

Oil Price Changes and Manufacturing Sector Output in Nigeria: A New Empirical Insight

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ABSTRACT

This study examines the relationship between global crude oil price fluctuations and the performance of Nigeria's manufacturing sector which is a key driver of industrialization and economic development. Given the volatility in international energy markets and their spillover effects on Nigeria's domestic productivity, the research investigates how oil price changes impact manufacturing costs, output, and pricing policies. Using the Autoregressive Distributed Lag (ARDL) model on secondary time-series data, the analysis finds significant short- and long-term effects, with oil price increases negatively affecting manufacturing output. This indicates that rising oil prices raise operational costs and suppress productivity, undermining economic growth. The study recommends diversifying Nigeria's energy sources to reduce reliance on volatile oil prices, enhancing local refining capacity to lower import dependence and cost inflation, and increasing investment in infrastructure and capital development to support manufacturing activities. Implementing these strategies would strengthen Nigeria's manufacturing industry, making it more resilient to global energy market fluctuations and fostering sustainable economic growth amid international instability.

Keywords: Oil Price, Manufacturing Sector, Real Effective Exchange rate, Lending rate.

INTRODUCTION

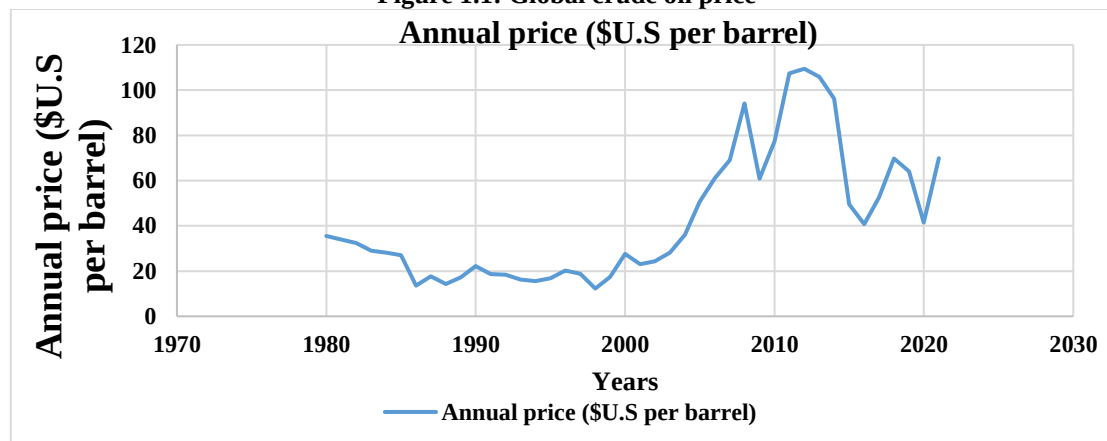
Energy aggregates constitute the foundational nexus of global macroeconomic productivity, accelerating aggregate supply and real economic growth (Ogbuabor et al., 2018; Belloumi & Aljazea, 2024). Nigeria operates within a unique structural paradox, functioning simultaneously as a net exporter of crude petroleum and a structural net importer of refined petroleum products (PwC Nigeria, 2025). Consequently, exogenous oil price shocks trigger profound transmission effects across domestic fiscal and monetary channels (Foye et al, 2026). While the hydrocarbon sector underwrites systemic capitalization, drives mechanized agriculture, and expands public infrastructure (NBS, 2025; Olujobi and Ape, 2025), its exploration incurs severe negative economic externalities.

At the microeconomic level, systemic oil spillages, gas flaring, and chemical toxicity release harmful greenhouse gases and disproportionately impoverish the host communities of the Niger Delta (Abubakar, 2025; Adeosun, 2018). This environmental degradation decimates traditional agrarian and aquaculture economies, fueling institutional friction, rent-seeking behavior, and social unrest (UNDP, 2024). Ultimately, prolonged fiscal over-reliance on a mono-product resource exposes the macroeconomic framework to extreme vulnerability from international commodity shocks, anchoring long-term structural imbalances and stalling diversification (Abubakar, et al, 2023).

