

ANALYSIS OF THE INFLUENCE OF INTEREST RATE ON MONEY SUPPLY AND INVESTMENT IN NIGERIA: A VECTOR ERROR CORRECTION MODEL (VECM) APPROACH

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ABSTRACT

The research analyzed the influence of interest rate on money supply and investment in Nigeria. It specifically analyzed the influence of working capital, return on investment, earning per share and gross operating profit on interest rate in Nigeria. Data was extracted from the Annual financial report of a manufacturing company using both descriptive research method and covariance while Autoregressive Distributed Lag Model (ARDL) and Vector Error Correction Model (VECM) were used to analyze the relationship which exist among the variables. The result of the findings showed that there is cointegration which implies aa long run relationship among the variables. The result revealed that Earning Per Share (EPS) had no significant impact on interest rate manufacturing firms in Nigeria. Furthermore, the result depicted that gross operating profit has a significant and positive impact on interest rate of manufacturing firms in Nigeria. The research recommends that financial managers increase their money supply and ensure that it is properly managed in order to enhance their investment, thus strengthening firm profitability. Furthermore, we suggest that financial managers should increase investment in working capital to accelerate their productivity so that they can also improve the profitability of the firms.

Keywords: Interest Rate, Money Supply, Investment, Gross Operating Profit, Nigeria

INTRODUCTION

In common debate, interest can be defined as the extra payment made by a borrower to the lender for the money borrowed and is shown as a percentage rate per a particular period of time, sometimes in a year. Keynes (1997) sees interest as a completely monetary observable fact, payment for the use of money. It is the reward of parting with liquidity of money. The neo-classical economies therefore, defined it as the price for the use of loanable funds. But the modern economics in their effort to avoid these divergent and controversial views about the nature of interest have explained it in terms of productivity, savings, liquidity preference and money.

One of the basic determinants of the rate of interest is the rate of marginal return over cost or the investment opportunity principle. The rate of return over cost depends upon the extent to which an income stream might be shifted by changes in capital utilization. According to Effa and Khalid (2011) if an individual has two investment opportunities before him in the form of two income streams that can be substituted for each other, 'cost' implies the laws of withdrawing one income stream and 'return' is the gain from substituting one income stream for another. The rate of return over cost is that discount rate at which the net values of the two investment opportunities are equalize. The ranking of investment opportunities, according to Fisher, depends on the rate of interest an investment opportunity may have a higher present value at a particular interest rate than any another. So, if the rate of return over cost in case of one opportunity is higher than the market rate of interest, it will be accepted and the other opportunity will be rejected. (Blanchard & Kahn, 1980).

Ravenna, and Walsh, (2005) believes that Interest rate favors the investors when the interest rate is low. The major factor that determines investment is interest rate and this is influenced by savings. The investors will also be favored when the marginal efficiency of capital is high. Marginal efficiency is defined as the expected rate of returns from additional unit of capital asset. It refers to the expected rate of profit per year on real investment of the most efficient type; it depends upon the entrepreneur expectation of future return. However, there will be no investment of profit expectation which is not very bright; this is the reason why investment falls to a low level during a depression despite all the encouragement to stimulate private investment (Brennan, Chordia & Subrahmanyam, 1998).

The term "Money supply" in an economy is not just coins and note in circulations; in fact, many millions of transactions take place without a coin or note being exchanged. Economists have for years seen a relationship between the money supply and the real exchange rate in an economy. Money is said to be any asset which performs the functions of money, but in actual practice, there are many financial assets which perform these functions to a greater or lesser degree and this makes it difficult to measure empirically the magnitude of money

(Obstfeld & Rogoff, 1996)

According to Amihud (2002), money supply is the total amount of money (e.g. currency and demand deposits) in circulation in a country at any given time. Currency in circulation is made up of coins and notes, while demand deposits or current account are those obligations which are not related with any interest payment and accepted by the public as a means of exchange drawn without notice by means of cheques.

Statement of the Problem

The relationship between interest rate and investment and money supply in the economy of developing countries like Nigeria has been one of the major concerns to many economist and analysts. The policy of interest rate in developing countries seems to have been backed by the McKinnon-Shaw financial intermediation hypothesis which postulates that interest rates have a positive response to investment, money supply and economic growth (Ariff, Farrar., & Khalid, (2012).

The issue of interest rate on investment and money supply is certainly not new but their implications in Nigeria has had mixed results in both developing and developed countries. We all know that for any economy to be rated as a developed nation such nation requires high level investment. This means that for a developing nation to be developed, it is expected of the developing nation to exhibit a higher-level investment. The evaluation of the impact of interest rates on investment and money supply in Nigeria is very important because it will provide useful information on which of the macro-economic variables will be used to monitor the level of the economy through investment and money supply.

