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# INFLATION, FOREIGN EXCHANGE RATE AND MANUFACTURING IN NIGERIA

**Okonkwo N. Osmond and Chigbu E. Ezeji (Ph.D)**

[1]Department of Economics, Alvan Ikoku Federal College of Education, Owerri
[2]Department of Financial Management Technology, Federal University of Technology, Owerri

**ABSTRACT:** *The near free fall of the naira in the parallel-market as a result of persistent fall in the international price of crude-oil is indicative of a monolithic economy. Oil export had accounted for an average of 97 percent total export since 1981 to 2013, hence in the current face of dwindling foreign exchange earnings tremendous pressure is been exacted on the naira. This study seeks to examine this phenomenon of inflation in Nigeria in terms of structural rigidities that have limited agricultural output and of course diversification of the Nigerian economy. Based on theoretical underpinnings two explanatory variables were specified in the model of the study, where the study sought to establish relationship between the explanatory variables and manufacturing capacity utilization (MCU) in Nigeria.*

**KEYWORDS:** Inflation Rate, Foreign Exchange Rate, Manufacturing Capacity Utilization, and Structural Rigidities.

## INTRODUCTION

The naira has been losing its value over the year. It has been buying fewer and fewer goods and services each succeeding year. There has been sustained rise in the prices of goods and services in Nigeria over the years. This scenario is what economists call inflation. Inflation hurts the economy in many ways. It creates problems for economic activities, for example, it discourages investment and limits export, and it also creates problems for the economy in term of income distribution and erodes purchasing power. Inflation erodes the purchasing power of individual members of the society by persistently reducing the quantity of goods and services that their income can buy, making peoples income increasingly worthless. This situation obviously brings about a fall in the standard of living of the people and creates severe problems for the growth and development of the economy.

Inflation discourages real investment because of its effect on the value of the currency. Real investment takes time to produce the expected income, due to the time lag occasioned by the manufacturing process, the investors then know that in periods of inflation, they will receive lesser value (that is, weak naira) than they had invested in the project. This discourages investments. The consequence of this problem is that potential output, potential employment, and potential opportunities for learning new skills and developing the much needed technological capacity is lost.

Inflation also creates problems for the country in its transactions with the rest of the world. It makes the country's exports more expensive than before, and thereby reducing the country's size of external market. The consequence of this scenario as evident in Nigeria is that, the country becomes unable to earn enough foreign exchange needed to meet her import bills. This throws it into deficit in its balance of payments.



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Inflation also distorts the pattern of income distribution in the economy. Those on fixed income like the pensioners and lenders term to lose in the sense that the rise in the price level in the intervening year reduces the value of the currency at the time they are paid. The borrowers seem to gain as they pay back their loans at a time the currency has become lower in value than they borrowed.

Thus inflation has adverse effects on employment, real income, investment and output. Currently, the value of the naira has dropped to a record low of ₦307.00 to a dollar in the parallel market consequent upon the continuous fall in the price of crude-oil in the international market. This is largely caused by structural rigidities that have impeded agricultural output, making it difficult to produce enough food, especially grains to meet the increasing demand. Hence most of these food-grains are massively imported into the country putting more pressure on the naira. The structural rigidities and market imperfections in the Nigeria economy paved the way for the oligopolies that dominate the Nigeria industries. These oligopolists often collude to increase prices even when the demand for their goods and services did not change.

### Objectives of the study

The objectives of this study include to:

1. Empirically investigate the impact of inflation on industrial growth in Nigeria.
2. To determine the degree of responsiveness of industrial growth to inflation.

## CONCEPTUAL LITERATURE

### Inflation

Inflation is the rate at which general prices of goods and services rise persistently over a period of time consequent upon continual rise in demand for goods and services relative to shortages in the supply of the goods and services. In order words, inflation is the persistent rise in the general price level over a period of time. Inflation has serious implication for the function of money as a medium of exchange and store of value. ₦120.00 could you a tin of Peak milk in 2013, but in 2014 you now need ₦130.00 to buy the same tin of Peak milk at the same or lesser quality. If this signify general price rise for goods and services in the economy, this means that the resulting inflation rate for the CPI in one year is 8.33 percent, meaning that the general price level for typical Nigerian consumers rose by 8.33 percent. Hence persistent increase in general price level, means that each unit of the currency (Naira) will buy fewer goods and services. Inflation reflects a reduction in the purchasing power per unit of naira, which is a loss of real value in the medium of exchange and unit of account within the country.

Nnamocha (2002) defined inflation as a sustained rise in the general level of prices. Inflation affects an economy by increasing the opportunity cost of holding money, that is, the uncertainty over future rise in prices which may discourage savings and investment. High inflation is often associated with excessive growth of money supply. Though, money supply does not necessarily cause inflation when it grows in the same proportion as output. However, moderate inflation rates may be attributed to fluctuations in real demand for goods and services or changes in available supplies such as in periods of scarcity.


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**Causes of Inflation in Nigeria**

Inflation is caused by the two sides of the economic system equation, the demand side and the supply side, hence inflation is often named after the side of the market which is believed to be responsible for the phenomenon at the time, for instance, demand-pull inflation and supply-side (or cost-push) inflation.

