achieve a sustainable economic growth and development. Achieving a very low inflation rate has been the primary goal of monetary policy makers in many developing countries including Nigeria but most of the government policies to lower inflation end up accelerating it. Developing countries in attempt to develop infrastructure, engage in expansionary monetary policy which has tendency of fueling inflation. Several studies have been conducted to examine the implication of money supply and inflation on growth process in developing countries. Among studies that have examined the linkage include Lucas (2000), Moroney (2012), Grauwe and Polan (2005), Odusanya and Atanda (2012), Omoke and Ugwuanyi (2010), Babatunde and Shuaibu (2011). Some of these studies suggest the existence of a negative relationship between money supply, inflation and growth driven by capital accumulation while others have found a positive relationship among these macroeconomic variables. Available statistics reveal that capital accumulation has been averagely low in Nigeria during the period under investigation. Episodes of de-accumulation of capital were experienced in 1980 to 1982 of about 28%. Also in 2005 to 2007 existing capital stock decreased by 7%. This suggests a

need to investigate factors that can contribute to capital accumulation in the country (Moroney, 2013). The growth in monetary aggregates was due to factors such as rapid monetization of oil inflows, minimum wage adjustments, and financing of government's fiscal deficit through the banking system (Grauwe and Pollan, 2015). Nigeria has experienced high volatility in inflation rates. Since the early1970's, there have been several major episodes of high inflation, in excess of 30 percent. The growth of money supply is correlated with the high inflation episode because money growth was often in excess of real economic growth (Owoje, and Onofowora, 2015). In addition, in the late 1980's, following the Structural Adjustment Program, the effects of wage increases created a cost-push effect on inflation. In the long run, it was the structural characteristics of the economy, coupled with the growth in money supply that translated these into permanent increases (Mohamed, 2016). In 1985, inflation peaked at 40 percent at a time of relatively little growth in the economy. At that time, the government was under pressure from debtor groups to reach an agreement with the International Monetary Fund, one of the conditions of which was devaluation of the domestic currency (Bick, Kremer and Nautz, 2012). Due to the extensive money growth in the country coupled with government objective to fast track development, another episode of inflation started in the last quarter of 1987 and accelerated through 1988 and 1989 (CBN Economic and Financial Review, 1990). Inflation in the early 1990s was exceptionally high at 45 percent, 57 percent and 72 percent in 1992, 1993 and 1995 respectively, but the late 1990s witnessed a sharp reduction in the rate of inflation. Anti-inflationary policies can have four potential effects: recession effects, capital stock effect, improved allocation effect, and productivity growth effect. The objective of the study is to empirically analyze the relationship between inflation, money supply and economic growth in Nigeria for the period 1980-2015.

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework

Existing theoretical literature on money supply, inflation and capital accumulation have provided divergent views on the relationship between the variables. Initial work by Tobin (1967) suggested that inflation has a positive effect on the stock of capital. This is called “Tobin effect”. According to the Tobin effect a higher inflation will reduce return to holding real money

balances and lead individuals to substitute out of money and into the alternative asset, physical capital. This permanent increase in inflation rate would result in a rise in the steady-state level of capital and output and a fall in the real interest rate. In Tobin's model the savings function is ad hoc. A number of authors have looked at the effect of inflation on capital stock models with optimal savings decisions. One attractive feature of these models is the need to be specific about how money enters the economy. Sidrauski (1967) employed a model in which real money balances are an argument of agents' utility functions, in the model money is super-neutral in the long run, that is the steady state levels of capital, output and the interest rate are independent of the rate of inflation. In addition Fischer (1979) shows that the super-neutrality of inflation in the Sidrauski model does not hold along the transition path of the steady state. Fischer finds that inflation can affect the rate at which the economy approaches the steady state. Gillman and Kejak (2002) examined Tobin-type effects of inflation on the levels of various variables, such as capital usage. A three sector model with human and physical capital was presented in utility function consisting of consumption, leisure and physical capital. Human capital is produced with effective physical capital and effective labor each in a Cobb-Douglas fashion. According to the study the basic link between the magnitude of the growth and the level effect is the degree to which inflation affects the real wage to real interest rate ratio and this depends on the magnitude of the interest elasticity of money demand.