Previous studies on this topic focus more on the relationship between interest rate and investment and economic growth. There is a dearth of research on the relationship between interest investment and monetary policy. This has informed the need to embark on the present study with a view to examining the impact of interest rate on monetary policy and investment in Nigeria.

Thus, this research work attempts to investigate the short and long-run effect of interest rate on investment and money supply in Nigeria using co-integration and error correction model to identify and breach the gap in knowledge inherent in other previous studies

LITERATURE REVIEW

Interest Rate

According to Monnet and Weber, (2001) Interest rate has gained considerable attention from economists, lenders, and borrowers alike, as it has to a large extent played a very important role in the economy. Interest rate facilitates the flow of funds from lenders to borrowers. It is

the cost of borrowing and shows what a borrower pays to the lender for the use of money. Interest rate aids the flow of credit in the economy and helps financial entities such as corporate organization, banks, mutual funds and insurance companies carry out their intermediation role. In other words, the economic activity in any economy, to a large extent, is influenced by interest rate. Interest rate affects the demand for and allocation of available loanable funds. It also affects the level of consumption, and the level and pattern of investment. Luca, (1982) believes that high interest rate discourages borrowing and encourages thereby slowing down the economy. Low interest rate, on the other hand, encourage borrowing and economic growth in that the lower the interest rate, the higher the profit expectation (other things being equal) as businesses are expected to pay small portion of their income as interest for fund borrowed. Conversely, the higher the interest rate, the lower the profit margins. (Evans and Honkapohja, 2003)

In Gavin, Keen, and Pakko, (2004) submission on Interest rate in today's world, exchange of goods and services is done with the use of money. People usually save whatever money is left after the purchase of goods and services which could be used for investment in the economy. To facilitate this process, a price is put on the use of such money which is always referred to as interest rate. Generally, interest rate can either be thought of as the costs of borrowing money or the returns from lending money, depending on one's perspective. (Collard F., and H. Dellas, 1999). In either case, interest rate reflects the time value of money, or the principle that people generally would rather have money today use of monetary policy, national central banks attempt to adjust their bases of interest rate and available banking money reserves to control the rate of lending by banks within their economies (Rudebusch, 2002). The theory is that when there is more, or cheaper, money perceived to be available in the economy through bank loans and other types of credit, consumers and businesses will spend more, sellers of goods and services will adjust prices upward, and inflation can accelerate. (Carpenter & Demiralp, 2006)

Conversely, when there is less, or more expensive, money available, consumers and businesses will restrict their spending, prices will fall, and inflation will decelerate. Thus, if central banks want to curb inflation, they will raise interest rates; and if they want to induce spending and economic activity, they will lower interest rates. (Carpenter & Demiralp, 2006). The term structure of interest rate is the relationship between interest rate or bond yields and different terms or maturities. In other word, it is commonly known as yield curve, which depicts the interest rate of similarly quality bonds at different maturities (Minford, Perugini & Srinivasan, 2002)

Factors which Cause Variations in the Interest Rate Structure

There are many factors that are responsible for the variation in the structure of interest rate. These factors include the following:

Inflation Rate

Inflation can be defined as a general rise in overall price level. Criffiths, defined inflation as a condition of generalized excess of demand of stocks of goods and flows of real income, a rise in per capital income of stocks of flow of money income. There is a need to distinguish between the normal interest rate and the real interest rate in order to understand how the rate of inflation affects the level of interest rate. Where the normal interest rate is straightforward rate, for example, 10%, the real interest rate is the nominal rate adjusted for the expected rate of inflation. If inflation rate is expected to exceed the level of interest during the period of the loan, the real rate to the lender becomes negative. Therefore, during the period of rapidly rising inflation, lender expects a normal rate, which exceeds the expected inflationary rate (Monnet & Weber, 2001).

The Fluctuations in the Supply and Demand for Funds

There are different stages of the business cycle offering different columns of supply and demand for funds. For instance, when the economy is on the peak stage (during boom) the demand for fund tend to be greater than the supply of funds and thus raise interest rates on the other hand, when the economy is declining the level of interest rate falls as a result of slump in business activities because expected returns may not be enough to offset the cost of capital (Sargent & Smith, 1987).