The entire industry in Nigeria are largely structured operate as either monopolistic or oligopolistic markets. The market structure of the Nigeria industries is very much far from pure competitive market structure. What is the implication of this for inflation? Guided by the prime objective to make and maximize profit, an investor has two variables to deal with. He may take steps to cut cost or may pursue increase in revenue, or may pursue both objectives simultaneously. Unfortunately, Nigerians are generally not known to be cost conscious people, and seem to worry very little about the cost side of any venture.

Oligopolistic and monopolistic industry situations as is the case in Nigeria provide perfect conditions for investors to collude and raise the prices of their goods and services arbitrarily. The Nigerian profit seeking industries generally find it easier to increase prices than cut costs, always giving reasons to justify their actions. This arbitrary increase in prices by oligopolies and monopolistic producers cause inflation. It leads to increase in the cost of living and as often experienced in Nigeria, usually provides the justification for demand by labour for salary increase to cope with the rising cost of living. The increased pay for workers leads to increase in the cost of production, and the oligopolies monopolistic producers once again increase prices to maintain profit level and the spiral continue on and on.

## THEORETICAL LITERATURE

### The Structural Theory of Inflation

This theory of inflation seeks to explain inflation in developing economies like Nigeria. The structuralists argued that increase in investment expenditure and the expansion of money supply to finance it are only proximate and not the ultimate factors responsible for inflation in the developing countries. The structuralists probe further into why aggregate output, especially of food-grains has not been increasing sufficiently in the developing countries to match the increase in demand brought about by the increase in investment expenditure, and money supply; why investment expenditure has not been fully financed by voluntary savings and as a result, excessive deficit financing.

According to the structuralists' theory of inflation, the developing economies are structurally underdeveloped as well as highly fragmented due to structural rigidities and the existence of market imperfections that permit oligopolies to increase prices even if the demand does not change. This rise in price level can occur due to increase in wage in the oligopolistic industry.

As a result of these structural imbalance rigidities, there are shortages of supply relative to demand in some sectors, while other sectors experience under-utilization of resources and excess capacity due to lack of demand. Based on these structural features of the developing economies the structuralists argued that the aggregate demand – supply model of inflation is inappropriate and inapplicable to the developing economies. They rather suggested analyzing



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disaggregative and sectoral demand-supply imbalances to explain inflation in developing economies.

The structuralists stated four sectoral constraints or bottlenecks which generate the sectoral imbalances that lead to inflation as:

**Agricultural Bottlenecks:**

The key factor to the structural constraint preventing food supply increasing adequately in developing economies include; disparities in land ownership, defective land tenure system which act as disincentives for raising agricultural production in response to increasing demand for them arising from increase in people's incomes, growth in population and urbanization. The use of backward agricultural technology also hampers agricultural growth. These bottlenecks have to be removed so that agricultural output can grow more rapidly to match the increasing demand for it in order to check inflation and support industrial growth.

**Resources Gap or Government's Budget Constraint:**

The absence of the required resources to finance public sector investment in various industries in order to fast-track industrialization of these economies by their governments has led to huge deficit financing. The socio-economic and political structure of these countries is such that it is not possible for the Government to raise enough resources through taxation, or from profits generated in the public sector enterprises for investment in new projects of economic development. Tax revenue is relatively very small due to low tax base, large scale tax evasion, inefficient and corrupt tax officers, and outright stealing of public funds. Consequently, the government has been forced to resort to-excessive deficit financing (that is, creation of new currency - seigniorage) which has caused excessive growth in money supply relative to increase in output therefore resulting in inflation in the developing countries. Also resource gap in the private sector due to inadequate voluntary savings and under-development of the capital market have led to their larger borrowings from the banking system which have created excessive bank credit.

**Foreign Exchange Bottleneck:**

Due to lack of export plus and mounting imports the developing economies have been facing balance of payment difficulties and shortage of foreign exchange. This affects price level in two ways. First, as a result of shortage in foreign exchange, domestic availability of goods in short supply could not be increased which leads to rise in their prices. Secondly, often in the face of foreign exchange shortage, governments often devalue local currency in order to encourage export and reduce imports. But this raises the prices of other goods due to cascading effect. This leads to cost push inflation.

**Infrastructural Bottlenecks:**

The structuralists argued that lack of infrastructural facilities such as; lack of power, transport and gasoline stand in the way of adequate growth in output. Poor growth of output combined with excessive growth of money supply causes stagflation (inflation existing with slow economic growth).



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**Empirical Literature**

Kasidi, et al (2013), studying the impact of inflation on economic growth in Tanzania analyzed time-series data for the period 1990 to 2011 using the ordinary least square (OLS). The study findings suggested that inflation has a negative impact on economic growth in Tanzania, and also that there was no long run relationship between inflation and economic growth during the period of study in Tanzania.

Doguwa, (2013), estimating the existence and level of inflation threshold in the relationship between inflation and economic growth in Nigeria, used three different approaches to estimate the threshold level of inflation above which money is not super-neutral.

Vaona, (2012) studying "inflation and growth in the long-run: a new Keynesian theory and further semiparametric evidence" concluded that inflation have negative linear impact on economic growth.

Umaru and Zubairu (2012) examined the impact of inflation on economic growth and development in Nigeria between 1970-2010 in their study "Effect of Inflation on the Growth and Development of the Nigerian Economy: An Empirical Analysis" came to the conclusion that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity.