2.2 Empirical Review

Several studies have tried to examine the implication of inflation and money supply as part of a group of independent variables or their individual effect on growth. This linkage has been observed in a number of studies: Barro (2011), Levine (2013), Ghosh and Philips (2013), Moosa (2011), Teriba (2006), Balakrishanan (2011), Grauwe and Pollan (2015), Lucas (2000), Moroney (2012). While some suggest the existence of a negative relationship between money supply, inflation and growth, others have found a positive relationship at different significant level in both cases. Omoke and Ugwuanyi (2010) tested the relationship between money, inflation and output by employing co-integration and Granger-causality test analysis. The findings revealed no existence of a co-integrating vector in the series used. Money supply was seen to Granger cause both output and inflation. The study conducted by Babatunde

and Shuaibu (2011) provided a monetary growth model for Nigeria by examining the existence of a significant long run relationship between money supply, capital stock , inflation and economic growth between 1975 and 2008. The paper estimated the variables using error correction mechanism in the bounds testing approach to co-integration within an autoregressive distributed lag framework. Empirical findings from this study reveal a positive and significant relationship between money supply and capital stock while a negative relationship was found between inflation.

While much explanation has been offered on the determinants of growth in Nigeria and/or its implication for the country's long term economic development, quite a little is known about the impact of money supply and inflation on the economic progression of the country. Reliable estimates of the linkage between money supply, inflation and growth in Nigeria are important pieces of information in formulating public policies on financial sector reforms and restructuring, particularly given the need for diversification of the economy from an oil dependent to a non-oil sector driven one which has been a major component of reforms over the years. Egwaikhide, Chete and Falokun, (2013) employed co-integration and error correction model technique to analyze the relationship between exchange rate, money supply and inflation in Nigeria. The study showed that the Nigerian inflation seems to explain both monetary and structural factors and that official and parallel market exchange rate exert an upward pressure on the price level in the country. Udah (2009) examined monetary policy and macroeconomic management in Nigeria using 3SLS estimation technique in addition with a policy simulation experiment. Empirical findings from this study suggest that monetary variables and government finances are linked through government's net indebtedness to the banking system. The simulation experiments show that a 20 percent contraction in monetary variables would reduce inflation rate faster than if the reduction in money supply were 10 percent. Odusanya and Atanda (2012) analyzed the dynamic and simultaneous inter-relationship between inflation and its determinant in Nigeria between 1970 and 2001. The long run and short run mechanism of interaction between inflation and its determinants were examined using Augmented-Engle Granger co-integration test and Error Correction Mechanism (ECM) model. Their results suggest that inflation rate, growth rate of real output and money supply and real share of fiscal deficit are stationary at level, indicating co-integration of the variables. While other