Government Intervention

The government controls the rate of interest through the Central Bank. If the money supply is reduced, interest rate will rise. The government does this by selling securities ad in effect; controlling the rate on securities it wants to sell sufficiently so that the public is attracted to purchase them quickly, this section government raises interest rate (Clarida,Galí, & Gertler, 2000)

Market Expectations

This also plays a role in causing the structure of the rate of interest to vary. When inflation rate increases, it will raise the rate of interest and if market expectation in that inflation rate is reduced and that a relaxed monetary control is in the pipeline, the interest rate will fall because of the speculation (Clower, 1967).

Investment

According to McCallum, (1999) Investment is to allocate money in the expectation of some benefit in the future. In simple terms, according to Gaurav Akrani investment refers to purchase of financial assets. While investment goods are those goods, which are used for further production. Investment implies the production of new capital goods, plants and equipment's. The usage of the word investment by economist is different from the common

everyday usage. When people say that they are making investment, they are normally referring to purchase of a common stock or a bond. This usage differs from that of an economist because these purchases do not involve an increase in demand for newly produced goods and services. When economist speaks of investment spending, they are referring to the purchase of new physical assets such as a new machine or a new house, purchase that do add to aggregate demand (Alvarez, Atkeson, & Kehoe, 2002).

In an economic sense therefore, investment is demanded for the following purposes; for the business to buy new premises, machinery and to raise the fund to finance increased manufacturing capacity, for public sector to carry out public works such as building new or reconstruction of houses, roads, schools and hospitals etc, for individual to buy or improve existing houses, or other fixed assets and for banks, Invest the customers' deposits to the other projects like investing in another bank for profit (Mwega, Ngola, and Mwangi, 1990). Thus, investment brings about increase in a country's productive capacity and raises the standard of living of the people. The processes of savings and investment play central roles in the circular flow of income and in determining the level of income (Soyibo & Adekanye, 1992).

Recall that investment depends on both output and interest rate, investment is a function of output and interest rate. On one hand if output goes up, it leads to an increase in investment and vice versa but on the other hand if interest rate goes up, it leads to decrease in investment and vice versa. The ambiguity has to do with initial reaction, depending on which of these two events dominate; investment can go up or down (Alvarez, Atkeson, & Kehoe, 2002).

Money Supply

Money supply refers to the total stock of monetary media of exchange available to a society for use in connection with the economic activity of the country (Badarudin, Ariff, and Khalid, 2012). According to the standard concept of money supply, it is composed of the following two elements: Currency with the Public and Demand deposits with the Public. Two things must be noted with regard to the money supply in the economy. First, the money supply refers to the total sum of money available to the public in the economy at a point of time. That is, money supply is a stock concept in sharp contrast to the national income which is a flow representing the value of goods and services produced per unit of time, usually taken as a year secondly, money supply always refers to the amount of money held by the public (Alvarez, Atkeson, & Kehoe, 2002).

CONCEPTUAL/LITERATURE REVIEW

Theories of Interest Rate

Several theories explained why interest is paid. The theories of interest can be divided into

two; the monetary theories and the non-monetary theories. The monetary theories are those theories of interest that stress the liquidity aspect of money, while the non-monetary theories of interest are those theories which give consideration to savings and productivity aspect of money. However, for the purpose of this study, we shall examine the three theories of interest rate; the classical or loanable funds theory, the liquidity performance theory (The Keynesian approach), the general equilibrium approach (Brunner, 1961).

The Monetarist Theory of Business Cycles

Monetarism is a school of thought in monetary economics led by Milton Friedman. This school of thought is a modern variant of classical macroeconomics. They developed a subtler and relevant version of the quantity theory of money. The monetarist theory is an economic concept which contends that changes in the money supply is the most significant determinants of the rate of economic growth and the behavior of the business cycle. A different explanation of occurrence of business cycles has been propounded by Friedman and Schwartz of Chicago University. They argue that instability in growth of money supply is the source of most cyclical fluctuations in economic activity. Therefore, their theory is called monetarist theory of business cycles. Friedman and his followers consider the free market economy as being inherently stable. According to them, it is the exogenous money shocks (i.e. money supply changes) that affect aggregate demand which in turn causes cyclical changes in output and employment in the economy (Badarudin, Ariff, & Khalid, 2012).

Thus, in the short-run, monetarists argue that expansionary monetary policies may increase the level of real GDP by increasing aggregate demand. However, in the long-run, when the economy is operating at the full employment level, they argue that the quantity theory remains a good approximation of the link between the supply of money, price level, and the real GDP. Also, in the long-run expansionary monetary policy only lead to inflation and do not affect the level of real GDP. (Brennan., Chordia, & Subrahmanyam, 1998)

The Quantity Theory

The quantity theory was first developed by Irving Fisher in the inter-war years and is a basic theoretical explanation for the link between money and the general price level (Geoff, 2012). Irving Fisher (1932), in his quantity theory of money, opine that like other classical writers the short-run monetary control was dictated by interest rates which were sticky but in the long-run the demand of influence was real cash balance. Fisher further assumed that the rise in commodity prices would precedes the increased in interest rate which was regarded as main channel of the firm's operation cost (Jelilov, 2016).