Crude oil prices are determined by the interaction of supply and demand in the global commodity market (Arezki et al., 2017). Other factors that influence prices include OPEC's production decisions, natural disasters, and

political instability. The graph below illustrates fluctuations in crude oil prices over time. The price fell from \$32.51 per barrel in 1981 to \$12.28 in 1998, then rose from \$24.36 in 2002 to \$50.64 in 2005. It subsequently increased, reaching \$105.87 per barrel in 2013, before falling to \$49.49 in 2015 and \$40.76 in 2016. In 2020, the COVID-19 pandemic contributed to a sharp decline in global oil demand and prices. According to the series cited by the Central Bank of Nigeria (CBN, 2020), the price fell from approximately \$67 per barrel in January to \$28 per barrel in May.

Figure 1.1: Global crude oil price



Source: Authors' computation using data from OPEC annual statistical bulletin 2021

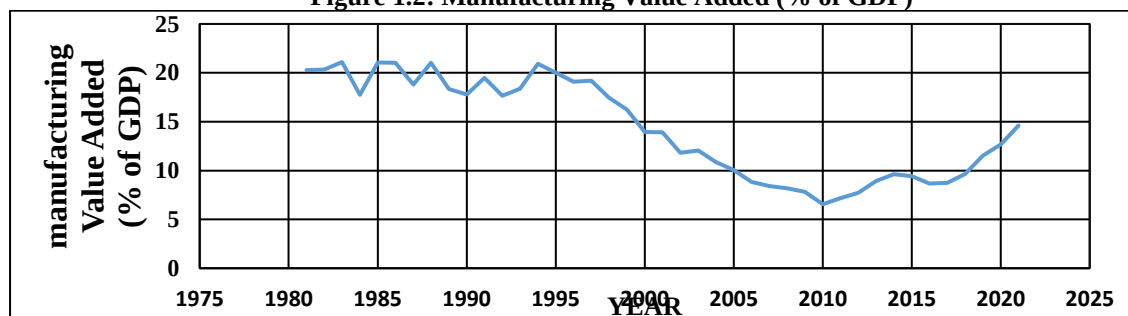
These fluctuations in oil prices affects the economy of Nigeria greatly being an oil-dependent country via various sectors like the manufacturing sector. Nigeria's economy depend largely on oil such that changes in oil prices can have extensive effects on the economy. As an oil exporting country, more than 90% of Nigeria's export earnings and above 80% of government revenue has been attributed to crude oil, (Ayadi, 2005). One way to guarantee continuous economic growth and higher volumes of investment is by the improvement of revenue and savings through higher oil prices. Iwayemi and Fowowe (2011) argued that, since Nigeria exports oil, increase in oil prices translates to faster economic growth. However, Nigeria being unable to independently refine its crude oil into petroleum product and as such is also an importer of petroleum products, the negative effect of oil price increases cannot be neglected. Soaring oil prices leads to higher costs of production. Hence, most technology dependent products that demand petroleum powered plants for production processes are mostly sourced from abroad. By implication, increase in oil prices results in importation of inflation and the depletion of the external reserves as a result of currency depreciation. These two conditions are unfavorable to real economic growth. Thus, higher oil prices can either expand the oil industry or prune output by deindustrializing other sectors of the economy. Explaining the impact of increase in crude oil price in Nigeria, Mordi & Adebisi (2010) opined that, as an oil importing country, an increase in the price of crude oil will lead to an increase in the cost of production which will subsequently lead to inflation and slow down of economic growth in Nigeria.

Nigeria got her independence since 1960 and since then, the country exports basically nothing aside raw materials (e.g. Crude oil). The development of any country especially that of the underdeveloped ones depends heavily on the growth of the manufacturing sector. The key sector that propels the production of goods and services, job creation and income improvement is the manufacturing sector. The transformation process of raw materials into finished goods is regarded as manufacturing. Manufacturing sector has the potential to employ millions of people and it's an important industry that creates most of the products citizens use on a daily basis. When the manufacturing sector is not performing well, it results in low manufacturing sector output. Low manufacturing sector output reduces the capacity of manufacturing as a source of employment generation. This indicates slower economic growth and scarcity of well-paying jobs for low-skilled and middle-skilled workers which tends to widen the inequality gap. If a factory happens to close down due to low productivity, middle-skilled workers will have to accept low-paying jobs in other sector like the service sector which contributes to a rise in income inequality. Furthermore, a reduction in the share of employment in the manufacturing sector implies a decline in the allocation of manufacturing value added in GDP signifying reduced economic growth. Low manufacturing sector output could result to inflation as too much money will be chasing fewer output, which will push the economy to turn towards importation. Increased importation will result in unfavorable balance of payment.