variables incorporated in the model such as import, exchange rate, interest rate are stationary at first difference. Bakare (2011) employed ordinary least square, multiple regression technique to examine the relationship between capital formation and economic growth in Nigeria. The study tested the stationarity and co-integration of the two variables. Error Correction Mechanism was used to determine the short run adjustment behavior of the model. Findings from this study suggest that capital formation and economic growth share a long run relationship in Nigeria in the periods under investigation. The study conducted by Babatunde and Shuaibu (2011) provided a monetary growth model for Nigeria by examining the existence of a significant long run relationship between money supply, capital stock , inflation and economic growth between 1975 and 2008. The paper estimated the variables using error correction mechanism in the bounds testing approach to co-integration within an autoregressive distributed lag framework. Empirical findings from this study reveal a positive and significant relationship between money supply and capital stock while a negative relationship was found between inflation. Ghosh and Phillips, (2013) maintain that while there is no doubt about the fact that high inflation is bad for growth, there is less agreement about the effect of moderate inflation. Using panel regressions which allowed for non-linearity specification, they found a statistically and economically significant inverse relationship between inflation and economic growth which holds robustly at all but the least inflation rates. They concluded that short-run growth costs of disinflation are only relevant for the most severe disinflations or when the initial inflation rate is well within the single-digit range. Quartey (2013) using the Johansen co-integration methodology, investigated whether the revenue maximizing rate of inflation is growth maximizing in Ghana. He found that there is a negative impact of inflation on growth. Furthermore, the study found a revenue maximizing rate of inflation at 9.14 percent over the period 1970-2006 using the Laffer curve. He further established that the rate of inflation that is growth maximizing is not a single digit one. Barro (2011) made an assessment on the effects of inflation on economic performance using data for around 100 countries over the period 1960-1990. His study reached to a conclusion that if a number of country characteristics are held constant, then the regression results suggested that an increase in average inflation of 10 percent per annum reduces the growth rate of real GDP by 0.2 to 0.3 percent per annum and

lowers the ratio of investment to GDP by 0.4 to 0.6 percent. In addition, Barro (2012) conducted another empirical study using panel data of around 100 countries from 1960 to 1990. He revealed that for a given starting level of real per capita GDP, the growth rate is enhanced by lower inflation, higher initial schooling and life expectancy, lower fertility, lower government consumption, better maintenance of rule of law, and improvements in the terms of trade. Marbuah (2010) investigated the relationship between inflation and economic growth to ascertain whether a significant effect existed in the case of Ghana over the period 1955-2009. The study found evidence of significant effect of inflation on economic growth with and without structural break. Specifically, the evidence showed both a minimum and maximum inflation levels of 6% and 10% respectively. Moreover, the study found that adjusting for structural break in the model increases the effect of inflation on growth at a robust level of 10% by a factor of 1.8 or approximately 81%.He concluded by recommending to continue pursuing the inflation targeting framework by keeping inflation targets below 10% for beyond 10%, inflation can be detrimental to Ghana's growth prospects. Hasanov (2010) employed annual data set on growth rate of real GDP, Consumer Price Index Inflation and growth rate of real Gross Fixed Capital Formation to investigate whether there was any effect of inflation on economic growth over the period of 2001-2009. Estimated model indicated that there was non-linear relationship between inflation and economic growth in the Azerbaijani economy and level of inflation for GDP growth was 13 percent. Inflation rate lower than 13 percent reflected statistically significant positive effect on GDP growth but this positive relationship became negative when inflation exceeded 13 percent. He added that, economic growth was expected to decline by about 3 percent when inflation increased above the 13 percent. Umaru and Zubairu (2012) suggested that all the variables in the unit root model were stationary and the results of causality revealed that GDP caused inflation and not inflation causing GDP. The results also revealed that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. Mallik and Chowdhury (2013) found two results: First, the relationship between inflation and economic growth is positive and statistically significant for Bangladesh, Pakistan, India and Sri Lanka. Second, the sensitivity of growth to changes in inflation rates was smaller than that of inflation to changes in growth rates. The