Empirical Review

The empirical works of this study were carried out in determining the economic implications

of interest rate on investment and money supply among other economic variables in Nigeria.

Osuji Obinna (2020) examined the impact of interest rate liberalization on investment in Nigeria from 1961 to 2017 using error correction model and variance decomposition of vector autoregressive model. The empirical findings of the study showed that interest rate liberalization has no significant impact on investment in Nigeria.

Inimino et al (2018) examined interest rate and domestic private investment in Nigeria from 1980 to 2015. The Augmented Dickey-Fuller test and Autoregressive Distributed Lag model were used as the main analytical tools. The ADF unit test result revealed stationarity of the variables at order zero and one, which satisfied the requirement to employ the ARDL Bounds testing approach. The ARDL Bounds test revealed the existence of a long run relationship among the variables.

Chioma and Anokwuru (2017) examined the impact of interest rates on Private Domestic Investment in Nigeria from the period of 1980 to 2015. To determine the relationship among the variables employed in the study, Ordinary Least Square Regression was adopted. Gross Domestic Product (GDP) served as the dependent variable while the Real Interest Rates and Prime Lending Rates were the independent variables. The results from the study showed that the Real and Prime Lending Rates are negatively related to Private Domestic Investment and statistically significant at 5% level. The coefficient of determination showed that only 23% of the variation in the private domestic investment was accounted for by interest rates. This shows that the predictive power of the model is very weak. This study comes to a final decision that the success of promoting the Private Domestic Investment does not rely only on interest rates though it should not be overlooked.

Fatoumata (2017) examined the impact of interest rate on economic growth in Nigeria from the period of 1990 to 2013. The result from the study found out that the interest rate has a slight impact on growth; nevertheless, the growth can be improved by keeping the interest rate at a low rate which will make investment increase, because of the inverse relationship between interest rate and investment. Due to findings of this study, it was found out that Nigerian authorities should set interest rate policies that will boost the economic growth. Consequently, suitable measure should be taken in order to have a more rapid economic growth.

Adigwe et al (2015) examined the impact of monetary policy on the Nigerian economy. To analyze the data from the period of 1980 to 2010, the Ordinary Least Square Method (OLS) is used. The result of the analysis indicates that monetary policy represented by money supply exerts a positive impact on Gross Domestic Product (GDP) growth but negative impact on the rate of inflation. The recommendations are that monetary policy should facilitate a favorable investment climate through appropriate interest rates, exchange rate and liquidity

management mechanism and the money market should provide more financial instruments that satisfy the requirements of the ever-green sophistication of operators.

Davis et al. (2015) examined the impact of interest rate on investment in Nigeria from the period of 1986 to 2012. Multiple regressions were used as the statistical method for the study which reveals that high interest rate negatively affects investment.

Makinde (2015) examined the Impact of Monetary Policy on Private Capital Formation in Nigeria. Secondary data sourced from the Central Bank of Nigeria Statistical Bulletin from the period of 1986 to 2013 was making use of by the study. The Ordinary Least Square Multiple regression technique was used side by side with R² goodness of fit test, F-statistics and the Durbin-Watson tests. The result revealed that the GDP growth rate has not been attracting significant private investment given the period of study; implying that the GDP has been growing at a level not sufficient to be able to attract private investment in the economy. Likewise, the money supply and the exchange rate have been relatively stable to also elicit increase in private investment which has in turn and to an extent promote sustainable economic growth in the country through private investment.

Okezie (2015) examined the relationship between Nigeria expansionary monetary policy (money supply) and investment growth (gross fixed capital formation), using time series data from the period of 1970 to 2012, obtained from the Central Bank of Nigeria statistical bulletin and the West African Institute for Financial and Economic Management data base. It employs the Engle-Granger two step modeling (EGM) procedure to co-integration based on unrestricted Error Correction Model and Pair wise Granger Causality tests. The result of the study shows that money supply and gross fixed capital formation are co-integrated in this study.

