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Relative Impact of Interest and Exchange Rate Fluctuations on the Output of Manufacturing Sector in Nigeria from 1986-2016

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ABSTRACT

In Nigeria, the government and economic experts have emphasized the role that industrialization and manufacturing can play in the structural transformation of the economy. This study however explored the relative impact of interest and exchange rate fluctuations on the output of manufacturing sector in Nigeria: 1986-2016. Secondary data used in the study were sourced from the Central Bank of Nigeria (CBN) statistical bulletin. The study adopted the ex-post facto research design and employed Autoregressive Distributed Lag (ARDL) bound test techniques. Basic diagnostic tests such as unit root test of Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) approaches were performed. The findings revealed that interest rate and exchange rate fluctuations have short run positive effect on the output of manufacturing sector in Nigeria. This implies that interest rate and exchange rate triggers productivity in the manufacturing sector in Nigeria. Based on these findings, the researchers recommended that control policies should be put in place to regulate the importation of goods that could be locally produced so as to improve the performance of the manufacturing sector in Nigeria.

Keywords: Interest rate; Exchange rate; Output of Manufacturing Sector.

INTRODUCTION

The manufacturing sector as a sub-sector of the industrial sector is responsible for productions of goods and services through combined utilization of raw materials and other factors of production such as labour force, land and capital or by means of production processes. It plays a catalytic role in the modern economy with dynamic benefits crucial for economic transformation.

Manufacturing is a process of converting raw materials into finished and consumable goods. In a typical advanced country, the manufacturing sector is a leading sector in many respects, being an avenue for increasing productivity related to import replacement and export expansion, creating foreign exchange earning capacity and raising employment

and per capita income which cause unique consumption patterns.

Interest rate is the price paid for the use of money. It is the opportunity cost of borrowing money from a lender. It can also be seen as the return being paid to the provider of financial resources. It is an important economic price. This is because whether seen from the point of view of cost of capital or from the perspective of opportunity cost of funds, interest rate has fundamental implications for the economy either impacting on the cost of capital or influencing the availability of credit, by increasing savings [1].

Exchange rate on the other hand is the price of one currency in terms of another. Nationally, in the Nigeria situation, it is the unit of naira needed to purchase one unit of another country's currency; For instance, US\$/U.K£ or alternatively U.K£/US\$ [2]. Exchange rate according to [3] is one of the most important macroeconomic variables necessary for the conduct of general economic policy

making. These fluctuations expose companies to foreign exchange risk.

The effect of macroeconomic indices such as interest rates, exchange rates and inflation rates on the output of the manufacturing sector has long remained unresolved especially in developing country like Nigeria. Though the common belief is that output of the manufacturing sector is influenced by changes in exchange rate, interest rates, inflation and other macroeconomic indicators [4], the findings of some researchers are in disagreement to this, hence, it becomes a debate. In the wake of this ongoing debate, this paper is intended to explore the relative impact of interest and exchange rate fluctuations on the output of manufacturing sector in Nigeria for the period of 1986-2016. The remaining part of this paper is divided into review of empirical literature for part two, methodology for part three, Data presentation, analysis and interpretation of results for part four, and Conclusion and recommendations for part five.

REVIEW OF EMPIRICAL LITERATURE

[5] studied the impact of exchange rate fluctuation on the performance of manufacturing firms in Nigeria (1986 to 2016). The study adopted multiple regression method based on Ordinary Least Square technique. However, in order to avoid the incidence of spurious estimates, ADF unit root and Johansen

cointegration test were conducted. Findings of the study revealed a statistical significance effect of exchange rate fluctuations on the profitability of manufacturing firms in Nigeria.

[6], examined the impact of exchange rate on industrial production in Nigeria over

the period: 1986-2010. The authors used the Vector Error Correction Model (VECM) and confirmed the existence of long run relationship between industrial production index, exchange rate, money supply and inflation rate in Nigeria. Moreover, the study revealed that exchange rate depreciation had no perceptible impact on industrial production in the short run but had positive impact in the long run.