policy implication of these results was the fact that although moderate inflation promotes economic growth, faster economic growth absorbs into inflation by overheating the economy. Frimpong and Oteng-Abayie (2010) found an effect of inflation on economic growth of 11 percent for Ghana over the period 1960-2008 though failing the test of significance at that level. They also estimated a robust 11 percent inflation level with close coefficients after dropping growth rate of aggregate labour force and money supply growth which were found to be insignificant in the OLS models. They further revealed that even at relatively lower levels, inflation is still significant. But their study however, failed to check for sensitivity of the estimated coefficients across sub-samples of the full sample period to establish a new evidence of the effect. Sergii (2014) found that growth - inflation interaction was strictly concave with some level of inflation. Inflation level is estimated using a non-linear least squares technique, and inference made by applying a bootstrap approach. The main findings were that inflation rate above 8 percent tend to slow down economic growth while below 8 percent promotes economic growth. Mwase, (2016) indicated that currency appreciation is associated with a decrease in inflation rate, with one quarter lag. Omoke and Ugwuanyi (2010) tested the relationship between money, inflation and output by employing co-integration and Granger-causality test analysis. The findings revealed no existence of a co-integrating vector in the series used. Money supply was seen to Granger cause both output and inflation. The result suggest that monetary stability can contribute towards price stability in Nigerian economy since the variation in price level is mainly caused by money supply and also conclude that inflation in Nigeria is too much extent a monetary phenomenon. They find empirical support in context of the money-price-output hypothesis for Nigerian economy. Udah (2009) studied the source of inflation and economic growth in Ethiopia using statistical analysis. According to him, between the year 2004 and 2008 the higher desires to spend and higher import price with slow growth of aggregate supply contributed to inflation in the country. He states that, inflation in Ethiopia is not a monetary phenomenon, and to him controlling money supply to reduce inflation will hinder growth of the economy. In addition to this, stopping the injection of money to the economy can't stop inflation due to high velocity of money caused by growth of financial institution and economic transaction in the economy. In part of the study he mentioned that, it is difficult to specify the exact relationship between

inflation and growth and one must study the structure of government spending and the nature of economic growth. Datta and Kumar (2014) stated that, there was an increase in broad money supply in Ethiopia and bank credit has been increased. From 2002 to 2006, Ethiopia's real GDP increased by 6.8 percent. Rather than adjusting the money stock with the change of GDP, the country's money supply grown by about 18 percent, contributing to an average 12 percent increase in the rate of inflation. He also argues that if a nation achieves full employment, it is possible to assume that economic growth is likely to precipitate an inflationary situation. However, Levine (2013) analyzed determinates of the recent soaring food inflation in Ethiopia and stated that, in Ethiopia food price accounts for the lion's share of the Consumer Price Index. This results in food price inflation necessitating general inflationary pressures in the economy both directly and indirectly. Moreover, food prices increased even faster than non-food items that made it the main contributor to high general inflation. Fekadu (2012) analyzed the relationship between inflation and economic growth in Ethiopia for the period 1980-2011.The Vector Auto regression (VAR) model showed that, an increase in economic growth decreases inflation whereas inflation does not have significant effect on economic growth in the short run. The Granger Causality test showed that, economic growth has forecasting power about inflation while inflation does not have predicting power about economic growth. The Co-integration test indicates that, there exist a long run relationship between economic growth and inflation in Ethiopia. Vector error correction estimates indicated that, economic growth significantly reduces inflation in short run while inflation does not have any significant effect on economic growth. Sims (2016) scrutinized the relationship between the money supply and the output of USA. This study found that the money supply helps in the interpretation of output and not the opposite. It means that there was causality relationship from the money supply to gross domestic product. Seoud and Abou (2015) examined the relationship between money supply and gross domestic product of Bahrain using the time series data for the periods of 2000 to 2013. In this study the ADF, the Engel Granger two steps co-integration test, the error correction mechanism were used to examine the relationship between the money supply and the gross domestic product. This study determined that the money supply and the gross domestic product were co-integrated at 1st difference level I(1). And the Granger causality test showed that there was unidirectional