The manufacturing sector in Nigeria is affected by several factors aside oil price variations. The challenges ranges from inadequate electricity supply, heavy dependence on agricultural inputs, government expenditure on manufacturing sector, interest rate, inflation, insecurity, real exchange rate, to poor infrastructure and poor

maintenance which themselves are as well vulnerable to shocks (Chinanufe, et al 2019, Orji, et al 2015 and NBS 2025). Data from WDI shows that, the manufacturing sector has gone through many phases of expansion and decline since the 1980s. Review of the manufacturing sector performance is illustrated in figure 1.2 below. The trend in the manufacturing sector output shows that the manufacturing sector is underperforming. Output was \$33.33B in 1981, and fell to a minimum of \$5.20B in 1993, subsequently, output has been on the rise from \$9.53B in 1998 to \$64.41B in 2021. Percentage contribution of manufacturing sector (MVA) to GDP was dwindling between 20%, 19%, 18% to 17% between the years 1981 to 1998. Contribution to GDP started decreasing continuously from 1995 and was lowest in 2011 with percentage contribution of 7.17%. Since 2011, MVA has been increasing to 9.42% in 2015, it reduced to 8.7% in 2017 but has been increasing to 14.61% in 2021 which is still below the value it was in 1981 (i.e., 20.26%).

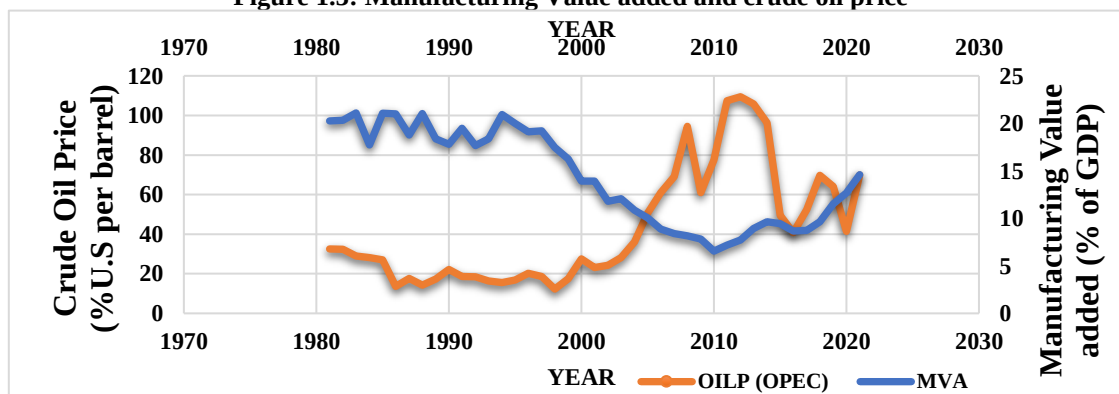
Figure 1.2: Manufacturing Value Added (% of GDP)



Source: Authors' computation using data from WDI

From both the supply and demand side, high crude oil prices are likely to make production costlier for businesses and make it more expensive for individuals or households to purchase goods (Eneji, Mal-lafia and Nnandi (2016)). Surge in oil price increases cost of production which in turns reduces purchasing power of consumers leading to reduced demand, investment and subsequently employment. However, reduction in oil prices serves as incentive for increased investment/production at lower cost leading to higher demand and subsequently increased output and economic growth. Increase in output leads to increased export resulting in favorable balance of payment. Currently, Nigeria is facing the issue of underperformance of the manufacturing sector. Notable among the challenges faced by the manufacturing sector is the fluctuations in the prices of crude oil prices. These fluctuations in oil prices is expected to affect the manufacturing sector which is shown in the figure below.

Figure 1.3: Manufacturing Value added and crude oil price



Source: Authors' computation using data from WDI and OPEC

In the figure above, the effect of oil price change on the manufacturing sector can be clearly seen. Manufacturing value added decreases as crude oil price increases. At lower crude oil price, manufacturing value added was high but at higher crude oil prices, manufacturing value added was low.