Marbuah, (2010) in the study, "The Inflation-Growth Nexus: Testing for Optimal Inflation for Ghana", investigated the relationship between inflation and economic growth to ascertain whether a significant threshold effect existed in the case of Ghana over the period 1955-2009. The study found evidence of significant threshold effect of inflation on economic growth. The evidence showed both a minimum and maximum inflation threshold levels of 6% and 10% respectively. The study also found that adjusting for structural break in the model increases the effect of inflation on growth at a robust threshold level of 10% by a factor of 1.8 or approximately 81%. The study recommended the continue pursuit of inflation targeting framework by keeping inflation targets below 10% for beyond 10% threshold, 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 threshold effect of inflation on economic growth over the period of 2001-2009 in the study, "Relationship between Inflation and Economic Growth in Azerbaijani Economy. Is there any Threshold Effect?" Estimated threshold model indicated that there was non-linear relationship between inflation and economic growth in the Azerbaijani economy and threshold 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 threshold.

Frimpong and Oteng-Abayie, (2010) in their study When is Inflation harmful? Estimating the Threshold Effect for Ghana found a threshold 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 threshold 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 threshold levels, inflation is still significant. But their study however, failed to check for



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sensitivity of the estimated coefficients across sub-samples of the full sample period to establish a new evidence of the threshold effect. The study thus concluded by highlighting the need to extend the context of analysis to deal with lower threshold levels in search of that evidence.

Espinoza *et al.* (2010) examined threshold effect of inflation on GDP Growth by using a panel data of 165 countries including Oil Exporting Countries and Azerbaijan over the period of 1960-2007. Their study found that for all country groups' threshold level of inflation for GDP growth was about 10 percent (with the exclusion of industrialized countries where threshold level was much lower). Estimated results suggested that inflation from higher than 13 percent decreases real non-oil GDP by 207 percent per year. Lastly, review of literature on money supply and exchange rate influence on economic growth and inflation.

Bick *et al.* (2009) modelled a large panel-dataset of 124 industrialized and developing countries over the period from 1950 to 2004 in the study Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis. Using a dynamic panel threshold model to shed light on the impact of inflation on economic growth, they found an inflation target of about 2 percent for industrialized countries and 17 percent for developing economies. Below the 17 percent threshold, the impact of inflation on economic growth remained insignificant, thus failing to support the growth-enhancing effects of inflation on economic growth in non-industrialized economies.

Sergii, (2009) found that growth - inflation interaction was strictly concave with some threshold level of inflation. Inflation threshold 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.

Schiavo (2007) used both nonparametric and semiparametric instrumental variable estimators, which have the advantage of letting the data, speak as much as possible. They showed that, for developed countries, low inflation rates have hardly any real effect and high inflation rates have negative real effects. For developing countries, they found that too high variability does not allow reaching clear-cut results.

Guerrero (2006) used previous hyperinflationary experience as instrument for inflation, finding that inflation has a negative impact on growth.

Drukker *et al.* (2005) used data from a sample of 138 countries from 1950 to 2000 to investigate the threshold effects in the relationship between inflation and economic growth. The panel regression results revealed that there is one threshold with an estimated value of 19.16 per cent that is well identified by the full sample. For the industrialized sample, the results indicated that there are two threshold points at 2.57 per cent and 12.61 per cent.

Li (2005) used data for 90 developing countries and 28 developed countries over the period 1961 – 2004 and found evidence of a nonlinear relationship between inflation and economic growth. He further showed that the form of nonlinearity in the inflation-growth relationship for developed countries differ from that of the developing ones. While two thresholds were found for the latter, only one threshold was detected for the former. He also studied the transmission channel through which inflation affects economic growth in a nonlinear manner. Based on theory and empirical findings, he identified two major transmission channels, which are the capital accumulation channel and the total factor productivity channel. He noted that inflation



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has been documented to affect economic growth either directly or via the behavior of the financial intermediaries. He opined that high and unstable prices affect the financial market and developments in the financial markets in turn affect the level and efficiency of investment and ultimately output growth. He concluded, through his empirical work, that for both developing and developed countries, the total factor productivity is the channel through which inflation adversely and nonlinearly affects economic growth.

Arai et al. (2004), using dynamic panel data methods on a data set of 115 countries over the period 1960–1995, did not find any evidence that inflation is harmful to growth. On the contrary, the negative correlation between inflation and growth can be explained by oil price shocks.

Faria and Carneiro (2001) examined the inflation-growth nexus from the perspective of an economy suffering from high and persistent inflation. He studied the case of Brazil and found empirical evidence for a negative effect of inflation on output in the short run.

Khan and Senhadji (2001) estimated a panel regression with data from 140 countries and spanning about 40 years to investigate the nonlinear relationship between inflation and economic growth. Having established the presence of nonlinearity, they found a threshold range of 1-3 per cent for industrial economies and 11 – 12 per cent for developing economies. The estimated relationships were found to be robust to different estimation procedures, alternative specifications, changes in threshold levels and different data frequency.

Mallik and Chowdhury (2001) empirically examined the relationship between inflation and GDP growth for four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka) using co-integration and error correction models. They found evidence of a long-run positive relationship between GDP growth and inflation. They also discovered significant feedbacks between inflation and economic growth and concluded that the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. This study puts the countries on a knife edge as they struggle to achieve non-inflationary growth. The challenge for them, therefore, is to find a growth rate that is consistent with a stable inflation rate, rather than beat inflation first to take them to a path of faster economic growth.