[7], examined the impact of exchange rate management on the growth of the manufacturing sector in Nigeria for the periods; 1986-2010. They employed Ordinary Least Square (OLS) multiple regression techniques and discovered among others that in Nigeria, exchange rate appreciation has a significant relationship with domestic output. And that exchange rate appreciation will promote growth in the manufacturing sector.

[8] examined the effect of exchange rate fluctuations on manufacturing sector output in Nigeria from 1986 to 2014. Data sourced from Central Bank of Nigeria (CBN) statistical Bulletin and World Development Indicators (WDI) on manufacturing output, Consumer Price Index (CPI), Government Capital Expenditure (GCE) and Real Effective Exchange Rate (EXC) were analyzed through the multiple regression analysis using Autoregressive Distribution Lag

(ARDL) techniques. Results showed that exchange rate fluctuations have long run and short run relationship on manufacturing sector output. The result showed that exchange rate has a positive and insignificant relationship with manufacturing sector output in Nigeria.

[9], studied the effects of exchange rate fluctuations on the manufacturing sector output in Nigeria over a period of 25 years (1985 - 2010). The study employed four (4) variables such as manufacturing gross domestic product (MGDP), manufacturing foreign private investment (MFPI), manufacturing employment rate (MER) and Exchange rate (ER). Descriptive statistics and multiple regression analysis techniques were employed. The findings revealed that all the independent variables have significant and positive relationship with dependent variable. The result also provided evidence that manufacturing foreign private investment (MFPI) and Exchange rate (ER) have positive effect on manufacturing gross domestic product (MGDP).

[10], investigated the effect of exchange rate on output of different sectors in Nigeria for the period of 1970-2007. The study adopted the modified IS-LM framework and estimated the behavioural equations. The results obtained indicated that exchange rate had significant contractionary effects on agricultural and manufacturing sectors while it had

expansionary effect on services sector in Nigeria.

Using the Autoregressive Distributed Lag (ARDL) approach,[11] empirically examined the effect of exchange rate variability on manufacturing sector performance in Ghana for the periods, 1986-2013. The results showed that there exists both a short run and long run relationship between exchange rate and manufacturing sector performance in Ghana. Particularly the result revealed that as the exchange rate appreciates, the manufacturing sector performance improves and as it depreciates, the sector is adversely affected.

[12], analyzed the effects of macroeconomic fluctuations on the financial performance of manufacturing firms in Kenya. They used secondary data extracted from the Nairobi Stock Exchange and the Kenya National Bureau of Statistics; 2003-2012. Using the multivariate regression model, the authors among other findings provided enough evidence that foreign exchange, interest rate and inflation rate have significant effects on the performance of the firms in the construction and manufacturing sectors in Kenya.

[13] investigated the relationship between interest rate and firm performance among listed companies in NSE. The study employed judgmental sampling technique

to select all companies which were actively trading in 2008 to 2013 and ordinary least squares(OLS) regression analysis. The findings revealed a positive but not significant relationship between interest rate and return on equity.

[14], examined the dynamic relationship between interest rate reforms; bank based financial development and economic growth in South Africa using co-integration and Error correction models, the study finds a strong support for the positive impacts of interest rate reforms on financial development. The study also discovered that interest rate reforms do not Granger cause investment and economic growth.

[15], examined the impact of interest rate on economic growth in Nigeria from 1990 to 2013. The study used ordinary least squares regression method and provided evidence that interest rate has a slight impact on growth; however the growth can be improved by lowering the interest rate which will increase the investment.

[16] explored causes of interest rate volatility and its implications on the socio-economic development of Nigeria for the year 2000 - 2005 periods. An econometric regression model was used while the findings of the study indicated a relationship between the dependent variable (interest rate) and independent

variables (money supply and required reserve ratio).

[17], examined the impact of interest rate reform on agricultural finance and growth in Nigeria from 1987-2011. Descriptive statistics, Ordinary Least Squares regression technique and Autoregressive

Distributed Lag model were used for data analysis. The chow test showed a significant differential impact of the aggregate credit volume to agricultural sector in the regulated and deregulated regimes.