relationship from the real gross domestic product to the money supply in the short run as well as the long run periods.Lashkarv and Kashani (2016) studied the impact of Monetary Variables on Economic Growth in Iran. To test the relationship between these variables, this study used time series data from the period of 1959 to 2008 support of the following variables such as employment, real economic growth, real money volume, real growth rate of government expenses, growth rate of oil revenues and exchange rates. In this study the OLS econometric technique was used to test the relationship between dependent and independent variables. Based on this analysis, this study found that the money volume was not significantly impact on economic growth of Iran. In the meantime, Nouri and Samimi (2016) examined the impact of monetary policy on economic growth in Iran. This study used annual time series data during the period of 1974 to 2008. To test the impact of monetary policy the econometric OLS method was employed. At last, this study explored that the money supply was positively impact on economic growth of Iran.Ogunmuyiwa and Francis (2015), explored the impact of money supply on economic growth on Nigerian economy. The time series data from 1980 to 2006 were utilized to test the impact of money supply. The money supply has positive impact on economic growth at 5% significant level. In this study the OLS econometric techniques was employed. In accordance with results, even though money supply affects positively on economic growth, but it has no significant impact on economic growth.Ikechukwu (2016) explored the impact of money supply on economic growth of Nigeria with the help of secondary data during the period of 1981 to 2010. This study used the following variables such as the real gross domestic product, the real exchange rate, the broad money supply, real interest rate to test the impact of money supply. Eventually, the above study delivered its conclusion that the all respective variables were insignificantly impact on the real gross domestic product except the money supply which was statistically significant on the economic growth of Nigeria. According to the above literatures, there are number of studies which were done internationally about the relationship between the money supply, inflation and economic growth. But in Nigerian context, there are no much related studies in this regard. This situation formulates the gap for this study regarding the relationship between the money supply, inflation and economic growth.

3. RESEARCH METHODOLOGY

The study employed multiple linear with Semi-log model relationships, Unit Root test, Co-integration test and ECM approaches.

3.1 Model Specification

The study adopted Mohamed (2016) and Moroney (2013) who specified the model as follows: GDP = F (RER, MS, RIR, IFR)… 1

We employed Semi-log in the model to bring the variables to equal weighting as some are in rate while some are in nominal values. Those in nominal values were logged.

Equation 1 is transformed into the following econometric model,

$LOGGDP_t = {}_0 + {}_1RER_t + {}_2LOGMS_t + {}_3RIR_t + {}_4IFR_t + \mu_t$ 2

Where;

LOGGDP = Log of Gross Domestic Product, RER = Real exchange Rate, LOGMS = Log of Broad money supply, RIR = Real interest rate, IFR = Inflation rate

$_0$= parameter constant, μ_t= error term, $_1$, $_2$, $_3$, $_4$ are estimates

In the above equation, LOGGDP (Log of Gross Domestic Product) is the dependent variable (endogenous variable) While RER (Real Exchange Rate), LOGMS (Log of Broad Money Supply), Real interest rate(RIR) and Inflation Rate (IFR) are the independent variables.

4. Presentation of Result

4.1 Unit Root Test Result

Unit root test is a test for stationarity of the variables using the augmented Dickey-Fuller (ADF) test with the null hypothesis (H_0): there is no unit root in the variables. The ADF results comprising of the t- statistics and 5% critical value are represented in the table below

Table 1a. Unit Root (ADF Test) at levels.

Variables	ADF Test	5% critical value	Order of integration	Remarks
LOGGDP	-2.144702	-3.544284	1 (0)	Not stationary
LOGMS	-3.141542	-3.568379	1 (0)	Not stationary
INFR	-2.768142	-3.595026	1 (0)	Not Stationary
RER	-1.842397	-3.515523	1 (0)	Not stationary
RIR	-6.156017	-3.552973	1 (0)	Stationary

Table 1a indicates that all the variables except RIR are not stationaryat level.

Tables 1b: Testing for Unit root at 1st difference form

Variables	ADF Test	5%critical value	Order of integration	Remarks
LOGGDP	-5.300491	-3.548490	1 (1)	Stationary
LOGMS	-3.564959	-3.515523	1 (1)	Stationary
INFR	-3.826533	-3.603202	1 (1)	Stationary
RER	-3.839432	-3.557759	1 (1)	Stationary
RIR	-6.156017	-3.552973	1 (0)	Stationary

Table 1b above shows that RIR is stationary at levels while LOGGDP, LOGMS, INFR and RER are stationary at first difference.