Fluctuations in oil prices have significant implications for the manufacturing industry because petroleum products serve as key production inputs. Increased oil prices tend to increase the cost of production in firms. Such increased prices result in overall prices and reduced growth. This is cost-push inflation: petroleum becomes expensive, and the products produced using petroleum products turn out to be expensive and the petroleum-dependent sectors of the economy, too, are more expensive. Due to the fact that the manufacturing sector of Nigeria continues to face issues, the government has established numerous policies to enhance the performance of industries as well as

encourage the national growth. As an example, an import-substitution industrialization strategy was implemented in the country in the First National Development Plan (1962-1968). This was aimed at reducing dependence on finished imported products, retaining the foreign exchange, and increasing production at the domestic front (CBN, 2003). The plan was further enhanced by the oil boom of the Second National Development Plan (1970-1974) but the manufacturing continued to be reliant on imported inputs due to the poor technological capabilities in Nigeria. The oil price crash of the early 1980s all over the world had seriously lowered the export income leaving most of the import-dependent industries unsustainable. Later policy responses such as stabilization of 1982 and restrictive monetary and exchange-control policies of 1984 did not have much output. All these challenges eventually resulted in the Structural Adjustment Programme (SAP) that was adopted in 1986. SAP was meant to minimize the high dependency of the economy on crude oil and it was intended to promote non-oil exports particularly manufactured goods (CBN, 2003). Despite these reforms, the contribution of the manufacturing subsector has continued to decline.

Several research studies have been carried out concerning the impact of oil price changes on different sectors in different economies. These studies include; Jiranyakul (2006) for Thailand, Alper and Torul (2009) for Turkey, Mehrara and Sarem (2009) for Indonesia, Iran, and Saudi Arabia, William, and Emmanuel (2015) for Ghana, Yasmeen et al (2019) for Pakistan and Nagmi (2019) for Libya. Domestically, some Nigerian studies have been more focused on the impact of oil price on the aggregate economy instead of looking at it from a sectoral perspective. These studies include; Ejapuwa and Ejumedia (2012), Ejapuwa et al (2012) and that of Loto (2012), Gummi, Hasan and Mu'azu (2018), Ibrahim et al (2014) and that of Ogboru (2017), Ejapuwa and Ejumedia (2012) as well as the findings of Loto (2012), Ogboru (2017), Ergin & Abdullahi (2018), Taofik (2018), Ogbuabor, et al (2018), Orji et al (2025 and 2019), Ugbaka (2020), Iganiga et al (2021), Colins et al (2022), Sani et al (2023), Oyalabu et al (2023), Sule-Iko in 2023. All these studies found different results on the relationship between oil price and the macroeconomic variables that were investigated but none focused explicitly on the manufacturing sector.

Given the significance of Nigeria's manufacturing sector and the challenges it faces, it is essential to investigate the factors influencing its output. This study aims to explore the relationship between oil prices and manufacturing sector performance in Nigeria, analyzing their interactions both in the short term and long term to inform effective policy decisions. Additionally, the research will assess how oil price volatility impacts the manufacturing industry, providing insights into strategies for economic growth. The structure of the paper is as follows: Section 2 details the methodology, while Sections 3 and 4 focus on the analysis of findings and the concluding remarks, respectively.

METHODOLOGY

This study aims at investigating the impact of fluctuations in the price of crude oil on the level of production in the manufacturing sector in Nigeria. The manufacturing industry is a major consumer of oil as one of the main production factors. We rely on the annual data of 1981 to 2021 that is provided by the Statistical Bulletin of Central Bank of Nigeria (2021), the Annual Statistical Bulletin of Organization of Petroleum Exporting Countries (2021), and the World Development Indicators (WDI, 2025).

The theoretical foundations are of the mainstream growth model of Samuelson and Nordhaus. This model explains that the primary factor in the growth of the economy is production. The most important thing in production is the transformation of resources into usable products which are primarily dependent on energy. It is against this perspective that the paper examines the effects of the decision to change the prices of crude oil to the manufacturing industry.

This we accomplish by examining a production function, which is: $Y = f(L, K, E)$

Production function is very common in the economic studies and it can include more standard inputs as compared to the basic factors of production. Considering the availability and accessibility of data for this research, the analysis focused on the following key variables, leading to:

$Y = f(\text{OILP}, \text{REER}, \text{LENR}, \text{INFL}, \text{FGCE})$

The Model

According to Koustoyiannis (1997), the initial and most crucial step in conducting an econometric analysis of any relationship is to clearly define and specify the model that will be used to empirically explain the phenomena.