METHODOLOGY

The objective of this study is to expose the relative impact of interest rate and exchange rate fluctuations on the output of manufacturing sector in Nigeria from 1986 to 2016. The study adopted *ex-post facto* research design and used annual time series data extracted from the

Central Bank of Nigeria (CBN) statistical bulletin, 2016 edition. In order to achieve this research objective, the autoregressive distributed lag (ARDL) model is applied. The basic ARDL model with p-lags of Y and r-lags of X following Wooldridge (2009) can be stated thus:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \dots + \beta_p Y_{t-p} + \gamma_1 X_{t-1} + \dots + \gamma_r X_{t-r} + \mu_t \dots \dots \dots \text{(equation 1)}$$

Where,

- Y_t = Dependent or Response variable at time t,
- Y_{t-1} = Dependent variable at time lag 1,
- X_{t-1} = Independent variable at time lag 1,
- β_0 = Constant
- $\beta_1, \beta_2, \dots, \beta_k$ = Regression parameters or coefficients of the regression estimates.
- ε_t = Error term

In this study, the researchers made use of the following symbols to denote their respective variables

- LOMS = log of Output of manufacturing sector (Dependent variable),
- LINTR = log of Interest rate (Independent variable),
- LEXCR = log of Exchange rate (Independent variable),
- β_0 = Constant,
- β_i = Regression parameters,
- ε = Error term.

Such that:

Table 2: Summary of Unit root test Results

| Variable | Augmented Dickey-Fuller Approach | | | | Philips-Perron Approach | | | |
|--------------|----------------------------------|---------|---------|------|-------------------------|---------|---------|-----------|
| | ADF-Stat | C.V @5% | P-value | O(I) | PP-Stat | C.V @5% | P-value | Inference |
| LOMS | -3.82 | -3.57 | 0.0295 | I(1) | -3.86 | -3.57 | 0.0272 | I(1) |
| LINTR | -4.49 | -3.62 | 0.0085 | I(0) | -6.09 | -3.57 | 0.0001 | I(0) |
| LEXCR | -5.62 | -3.57 | 0.0004 | I(1) | -5.93 | -3.57 | 0.0002 | I(1) |

Source: Author's computation (using E-views 9)

The unit root test indicates that the variables are not stationary at same level. This informs the choice of the ARDL which accommodates a combination of

I(1) and I(0) variables and which is also very efficient in the face of a small sample.

Table 3: ARDL short run estimates

Dependent Variable: LOMS

Method: ARDL (4, 4, 2)

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|-----------|-------------|------------|-------------|--------|
| LOMS(-1) | 1.754076 | 0.185295 | 9.466420 | 0.0000 |
| LOMS(-2) | 0.892978 | 0.315235 | 2.832741 | 0.0133 |
| LOMS(-3) | 0.442259 | 0.293772 | 1.505450 | 0.1544 |
| LOMS(-4) | 0.592820 | 0.188235 | 3.149362 | 0.0071 |
| LINTR | 0.141463 | 0.121373 | 1.165522 | 0.2633 |
| LINTR(-1) | 0.109532 | 0.104812 | 1.045030 | 0.3137 |
| LINTR(-2) | 0.320160 | 0.104929 | 3.051211 | 0.0086 |
| LINTR(-3) | 0.233984 | 0.104652 | 2.235833 | 0.0422 |
| LINTR(-4) | 0.08535 | 0.066185 | 1.289554 | 0.2181 |

| | | | | |
|--------------------|---------|--------------------|----------|--------|
| | 0 | | | |
| LEXCR | 0.03429 | 0.062058 | 0.552586 | 0.5893 |
| | 2 | | | |
| LEXCR(-1) | - | 0.069596 | - | 0.0497 |
| | 0.14949 | | 2.147981 | |
| | 2 | | | |
| LEXCR(-2) | 0.06344 | 0.052353 | 1.211785 | 0.2457 |
| | 1 | | | |
| C | - | 0.818834 | - | 0.9147 |
| | 0.08934 | | 0.109115 | |
| | 7 | | | |
| R-squared | 0.99907 | Mean dependent | | 7.1243 |
| | 7 | var | | 48 |
| Adjusted R-squared | 0.99828 | S.D. dependent var | | 1.3578 |
| | 6 | | | 59 |
| F-statistic | 1262.90 | Durbin-Watson | | 2.2920 |
| | 6 | stat | | 23 |
| Prob(F-statistic) | 0.00000 | | | |
| | 0 | | | |