Nell, (2000) examined the issue if inflation was detrimental to economic growth or not by using Vector Auto Regressive (VAR) technique. Data for the period from 1960-1999 was used and his empirical results suggested that inflation within the single-digit zone may be beneficial to economic growth, while inflation in the double digit zone tends to limit economic growth.

Kim and Willett (2000), using cross-country/time series data, found that the negative effect of inflation on growth is greater in developed countries than in developing ones and that the inclusion of oil supply shocks in the model weakens the inflation–growth nexus, which, however, does not disappear.

## METHOD OF DATA ANALYSIS

### Model specification

This study employs the most commonly used econometric technique in analyzing the MPTMs, the VAR model. The specification of the VAR model is given by



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$Zt = A(L)Zt-1 + B(L)Xt + ut$ …… (1)

Where $A(L)$ and $B(L)$ are the polynomial matrices for the lag operator L. $Zt$ is a vector of endogenous variables, $Xt$ is a vector of exogenous variables and $ut$ is a vector of random error terms. The baseline model includes the manufacturing capacity utilization, inflation, and foreign exchange rate which can be expressed as:

$Zt = (MCU_t, INF_t, REX_t)$ ……(2)

Equation (2) can be expressed in the explicit form as:

$MCU_t = \Omega_0 + \sum\Omega_1 MCU_{t-1} + \sum \Omega_2 INF_{t-1} + \sum \Omega_3 REX_{t-1} + \varepsilon_t$ ……..(3)

$INF_t = \delta_0 + \sum\delta_1 MCU_{t-1} + \sum \delta_2 INF_{t-1} + \sum \delta_3 REX_{t-1} + \lambda_t$ ……..…..(4)

$REX_t = \alpha_0 + \sum \alpha_1 MCU_{t-1} + \sum \alpha_2 INF_{t-1} + \sum \alpha_3 REX_{t-1} + \mu_t$ ……..…..(5)

Where:

MCU = Manufacturing capacity utilization in Nigeria
INF = Inflation rate in Nigeria
Rex = Foreign exchange rate in Nigeria

**Sources of Data**

This study employed secondary data collected from the following sources; Central bank of Nigeria's statistical bulletin (various issues including 2006 and 2013 editions); and www.indexmundi.com. The data series sourced therefrom and used in this study include: Manufacturing capacity utilization (MCU), Inflation rate (INF), and Foreign exchange rate (REX).

## RESULTS AND DISCUSSION OF FINDINGS

### Stationarity Test

Test was conducted on the time series properties on the variables under study. The Augmented Dickey Fuller test statistic was employed to test for stationarity of all variables included in the model. The result of the test as shown in table 1 below showed that all-time series data are stationary at first difference at 5 percent level of significance.

**Table 1: Augmented Dickey-Fuller test statistic**

Sample: 1981 2013
Test Type: ADF

| | Level | First | Order of integration |
|---|---|---|---|
| MCU | -2.493514 | -3.092740 | I(1) |
| INF | -2.682326 | -5.742462 | I(1) |
| REX | 0.080589 | -5.313244 | I(1) |



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| | | |
|---|---|---|
| 1% level | -3.653730 | -3.661661 |
| 5% level | -2.957110 | -2.960411 |
| 10% level | -2.617434 | -2.619160 |

**VAR Lag Order Selection Criteria**

Due to the importance of lag length in estimating a VAR model, it became imperative to confirm the optimal lag length. Using the VAR lag order selection criteria, all the test instruments selected the lag length of 10 as shown in table 2 below. This lag length of 10 was used in estimating the VAR model of this study.

**Table 2: VAR Lag Order Selection Criteria**

VAR Lag Order Selection Criteria
Endogenous variables: MCU INF REX
Exogenous variables: C
Sample: 1970 2013
Included observations: 34

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -458.0077 | NA | 1.20e+08 | 27.11810 | 27.25278 | 27.16403 |
| 1 | -363.4402 | 166.8837 | 785732.5 | 22.08472 | 22.62343 | 22.26844 |
| 2 | -355.5197 | 12.57967 | 849579.9 | 22.14822 | 23.09097 | 22.46972 |
| 3 | -352.8276 | 3.800653 | 1276125. | 22.51927 | 23.86606 | 22.97856 |
| 4 | -343.4143 | 11.62820 | 1334521. | 22.49496 | 24.24578 | 23.09204 |
| 5 | -342.3004 | 1.179366 | 2389610. | 22.95885 | 25.11371 | 23.69372 |
| 6 | -336.7372 | 4.908748 | 3545402. | 23.16101 | 25.71991 | 24.03367 |
| 7 | -326.7035 | 7.082579 | 4526942. | 23.10021 | 26.06314 | 24.11065 |
| 8 | -313.3211 | 7.084778 | 5711334. | 22.84242 | 26.20939 | 23.99065 |
| 9 | -303.9970 | 3.290888 | 12924922 | 22.82335 | 26.59436 | 24.10937 |
| 10 | -136.6969 | 29.52355* | 6340.326* | 13.51158* | 17.68662* | 14.93539* |

**Model Estimation**

The estimated VAR results as shown in table 3 in the appendix 1 revealed that there are significant impact between the past values of manufacturing capacity utilization (MCU) and foreign exchange rate (REX) on manufacturing capacity utilization; also there are evidence of significant relationships between MCU and REX on inflation (INF) in Nigeria. There is also a significant impact from MCU and past values of foreign exchange rate (REX) on the current value of REX. The VAR estimated results also showed the $R^2$ of 0.99, 0.79 and 0.99 for manufacturing capacity utilization (MCU), inflation rate (INF) and foreign exchange rate (REX) models respectively indicate that 99 percent of total variations in MCU, 79 percent variations in inflation rate and 99 percent total variations in foreign exchange rate models respectively are explained by the explanatory variables in the models. The $R^2$-adjusted of 0.97, 077 and 0.99 for MCU, INF and REX models respectively indicating 97 percent, 77 percent



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and 99 percent for MCU, INF and REX respectively indicate that the explanatory variables in the models were robust in explaining the variations in the regressands.