Identified Knowledge Gap

Judging by the foregoing, it can be seen that so many studies have been carried out related to the study at hand, But it is to be noted that most studies sees interest rate and money supply as a means (Independent variable) rather than an end (Dependent variable) and practically few to none have actively combined the selected variables for this study, and majority of scholars usually consider investment as a predictor rather than a criterion variable, and this study shall eliminates the need to develop explicit economic models by imposing prior restrictions thus this study intends to put the viability of this to assist researchers and add to the dearth of knowledge in this area.

METHODOLOGY

Along with other economists and policymakers, many scholars have examined interest rate as a key factor of investment while the others postulate interest rate as the key determinant

to money supply. The monetary theory of business cycle link changes on interest rate and money supply conditions to investment, with a unit increase in money supply increases the aggregate price level. The interest rate theory consider money supply a more effective instrument of economic equilibrium than fiscal policy. Keynesian economists link inflation to demand factors of any investment (working capital + investment + productivity) over aggregate supply with a unit increase in wages and prices of products.

Model Specification

To examine if interest rate is the determinant of money supply and investment in Nigeria. The following mathematical model was developed to analyse the relationship between interest rate, money supply and investment in Nigeria using Working Capital (WCP), Return on Investment (ROI), Earning per Share (EPS) and Gross Operating Profit (GOP) as the explanatory variables and regressed against the dependent variables and also to see how it affected Interest Rate (INTR) positively.

This study employed the model specified below.

$INTR f(WCP, ROI, EPS, GOP) \dots\dots\dots (1)$

Where;

- INTR = Real Interest Rate
- WCP = Working Capital
- ROI= Return on Investment
- EPS = Earnings Per Share
- GOP=Gross Operating Profit
- f = functional relationship

Estimation Technique

The econometric techniques employed in estimating and reflect the influence of money supply and investment in this study are Autoregressive Distributed Lag Model (ARDL) and Vector Error Correction Model (VECM) while co-integration was used to analyze the relationship which exist among the variables which were clearly explained through descriptive method. The ARDL reflected reliable and vigorous results both for the long-run and short-run relationship between the variables of the model. The data's stochastic properties through the descriptive statistics and unit root tests were performed to know if the series were stationary or not. The lag selection test was also done to determine the appropriate lag length for the analysis.

Data Description and Sources

To approximate the concerned models and examine the statistical significance of the

variables that relate to interest rate, money supply and investment. This study covers the period of 1992 – 2018. The variables under consideration are: Real Interest rate (INTR) which is the dependent variables Working Capital (WCP), Return on Investment (ROI), Earning per Share (EPS) and Gross Operating Profit (GOP) The variables are obtained from the Annual financial report of a manufacturing company.

DATA ANALYSIS AND RESULTS

Descriptive statistics and Covariance Estimate

The descriptive statistics on Table 1 revealed the average values of the Interest Rate (INTR), Working Capital (WCP), Return on Investment (ROI), Earning per Share (EPS) and Gross Operating Profit (GOP) are 17.552, 10.322, 23.937, 6.442 and 7.393 respectively. The standard deviation shows that Earning Per Share (EPS) and Gross Operating Profit (GOP) are the most volatile variables with 1.836 and 1.734 respectively while Working Capital (WCP) is the least volatile of the variables with 0.394. Furthermore, the table revealed that the skewness statistics of Earning Per Share (EPS) and Gross Operating Profit (GOP) are negatively skewed while other variables are positively skewed. The Kurtosis statistics showed that Interest Rate (INTR) is leptokurtic, which implies that the distributions are peaked relative to normal distribution, while other variables are mesokurtic, implying that the variables have normal distribution that is the distribution of the variables is bell shaped. Lastly, the Jarque-Bera statistic for the null hypothesis of normal distribution for all the variables except Interest Rate (INTR) cannot be rejected at 5% significant level as they are not significant at 5% confidence level.

Table 1: Descriptive Statistics table

Variables	LOG(CRP)	LOG(REV)	LOG(MKS)	LOG(PFT)	LOG(CFL)
Mean	17.55237	10.32272	23.93714	6.441615	7.392524
Std. Dev.	0.393868	0.506179	0.655904	1.835596	1.73353
Skewness	2.614934	0.327195	0.506351	-0.54352	-0.37433
Kurtosis	12.90374	1.642651	1.837723	2.037056	2.188385
Jarque-Bera	162.021	2.932887	3.069588	2.72404	1.574826
Probability	0.00000	0.230745	0.2155	0.256143	0.45502
Observations	31	31	31	31	31

Source: Authors' Computation (2020)

Unit Root Test

This study adopted Augmented Dickey-Fuller test to investigate the stationarity of the variables. The results of the unit root test presented in Table 2 revealed that INTR and EPS were stationary at the level $I(0)$, while ROI, WCP and GOP were stationary at the first

difference $I(1)$. Based on the mix order of integration in the result this study will use Auto-regressive Distributed Lag Bound co-integration technique because it is the estimation technique that accommodates mixed order of integration.