**Note: p-values and any subsequent tests do not account for modelselection.*

Source: Author's computation

The Autoregressive Distributed Lag (ARDL 4, 4, 2) result shows that interest rate (LINTR) and exchange rate fluctuations (LEXCR) have short run effect on the output of the manufacturing sector in Nigeria. The interest rate at lag 4 and

exchange rate at lag 2 have non-significant positive influence on the output of manufacturing sector in Nigeria. This implies that the both explanatory variables trigger manufacturing productivity in Nigeria.

Table 4: ARDL Bound test

| | | | |
|---|----------|----------|--|
| Null Hypothesis: No long-run relationships exist | | | |
| Test Statistic | Value | k | |
| F-statistic | 2.82584 | 2 | |
| | 1 | | |
| Critical Value Bounds | | | |
| Significance | I0 Bound | I1 Bound | |
| 10% | 3.17 | 4.14 | |
| 5% | 3.79 | 4.85 | |
| 2.5% | 4.41 | 5.52 | |
| 1% | 5.15 | 6.36 | |

Source: Author's computation

The ARDL bound test result indicates that no long run relationship exists among the

variables.

CONCLUSION AND RECOMMENDATIONS

This study explored the relative impact of interest rate and exchange rate fluctuations on the output of manufacturing sector in Nigeria. From the findings, it was revealed that interest rate and exchange rate fluctuations on the short run, trigger productivity of the

manufacturing sector in Nigeria. In view of this, the researchers recommended that control policies should be put in place to regulate the importation of goods that could be locally produced so as to improve the performance of the manufacturing sector in Nigeria.

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APPENDIX

Data Used

| Years | OMS (₦'BILLIONS) | INTR (%) | EXCR (₦/US\$1.00) |
|-------|------------------|----------|-------------------|
| 1986 | 38.65 | 10.50 | 2.0206 |
| 1987 | 43.22 | 17.50 | 4.0179 |
| 1988 | 63.52 | 16.50 | 4.5367 |
| 1989 | 72.90 | 26.80 | 7.3916 |
| 1990 | 84.27 | 25.50 | 8.0378 |
| 1991 | 110.60 | 20.01 | 9.9095 |
| 1992 | 153.47 | 29.80 | 17.2984 |
| 1993 | 221.23 | 18.32 | 22.0511 |
| 1994 | 354.66 | 21.00 | 21.8861 |
| 1995 | 414.13 | 20.18 | 21.8861 |
| 1996 | 477.95 | 19.74 | 21.8861 |
| 1997 | 546.71 | 13.54 | 21.8861 |
| 1998 | 620.20 | 18.29 | 21.8861 |
| 1999 | 713.82 | 21.32 | 92.6934 |
| 2000 | 826.03 | 17.98 | 102.1052 |
| 2001 | 989.11 | 18.29 | 111.9433 |
| 2002 | 1127.23 | 24.85 | 120.9702 |
| 2003 | 1304.07 | 20.71 | 129.3565 |
| 2004 | 1516.05 | 19.18 | 133.5004 |
| 2005 | 1778.73 | 17.95 | 132.1470 |
| 2006 | 2082.49 | 17.26 | 128.6516 |
| 2007 | 2401.19 | 16.94 | 125.8331 |
| 2008 | 2761.55 | 15.14 | 118.5669 |
| 2009 | 3170.82 | 18.99 | 148.8802 |
| 2010 | 3578.64 | 17.59 | 150.2980 |
| 2011 | 4527.45 | 16.02 | 153.8616 |
| 2012 | 5588.82 | 16.79 | 157.4994 |
| 2013 | 7233.32 | 16.72 | 157.3112 |
| 2014 | 8685.43 | 16.55 | 158.5526 |
| 2015 | 8973.77 | 16.85 | 193.2792 |
| 2016 | 8903.24 | 17.02 | 253.4923 |

Source: CBN Statistical Bulletin, 2016