**Table 4: VAR Lag Exclusion Wald Tests**

VAR Lag Exclusion Wald Tests
Sample: 1970 2013
Included observations: 34

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

| | MCU | INF | REX | Joint |
|---|---|---|---|---|
| Lag 1 | 59.72733 | 0.524049 | 13.61891 | 3987.879 |
| | [ 6.72e-13] | [ 0.913577] | [ 0.003473] | [ 0.000000] |
| Lag 2 | 4.037216 | 0.315369 | 7.506129 | 206.9193 |
| | [ 0.257473] | [ 0.957113] | [ 0.057401] | [ 0.000000] |
| Lag 3 | 2.516228 | 0.259696 | 13.86792 | 85.34079 |
| | [ 0.472365] | [ 0.967421] | [ 0.003091] | [ 1.40e-14] |
| Lag 4 | 5.170277 | 0.549322 | 15.78091 | 1897.639 |
| | [ 0.159745] | [ 0.907929] | [ 0.001257] | [ 0.000000] |
| Lag 5 | 5.636065 | 0.076518 | 2.791916 | 634.1359 |
| | [ 0.130723] | [ 0.994498] | [ 0.424832] | [ 0.000000] |
| Lag 6 | 10.70525 | 0.152290 | 7.028528 | 1642.825 |
| | [ 0.013431] | [ 0.984897] | [ 0.070994] | [ 0.000000] |
| Lag 7 | 9.206573 | 1.090893 | 22.26744 | 631.2127 |
| | [ 0.026667] | [ 0.779273] | [ 5.74e-05] | [ 0.000000] |
| Lag 8 | 13.90412 | 1.022913 | 7.593433 | 1321.487 |
| | [ 0.003039] | [ 0.795708] | [ 0.055206] | [ 0.000000] |
| Lag 9 | 24.46978 | 0.175344 | 9.924870 | 1199.720 |
| | [ 1.99e-05] | [ 0.981468] | [ 0.019216] | [ 0.000000] |
| Lag 10 | 35.92287 | 0.488051 | 38.10356 | 4190.778 |
| | [ 7.77e-08] | [ 0.921509] | [ 2.69e-08] | [ 0.000000] |
| df | 3 | 3 | 3 | 9 |

**Block-F Test**

The result of the block-F test as shown in table 4 above indicated that the parameters of all lags of variables in this are jointly significant at 1 percent significant level, that is , jointly, all the parameters are significant at 1 percent. Individually, the manufacturing capacity



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utilization model is significant in lag 6, lag 7 and lag 8, while foreign exchange rate model is significant in lag 1, lag 3lag 4 and lag 9.

## Model Stability Test

The autoregressive inverse root of VAR as displayed in table 5in appendix 2 showed that all polynomial roots were all inside the unit circle which is indicative that the VAR model is stable and useful for policy making.

## Impulse Response Function (IRF)

The graph of the impulse response function in figure 1 below showed that inflation rate exacts negative impact on manufacturing capacity utilization at the short run but began to move to equilibrium path and then exacting positive impact on manufacturing capacity utilization beginning from the eight year. On the other hand, foreign exchange rate maintained movement along the equilibrium path at all periods. Manufacturing capacity utilization had initial negative impact on inflation but after the third year moved into positive path and fluctuated slightly back into negative effects in periods 7 and 8 before finding its way back into equilibrium path. Manufacturing capacity utilization had initial positive effects on foreign exchange rate at the short run but finds its way into negative path from the fifth year. All effects were significant at 5 percent.