Table 2: Augmented Dickey-Fuller test

Variables	Level	After Differencing	Status
LOG(CRP)	-7.877	-124.193	I(0)
LOG((RVN)	-0.551	-3.929	I(1)
LOG(MKS)	-1.788	-4.851	I(1)
LOG(PFT)	-4.438	-6.938	I(0)
LOG(CFL)	-2.205	-4.149	I(1)

Source: Authors' Computation (2020)

Co-integration Estimate

Table 3 below displayed the Bound Co-integration test and it revealed that the value of the F-statistics which is 7.44284 is greater than both the upper and lower bound critical value at 5%, which implies that there is presence of co-integration among the variables in the model.

Table 3: ARDL Bound Co-integration Test

Estimated Model	F-Statistics	
5.33621		
Critical Values	Lower Bound	Upper Bound
1%	3.29	3.49
5%	2.56	4.37

Source: Author's computation (2020)

Regression Estimates on Influence of Interest Rate on Money Supply and Investment in Nigeria.

Table 4 below showed the ARDLECM and it revealed that interest rate has a positive significant impact on money supply and investment in Nigeria. This implies that in every investment that yield progressive interest rate there is strong tendency that investors will be willing to inject more working capital on the investment to gear up their productivity and anticipate for more return on their investment and also earn more shares which will enhance them the more sense of belonging in the investment through the gross operating profit of the firms. This finding conforms to the apriori expectation and in tandem with the study of Cooper, (2016).

Also, the result revealed that Earning Per Share (EPS) had no significant impact on interest

rate manufacturing firms in Nigeria. This is in contract to the findings of . Dhakal, Kandil,& Sharma, (2013) who found a positive impact.

Furthermore, the result depicted that gross operating profit had a significant and positive impact on interest rate of manufacturing firms in Nigeria. This implies that there is a strong indication that when some investors realise that some certain investments yield lots of interest with less risk and fraudulent free, investors will go extra mile to source for more fund and inject it to the investments to maximise their interest rate. This conform to the apriori expectation and in tandem with the findings of Cagan, (2012).

Gross operating profit also had a positive and significant impact on interest rate of manufacturing firms in Nigeria. This implies that the higher the gross operating profit the higher the interest rate of manufacturing firms in Nigeria and it confirm to the apriori expectation.

In addition, the table below displayed the Error Correction Mechanism results which revealed the level of adjustment within the model. The result showed that the ECM term is negative and significant at 5% confidence level. The coefficient which is -0.4139 indicates that 41.39 percent of disequilibrium in the previous year in interest rate of manufacturing firms in Nigeria is been corrected by Real Interest Rate (INTR), Working Capital (WCP), Return on Investment (ROI) and Earning Per Share (EPS). The ECM result also revealed the speed at which the model adjusts back to equilibrium.

Lastly, the coefficient of multiple determinations (R-squared) revealed that 98.6 per cent of variation in interest rate is jointly explained by the independent variables while the remaining 1.4 per cent of the variations in the interest rate is explained by variables not included in the model. This implies that the variables employed in the model are suitable for the analysis.

Table 4: ARDELECM Regression

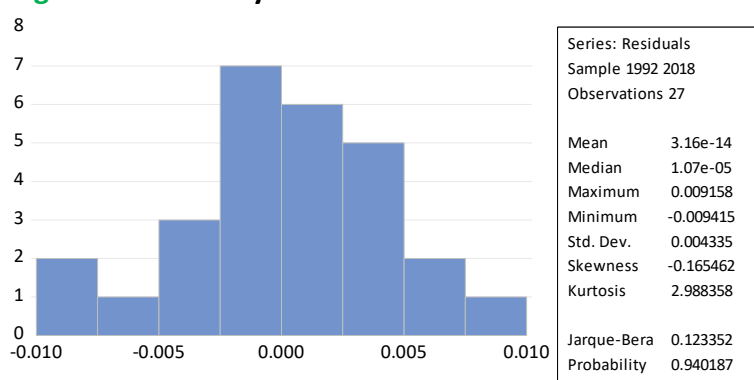
Variables	Coefficients	Std. Error	t-Statistics	Prob.
DLOG(RVN)	1.339	0.214	6.253	0.008
DLOG(MKS)	-0.012	0.017	-0.689	0.540
DLOG(PFT)	0.067	0.017	4.005	0.002
DLOG(CFL)	0.015	0.022	4.626	0.019
Coint-Eq(-1)*	-0.4139	0.038	-10.913	0.002
R-squared: 0.7612			Adjusted R-Squared:	
			0.956	
Log likelihood: 109.104			Durbin-Watson Stat.	
			2.877	