2.1.1: Model specification

The econometric model specification is given as:

$$\text{LMVA}_t = \beta_0 + \beta_1 \text{LOILP}_t + \beta_2 \text{REER}_t + \beta_3 \text{INFL}_t + \beta_4 \text{LEND}_t + \beta_5 \text{LFGCE}_t + \mu_t \quad (3.3)$$

Where,

β_0 = is the intercept term for regression, μ_t = Stochastic error term

t = time, which is used because we are dealing with time series data.

L =log operator

All other variables are as defined below.

The Generalized ARDL (p, q) model is expressed as:

$$Y_t = \alpha_0 + \sum_{i=1}^p \pi_{2i} Y_{t-i} + \sum_{i=1}^p \pi_{2i} X_{t-i} + w_t \dots \dots \dots (3.4)$$

Where:

p and q do not necessarily imply symmetry in lag lengths,

p represents the optimal lag length for the dependent variable,

q indicates the optimal lag length for the independent variables.

2.1.2: ARDL Model Specification

$$\Delta LMVA_t = \alpha_0 + \sum_{i=1}^p \Phi_i \Delta LMVA_{t-i} + \sum_{i=0}^p \theta_i \Delta LOILP_{t-i} + \sum_{i=0}^p \mu_i \Delta REER_{t-i} + \sum_{i=0}^p \Psi_i \Delta INFL_{t-i} + \sum_{i=0}^p \Omega_i \Delta LENDR_{t-i} + \sum_{i=0}^p \varphi_i \Delta LFGCE_{t-i} + \delta_1 LOILP_{t-1} + \delta_2 REER_{t-1} + \delta_3 INFL_{t-1} + \delta_4 LENDR_{t-1} + \delta_5 LFGCE_{t-1} + \omega_t \dots \dots \dots (3.5)$$

Where:

Δ denotes the first difference operator.

Parameters α_1 - α_5 represent the short-run relationship coefficients.

Parameters β_1 - β_5 denote the long-run relationship coefficients.

$(t - i)$ indicates the lagged term of the respective variables.

Σ and ω_i signifies the summation operator and the error term of the equation.

All other variables are as defined above.

Definition of Variables

MVA means Manufacturing Value Added which measure the manufacturing sector contribution to the economy. OILP stands for Crude Oil Price which refers to the spot price of a barrel of oil in the international market. REER represents Real Effective Exchange Rate. INFL stands for Inflation, which depicts a continuous rise in general prices of goods and services. LENDR means lending rate. This emphasizes the role of the financial sector in the economy. GCE stands for Gross Capital Expenditure. Government capital expenditure is the finances that the government uses in long term development projects like machinery, infrastructure, schools and roads. This variable is incorporated since such expenditure is in favour of manufacturing sector in Nigeria as it gives the necessary infrastructure to aid in production.

2.3 Estimation Technique

This study utilized the ARDL estimation method, originally developed by Pesaran and Shin (1999) and subsequently extended by Pesaran and colleagues. The ARDL approach is particularly suitable for scenarios where the variables in the model are integrated at different levels, especially when they include a combination of $I(0)$ and $I(1)$ processes.

EMPIRICAL RESULTS AND DISCUSSION

Unit Root Tests

The unit root test is performed to examine whether the variables in this study are stationary, essentially assessing how they behave and evolve over time.

Table 3.1 Augmented Dickey-Fuller unit root test results

variables	ADF stat at level	5% Critical Value	ADF stat at first difference	5% Critical Value	Order of Integration	Conclusion
LMVA	0.041103	-3.526609	-5.703421	-3.529758	I(1)	Stationary @ first difference
LOILP	-2.442508	-3.526609	-5.150919	-3.533083	I(1)	Stationary @ first difference
REER	-2.861346	-3.529758	-4.797941	-3.529758	I(1)	Stationary @ first difference
INFL	-4.484769	-3.529758	—	—	I(0)	Stationary @ levels
LENDR	-1.683745	-3.526609	-6.286284	-3.529758	I(1)	Stationary @ first difference
LFGCE	-1.455709	-3.526609	-6.767955	-3.529758	I(1)	Stationary @ first difference

Source: Authors' construct using EViews' output

As the ADF unit root test results given in Table 3.1 indicate, the majority of variables are stationary, and they do not have a unit root. Very few variables are stationary when first differenced, with the exception being INFL which is already a level stationary variable. As noted by Pesaran et al. (2001), a key requirement for applying the ARDL model is a combination of variables integrated at different orders. This feature is fulfilled by the stationarity pattern of these results. It offers an appropriate background to the discussion in this paper.