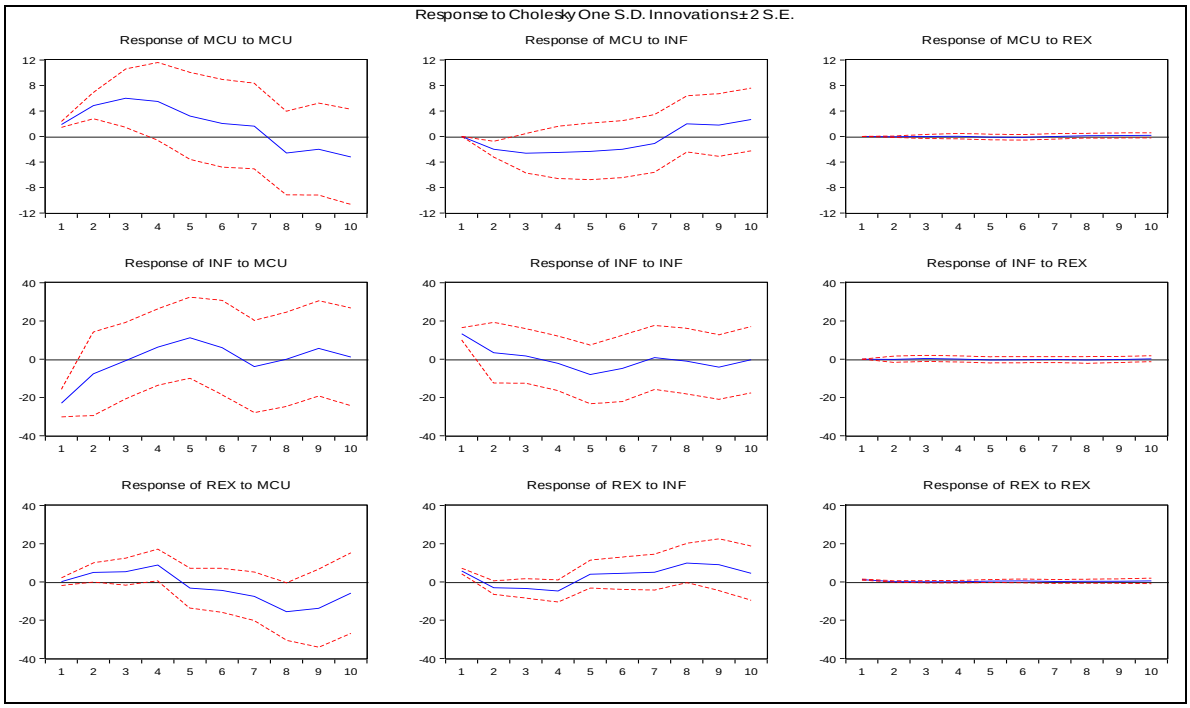


**Figure 1: Response to Cholesky One S.D Innovations**

## Variance Decomposition

The forecast error variance of manufacturing capacity utilization in Nigeria revealed that variation was mostly caused by itself and slightly by inflation after the fourth year. Variation in inflation rate in Nigeria is found to be mostly caused by manufacturing capacity utilization. On the other hand, variations in foreign exchange rate was mostly caused by inflation rate at the short run and manufacturing capacity utilization in the long run in the Nigeria.



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**Table 6: Variance Decomposition of Variables**

| Variance Decomposition of MCU | | | | |
|---|---|---|---|---|
| Period | S.E. | MCU | INF | REX |
| 1 | 1.877417 | 100.0000 | 0.000000 | 0.000000 |
| 2 | 5.570534 | 86.83636 | 13.15460 | 0.009041 |
| 3 | 8.590325 | 85.02656 | 14.96959 | 0.003846 |
| 4 | 10.49974 | 84.19080 | 15.80576 | 0.003433 |
| 5 | 11.22726 | 81.78473 | 18.20446 | 0.010810 |
| 6 | 11.58753 | 79.89391 | 20.07800 | 0.028091 |
| 7 | 11.75224 | 79.58253 | 20.39016 | 0.027314 |
| 8 | 12.19618 | 78.43479 | 21.52988 | 0.035336 |
| 9 | 12.48841 | 77.36262 | 22.59109 | 0.046286 |
| 10 | 13.16631 | 75.57916 | 24.36384 | 0.057004 |
| Variance Decomposition of INF | | | | |
| Period | S.E. | MCU | INF | REX |
| 1 | 26.51945 | 74.93472 | 25.06528 | 0.000000 |
| 2 | 27.79836 | 75.69117 | 24.30850 | 0.000324 |
| 3 | 27.86013 | 75.42563 | 24.55475 | 0.019617 |
| 4 | 28.65594 | 76.17518 | 23.80438 | 0.020438 |
| 5 | 31.78159 | 74.32425 | 25.64566 | 0.030086 |
| 6 | 32.70664 | 73.59244 | 26.36969 | 0.037868 |
| 7 | 32.94451 | 73.89371 | 26.06404 | 0.042253 |
| 8 | 32.96262 | 73.81259 | 26.12961 | 0.057796 |
| 9 | 33.69763 | 73.43763 | 26.50262 | 0.059747 |
| 10 | 33.71973 | 73.46148 | 26.47421 | 0.064308 |
| Variance Decomposition of INF | | | | |
| Period | S.E. | MCU | INF | REX |
| 1 | 5.838128 | 0.058996 | 95.65613 | 4.284872 |
| 2 | 8.216681 | 36.29324 | 61.48344 | 2.223316 |
| 3 | 10.39573 | 49.56406 | 49.03652 | 1.399424 |
| 4 | 14.46134 | 63.16580 | 36.10720 | 0.727001 |
| 5 | 15.37740 | 60.31032 | 38.95209 | 0.737592 |
| 6 | 16.63676 | 58.57674 | 40.69400 | 0.729262 |
| 7 | 18.97181 | 60.86245 | 38.55911 | 0.578442 |
| 8 | 26.44031 | 65.78769 | 33.89022 | 0.322084 |
| 9 | 31.12469 | 66.89658 | 32.85257 | 0.250850 |
| 10 | 31.99428 | 66.61769 | 33.11517 | 0.267144 |
| Cholesky Ordering: MCU INF REX | | | | |

## VAR Granger Causality Test

The VAR granger causality results as shown in table 7 revealed that bi-causality running from foreign exchange rate to manufacturing capacity utilization and inflation at 5 percent significant level. There is also a uni-directional causality from inflation to manufacturing capacity utilization at 5 percent significant level.