Source: Authors' computation (2020)

Diagnostics Tests

Diagnostics tests are conducted to determine the appropriateness and robustness of the estimate. This study conducted Breuch-Godfrey Serial Correlation LM and heteroskedasticity ARCH tests. The results of the normality test indicated that the Jarque-Bera probability value was greater than 0.05 confidence level indicating that the residuals from model were normally distributed. Also, Breusch-Godfrey Serial heteroskedasticity ARCH tests showed that the residuals are Homoskedasticity. Furthermore, Breuch-Godfrey Serial Correlation LM revealed that there is no serial correlation in the estimates. Lastly, Ramsey RESET Test indicated that is appropriate and free from error.

Figure 1: Normality Test



Source: Authors' computation (2020)

Figure 1 shows a line graph for the variables under consideration. Interest rate was at the lowest point in 0.010 while its highest point was in 0.000. Probability had its figure on 0.940187 which is a clear indication of positive influence among the variables. Interest Rate was relatively stable within the period of study. Return on Investment was always on the increase, with the highest value in 2018 and Working Capital was stable during the period under consideration

Table 5: Diagnostics Tests

Heteroskedasticity Test:		F-Statistics	Prob.	F(23,3)
Breusch-Godfrey Serial		1.744	0.362	
Breusch-Godfrey Serial correlation test	F-Statistics	Prob.	F(2,1)	
	1.858	0.4605		
Ramsey RESET Test		F-Statistics	Prob.	F(1,16)
		1.313	0.370	

Source: Authors' computation (2020)

CONCLUSION AND POLICY RECOMMENDATION

This study investigated the effect of working capital management on profitability in manufacturing firms in Nigeria between the periods of 1988 and 2019. Based on the mixed level of stationarity of the variables as revealed by the unit root test, the study made use of auto-regressive distributed lag (ARDL) technique to analysis the data. The bound test showed that the variables co-integrate consequently the study estimated the ARDLECM. The result of the finding on the analysis of interest rate on money supply affect the monetarist theory of business cycle through working capital and by extension of theory of interest rate effect on return on investment on earnings per share. Before testing these two, one needs to test that the money supply is in conforms to the endo genous quantity theory of money supply. The test of interest rate theory effect returns on investment and earning per share is an example of possible reason to effect of investment. The literature of money supply and investment which their variables are transform to ensure there is no spurious parameter estimates as an improvement to prior studies. The result on this study are very useful with new finding on money supply and investment. The result showed that Interest rate had positive influence on Working Capital (WCP), Return on Investment (ROI), Earning per Share (EPS) of manufacturing firms in Nigeria while Gross Operating Profit had no significant impact. The findings of this study is in tandem with monetarist theory of business cycle, Shrivastava et al. (2017), Altaf & Shah (2017), Afrifa et al. (2014) and Gill et al. (2010). This implies that interest rates positively influence money supply and investment of manufacturing firms in Nigeria. Consequently, the study recommends that manufacturing firms should ensure that they have sufficient money supply such as Working Capital (WCP), Gross Operating Profit (GOP) at every point in time to maximize their interest rate.

we recommend that financial managers increase their money supply and ensure that it is properly managed in order to enhance their investment, thus strengthening firm profitability. Furthermore, we suggest that financial managers should increase investment in working capital to accelerate their productivity so that they can also improve the profitability of the firms. Financial managers should strive to achieve an optimal working capital which balances costs and benefits, while maximizing profitability, and by default, shareholder wealth. Limitations of this study are that it relied on only one measure of investment, the return on investment; giving the findings limited generalizability and comparability to other studies that have applied other measures such as gross operating profit or earning per share for example. However, future research could consider a comparison of other industrial sectors to assess the effect of interest rate as a determinants of money supply and investment by extending the dependent variables to include different measures of gross operating profit