4.2 Co-integrationTest Result

Table 2: Unrestricted Co-integration rank test results (trace)

Table 3a: Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.665393	93.07518	69.81889	0.0002
At most 1 *	0.638382	55.85202	47.85613	0.0074
At most 2	0.326362	21.26839	29.79707	0.3411
At most 3	0.184200	7.836240	15.49471	0.4831
At most 4	0.026533	0.914323	3.841466	0.3390

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 2b: Unrestricted Cointegration rank test results (maximum eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.665393	37.22316	33.87687	0.0192
At most 1 *	0.638382	34.58363	27.58434	0.0054
At most 2	0.326362	13.43215	21.13162	0.4133
At most 3	0.184200	6.921917	14.26460	0.4984
At most 4	0.026533	0.914323	3.841466	0.3390

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 2a shows that the Trace statistic (93.07518) is greater than the critical value at 5% (69.81889) or probability values less than 0.05 and also indicating 2 co-integrations at 5% level of significance, thus, our variables are co-

integrated indicating a possible long run relationship. We proceed to estimate the error correction model.

Table 2b equally shows that the Max-Eigen statistic (37.22316) is greater than the critical value (33.87687) at 5% level of significance and also indicating 2 co-integrating vectors. This shows that our variables are co-integrated. We proceeded to estimate the error correction model.

4.3 Error Correction Model (ECM)

Table 3. ErrorCorrection Analysis Result

Variables	Coefficient	Stderror	t- statistics	Prob
D(LOGMS)	0.459879	0.269480	4.706669	0.0098
D(INFR)	-0.00183	0.001877	-7.97824	0.0007
D(RER)	0.000355	0.000389	0.912681	0.3698
D(RIR)	-0.00413	0.001310	-3.41651	0.0021
C	0.113673	0.064909	3.751250	0.0017
ECM(-1)	-0.226559	0.115077	-2.96876	0.0097

Given the result of the co-integration test which reveals the existence of co-integration among variables, error correction is considered appropriate for the analysis. The error correction analysis shows that there is a positive relationship between broad money supply, real exchange rate, and economic growth in Nigeria, while negative relationships exist between inflation, real interest rate and economic growth. The coefficient of the ECM (-1) in Table 3 indicates that 22.6% of the disequilibrium in the model will be corrected annually. In other words, 22.6% of disequilibrium in the short run will be corrected in the long run. The speed of adjustment indicates that the model will converge completely to its equilibrium system in 4.2 years.

5. CONCLUSION

The study examined the long-run equilibrium relationship between inflation, money supply on economic growth in Nigeria. The ECM model and Co-integration test were used and five variables such as of economic growth, broad money supply, inflation, real exchange rate and real interest rate were used for the study. The variables were tested for unit root using the Augmented

Dickey-Fuller approach and were found to be stationary at levels and first difference. The co-integration and error correction mechanism were carried and the findings were: Broad money supply has positive and significant impact on economic growth. This implies that when central bank increases money supply with inflation checking, it will in turn lead to increase in economic growth in Nigeria. Inflation has a negative impact on economic growth in Nigeria. This implies that an increase in inflation will lead to a decrease in economic growth and also the result shows that it is statistically significant. Real exchange rate has a positive and significant impact on economic growth in Nigeria. The co-integration test reveals the existence of co-integration among variables; this implies that there is a long-run relationship between the variables in the model. The coefficient of ECM indicates that about 22.6% of disequilibrium in the short-run will be corrected in the long-run. The speed of adjustment indicates that the model will converge completely to its equilibrium system in 4.2years.The study recommends that Government through its monetary policy should maintain the price stability by controlling the growth of money supply in the economy. Effort should be made to enhance a policy that will encourage money supply in order to boost the economic growth of Nigerian; this is a result of its positive and significant impact in economic growth.

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