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**Table 7: VAR Granger Causality Test**

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1970 2013
Included observations: 34

Dependent variable: MCU

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| INF | 44.74042 | 10 | 0.0000 |
| REX | 17.25833 | 10 | 0.0688 |
| All | 98.48107 | 20 | 0.0000 |

Dependent variable: INF

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| MCU | 4.119849 | 10 | 0.9418 |
| REX | 3.453980 | 10 | 0.9686 |
| All | 5.508737 | 20 | 0.9994 |

Dependent variable: REX

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| MCU | 22.85870 | 10 | 0.0113 |
| INF | 107.0869 | 10 | 0.0000 |
| All | 158.4236 | 20 | 0.0000 |

## CONCLUSION

This study investigated the interactions between inflation, foreign exchange rate and manufacturing capacity utilization in Nigeria, and the findings of the study revealed that a shock on inflation rate had a negative impact on manufacturing capacity utilization in the short run, but in the long run began to exact positive impact on manufacturing capacity utilization in Nigeria. Variations in foreign exchange rate are caused by inflation in the short run and manufacturing capacity utilization in the long run, while variation in inflation rate is mostly caused by manufacturing capacity utilization. Also the study concludes that inflation rate causes manufacturing capacity utilization in Nigeria.

## RECOMMENDATIONS



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The study recommends the need to stabilize the consumer price level by ensuring growth in agricultural output and diversifying the Nigerian economy in other to guarantee stable prices in both agricultural and manufactured goods.

Impetus most also be given to resuscitating ailing and moribund industries in the country in other to boost output and reduce prices.

Finally, industries must as a matter of government policy depend mainly on locally sourced raw materials in order not to put undue pressure on foreign exchange rate especially in the long run.

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## APPENDIX 1

**Table 3: VAR Estimation Result**

Vector Autoregression Estimates
Sample (adjusted): 1980 2013
Included observations: 34 after adjustments
Standard errors in ( ) & t-statistics in [ ]

| | MCU | INF | REX |
|---|---|---|---|
| MCU(-1) | 0.950847 | -0.700306 | -1.002389 |
| | (0.16382) | (2.31398) | (0.50941) |
| | [ 5.80437]* | [-0.30264] | [-1.96774]** |
| MCU(-2) | -0.259815 | 0.242679 | 0.193210 |
| | (0.25750) | (3.63737) | (0.80075) |
| | [-1.00897] | [ 0.06672] | [ 0.24129] |
| MCU(-3) | -0.138708 | 1.403415 | 0.301554 |
| | (0.23676) | (3.34433) | (0.73624) |
| | [-0.58586] | [ 0.41964] | [ 0.40959] |
| MCU(-4) | 0.013123 | -1.223427 | -0.124895 |
| | (0.21365) | (3.01788) | (0.66437) |
| | [ 0.06142] | [-0.40539] | [-0.18799] |
| MCU(-5) | 0.134419 | -0.249772 | 0.081656 |
| | (0.21417) | (3.02532) | (0.66601) |
| | [ 0.62761] | [-0.08256] | [ 0.12260] |
| MCU(-6) | -0.310844 | -0.022651 | 0.690441 |
| | (0.20054) | (2.83267) | (0.62360) |
| | [-1.55007] | [-0.00800] | [ 1.10719] |
| MCU(-7) | 0.151494 | 1.532316 | -1.598013 |
| | (0.19845) | (2.80323) | (0.61712) |
| | [ 0.76338] | [ 0.54663] | [-2.58948]** |
| MCU(-8) | 0.325413 | -2.078193 | 0.876115 |
| | (0.14925) | (2.10828) | (0.46413) |
| | [ 2.18027]** | [-0.98573] | [ 1.88766]*** |
| MCU(-9) | -0.180850 | 0.074550 | -0.346901 |
| | (0.04453) | (0.62905) | (0.13848) |
| | [-4.06107]* | [ 0.11851] | [-2.50504]** |
| MCU(-10) | -0.226644 | -0.094146 | -0.169615 |
| | (0.04006) | (0.56586) | (0.12457) |