REFERENCES

- Alvarez, F., Atkeson, A. & Kehoe, P.J. (2002). Money, Interest Rates, and Exchange Rates with Endogenously Segmented Markets. *Journal of Political Economy* 110, 731-12.
- Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time series effects. *Journal of Financial Markets*, 5, 31–56. Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, 17, 223–249.
- Ariff, M., Farrar, J., & Khalid, A. M. (Eds.). (2012). *Regulatory failure and global financial crisis*. UK and USA: Edward Elgar Ltd.
- Auray, S. & Feve, P. (2003). *Money Growth and Interest Rate Rules: Is There an Observational Equivalence?* University of Toulouse.
- Badarudin, E., Ariff, M., & Khalid, A. (2012). (in press). Exogenous or endogenous money supply: Evidence from Australia. *Singapore Economic Review* 57.
- Benhabib, J., Schmitt-Grohé, S. & Uribe, M. (2001). Monetary Policy and Multiple Equilibria. *American Economic Review* 91, 167-185.
- Blanchard, O.J. & Kahn, C.M. (1980). The Solution of Linear Difference Models under Rational Expectations. *Econometrica* 48, 1305-1313.
- Brennan, M. J., Chordia, T., & Subrahmanyam, A. (1998). Alternative factor specifications, security characteristics and the cross-section of expected stock returns. *Journal of Financial Economics*, 49, 345–373.
- Bryant, R. C., Holtham, G., & Hooper, P. (1988). Consensus and diversity in the model simulations. In R. C. Bryant, D. W. Henderson, G. Holtham, P. Hooper, & S. A. Symansky (Eds.), *Empirical macroeconomics for interdependent economies* (pp. 27–62). Washington, D.C.: The Brookings Institution.
- Cagan, P. (1972). *Channels of monetary effects on interest rates*. New York, New York, USA: Columbia University Press.
- Cagan, P., & Gandolfi, A. (1969). The lag in monetary policy as implied by the time pattern of monetary effects on interest rates. *American Economic Review*, 59(2), 277–284.
- Calvo, G. (1983). Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics* 12, 383-398.
- Carlstrom C.T. & Fuerst, T.S. (2001). Timing and Real Indeterminacy in Monetary Models. *Journal of Monetary Economics* 47, 285-298.
- Christiano, L.J., Eichenbaum, M. & Evans, C. (2001). Nominal Rigidities and the Dynamic Effect of a Shock to Monetary Policy, Federal Reserve Bank of Cleveland, Working

Paper 107.

Clarida, R., Galí, J. & Gertler, M. (1999). The Science of Monetary Policy: A New Keynesian Perspective. *Journal of Economic Literature* 37, 1661-1707.

Clarida, R., Galí, J. & Gertler, M. (2000), Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. *Quarterly Journal of Economics* 115, 147-180.

Clower, R.W. (1967). A Reconsideration of the Micro foundations of Monetary Theory. *Western Economic Journal* 6, 1-8.

Collard F. & Dellas, H. (2005). Poole in the New Keynesian Model. *European Economic Review* 49, 887-907.

Evans, G.W. & Honkapohja, S. (2003). *Friedman's Money Supply Rule vs. Optimal Interest Rate Rule*. University of Oregon.

Gavin W.T., Keen, B.D. & Pakko, M.R. (2004). The Monetary Instrument Matters, Federal Reserve Bank of St. Louis, Working Paper 2004-026a.

Ireland, P.N. (2004). Technology Shocks in the New Keynesian Model. *Review of Economics and Statistics* 86, 923-936.

Lucas Jr., R.E. (1982). Interest Rates and Currency Prices in a Two-Country World. *Journal of Monetary Economics* 10, 335-359.

Lucas Jr., R.E. (2000). Inflation and Welfare. *Econometrica* 68, 247-274.

McCallum, B.T. (1983). On Non-Uniqueness in Rational Expectations Models: An Attempt at Perspective. *Journal of Monetary Economics* 11, 139-168.

McCallum, B.T. (1999). The Role of the Minimal State Variable Criterion in Rational Expectations Models. *International Tax and Public Finance* 6, 621-639.

Minford, P., Perugini F. & Srinivasan, N. (2002), Are Interest Rate Regressions Evidence for a Taylor rule? *Economics Letters* 76, 145-150.

Monnet, C. & Weber, W.E. (2001). Money and Interest Rates. *Federal Reserve Bank of Minneapolis Quarterly Review* 25, 2-13.

Obstfeld, M. & Rogoff, K. (1996). *Foundations of International Macroeconomics*. Cambridge, Massachusetts: The MIT Press.

Ravenna, F. & Walsh, C.E. (2005). Optimal Monetary Policy with the Cost Channel. *Journal of Monetary Economics*, forthcoming.

Rudebusch, G.D. (2002). Terms Structure Evidence on Interest Rate Smoothing and Monetary Policy Inertia. *Journal of Monetary Economics* 49, 1161-1187.

Sargent, T.J. & Smith, B.D. (1987). Irrelevance of Open Market Operations in Some Economies with Government Currency being dominated in Rate of Return. *American Economic Review* 77, 78-92.