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| | | | |
|---|---|---|---|
| | [-5.65769]* | [-0.16638] | [-1.36159] |
| INF(-1) | -0.133323 | 0.273936 | -0.296485 |
| | (0.03299) | (0.46604) | (0.10260) |
| | [-4.04094]* | [ 0.58779] | [-2.88979]** |
| INF(-2) | -0.046441 | -0.193567 | -0.296109 |
| | (0.03545) | (0.50075) | (0.11024) |
| | [-1.31005] | [-0.38656] | [-2.68612]** |
| INF(-3) | -0.039098 | -0.180566 | -0.433315 |
| | (0.03760) | (0.53108) | (0.11692) |
| | [-1.03991] | [-0.34000] | [-3.70623]** |
| INF(-4) | -0.026888 | -0.206182 | 0.176559 |
| | (0.03824) | (0.54022) | (0.11893) |
| | [-0.70307] | [-0.38167] | [ 1.48461] |
| INF(-5) | -0.094943 | 0.007671 | 0.008629 |
| | (0.04137) | (0.58437) | (0.12865) |
| | [-2.29498]** | [ 0.01313] | [ 0.06708] |
| INF(-6) | -0.091793 | -0.108676 | 0.226066 |
| | (0.04102) | (0.57941) | (0.12755) |
| | [-2.23784]** | [-0.18756] | [ 1.77232]*** |
| INF(-7) | 0.110531 | -0.501222 | 0.528529 |
| | (0.03987) | (0.56322) | (0.12399) |
| | [ 2.77208]** | [-0.88991] | [ 4.26264]* |
| INF(-8) | -0.094724 | -0.273909 | 0.345600 |
| | (0.04457) | (0.62956) | (0.13859) |
| | [-2.12534]** | [-0.43508] | [ 2.49361]** |
| INF(-9) | 0.074483 | -0.211003 | -0.189647 |
| | (0.04586) | (0.64773) | (0.14260) |
| | [ 1.62430] | [-0.32576] | [-1.32996] |
| INF(-10) | -0.037463 | -0.483352 | 0.243577 |
| | (0.04996) | (0.70567) | (0.15535) |
| | [-0.74990] | [-0.68495] | [ 1.56792] |
| REX(-1) | -0.043828 | -0.041409 | 0.166735 |
| | (0.04945) | (0.69846) | (0.15376) |
| | [-0.88637] | [-0.05929] | [ 1.08437] |
| REX(-2) | 0.038741 | 0.307781 | 0.004062 |
| | (0.05055) | (0.71411) | (0.15721) |
| | [ 0.76633] | [ 0.43100] | [ 0.02584] |



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| | | | |
|---|---|---|---|
| REX(-3) | 0.056738 | -0.032851 | 0.145096 |
| | (0.05170) | (0.73032) | (0.16078) |
| | [ 1.09741] | [-0.04498] | [ 0.90247] |
| REX(-4) | -0.096219 | -0.217075 | 0.501673 |
| | (0.04846) | (0.68445) | (0.15068) |
| | [-1.98575]** | [-0.31715] | [ 3.32943]** |
| REX(-5) | -0.043009 | -0.188503 | 0.266292 |
| | (0.05174) | (0.73088) | (0.16090) |
| | [-0.83123] | [-0.25791] | [ 1.65502] |
| REX(-6) | 0.087239 | -0.265436 | -0.262081 |
| | (0.05671) | (0.80103) | (0.17634) |
| | [ 1.53838] | [-0.33137] | [-1.48619] |
| REX(-7) | -0.013207 | -0.237905 | 0.037679 |
| | (0.06075) | (0.85817) | (0.18892) |
| | [-0.21739] | [-0.27722] | [ 0.19944] |
| REX(-8) | -0.005708 | 0.122528 | -0.179295 |
| | (0.05252) | (0.74184) | (0.16331) |
| | [-0.10868] | [ 0.16517] | [-1.09787] |
| REX(-9) | 0.017408 | 0.146078 | -0.177088 |
| | (0.04918) | (0.69470) | (0.15293) |
| | [ 0.35396] | [ 0.21028] | [-1.15793] |
| REX(-10) | -0.035287 | 0.120891 | 0.670041 |
| | (0.04502) | (0.63597) | (0.14001) |
| | [-0.78375] | [ 0.19009] | [ 4.78580]* |
| C | 34.60928 | 130.2993 | 62.36870 |
| | (6.92558) | (97.8272) | (21.5362) |
| | [ 4.99731] | [ 1.33193] | [ 2.89600] |
| R-squared | 0.997520 | 0.792838 | 0.999225 |
| Adj. R-squared | 0.972715 | 0.778787 | 0.991474 |
| F-statistic | 40.21490 | 0.382713 | 128.9099 |

Where: * 1% significant; ** 5% significant; and *** 10% significant



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## APPENDIX 2

**Table 5: Model Stability Test**

Roots of Characteristic Polynomial
Endogenous variables: MCU INF REX
Exogenous variables: C
Lag specification: 1 10

| Root | Modulus |
|---|---|
| 0.817095 - 0.569733i | 0.996112 |
| 0.817095 + 0.569733i | 0.996112 |
| 0.915907 + 0.371917i | 0.988539 |
| 0.915907 - 0.371917i | 0.988539 |
| -0.818604 - 0.542808i | 0.982218 |
| -0.818604 + 0.542808i | 0.982218 |
| -0.273887 + 0.934614i | 0.973919 |
| -0.273887 - 0.934614i | 0.973919 |
| 0.638333 + 0.722061i | 0.963764 |
| 0.638333 - 0.722061i | 0.963764 |
| -0.956940 | 0.956940 |
| -0.861751 + 0.406535i | 0.952830 |
| -0.861751 - 0.406535i | 0.952830 |
| 0.925040 + 0.198358i | 0.946068 |
| 0.925040 - 0.198358i | 0.946068 |
| -0.583343 - 0.733628i | 0.937282 |
| -0.583343 + 0.733628i | 0.937282 |
| 0.008472 - 0.912693i | 0.912732 |
| 0.008472 + 0.912693i | 0.912732 |
| 0.183122 - 0.890318i | 0.908955 |
| 0.183122 + 0.890318i | 0.908955 |
| 0.507424 - 0.739492i | 0.896843 |
| 0.507424 + 0.739492i | 0.896843 |
| -0.895777 | 0.895777 |
| -0.452718 + 0.691674i | 0.826660 |
| -0.452718 - 0.691674i | 0.826660 |
| -0.415411 | 0.415411 |


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