Bounds test for Co-integration

The cointegration test is used to examine the existence of two or more non-stationary variables with a stable long-term relationship. As Gujarati (2013) explains, economic relationships are often expressed in equilibrium, and variables are considered cointegrated when they move together over time.

Table 3.2: Bounds Test for Co-Integration Result

Table 3.1: Bounds Test for Cointegration Result			
Test Statistic	Value	k	Result Cointegration
F-statistic	5.01016	5	
Critical Value Bounds			
Significance	I0 Bound	I1 Bound	
10%	2.75	3.79	
5%	3.12	4.25	
2.50%	3.49	4.67	
1%	3.93	5.23	

Source: EViews' Output

From table 3.2, the results showed that the F-statistic from the Wald test exceeds both the lower and upper critical values at the 5% significance level. Consequently, the null hypothesis is rejected, indicating that the variables are cointegrated. This confirms the existence of a stable long-term relationship among them. Based on this, the study proceeds to estimate both short- and long-term models, incorporating an Error-Correction Model (ECM) to capture the speed at which the system returns to equilibrium.

Result of the Estimated Long-Run Coefficient of the ARDL

Table 3.3. Long-Run Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOILP	-0.62341	0.082235	-7.580802	0.0001
LENDR	-0.642589	0.28107	-2.286222	0.0516
INFL_CPI_	-0.295977	0.101969	-2.902612	0.0198
LFGCE	0.128689	0.059283	2.170749	0.0617
REER	-0.278006	0.148722	-1.8693	0.0985
C	8.762803	1.850215	4.736099	0.0015
@TREND	-0.031973	0.009605	-3.328582	0.0104
R-Squared = 0.995693		F-Statistics = 66.052223		Durbin-Watson stat = 2.975198
Adjusted R-squared = 0.980619		Prob(F-statistics)= 0.000001		

Source: Researchers' construct using EViews' Output

The long-term results indicate that, apart from federal government capital expenditure, variables such as oil price, lending rate, inflation rate, and the real effective exchange rate have a negative effect on Nigeria's manufacturing sector output. These findings are consistent with both economic theory and the a priori expectations of this study, except for the real effective exchange rate. The manufacturing sector in Nigeria heavily relies on imported raw materials and capital equipment for production; therefore, an appreciation of the exchange rate is generally expected to benefit the sector more than devaluation. However, the negative impact observed can be attributed to imported inflation driven by high oil prices, which outweighs the potential benefits of lower import costs for other inputs. Additionally, when imports become cheaper, consumers tend to prefer foreign goods over domestically produced ones, leading to reduced demand for local products, which discourages production and diminishes output.

3.6 Short-Run Coefficient Estimate

Table 3.4 ARDL Model Short Run & ECM Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMVA(-1))	0.2083	0.2755	0.7559	0.4573
D(LMVA(-2))	0.5943	0.2035	2.9199	0.0077
D(LOILP)	-0.0351	0.0710	-0.4951	0.6252
D(LOILP(-1))	0.2977	0.0824	3.6122	0.0015
D(LENDR)	-0.4239	0.1290	-3.2854	0.0032
D(LENDR(-1))	0.0512	0.1421	0.3606	0.7217
D(LENDR(-2))	0.1642	0.1154	1.4230	0.1681
D(INFL_CPI_)	0.0862	0.0357	2.4108	0.0243
D(LFGCE)	0.0048	0.0194	0.2475	0.8067
D(REER)	-0.1664	0.0674	-2.4688	0.0214
ECM(-1)	-0.1090	0.2417	...-0.4508	0.6563

Source: Researchers' construct using EViews' Output

Table 3.4 presents the short-term coefficients. Notably, the current period crude oil price has a negative coefficient of approximately -0.035187. This indicates that, all else being equal, a 1% increase in crude oil price results in an average decrease of 0.035187 in manufacturing sector output (MVA), suggesting that higher oil prices negatively impact the manufacturing sector. Conversely, in previous periods, crude oil price exhibited a positive effect on manufacturing output, with a coefficient of about 0.297738. This finding contradicts the a priori expectation but aligns with the results of Gummi, Adamu, and Asiya (2018), who found that oil prices have a positive and statistically significant impact on manufacturing output at the 5% significance level.

The error correction term is -0.109013, indicating that approximately 10.9% of any deviation from equilibrium in the short run will be adjusted within a quarter, restoring the system toward its long-term equilibrium.

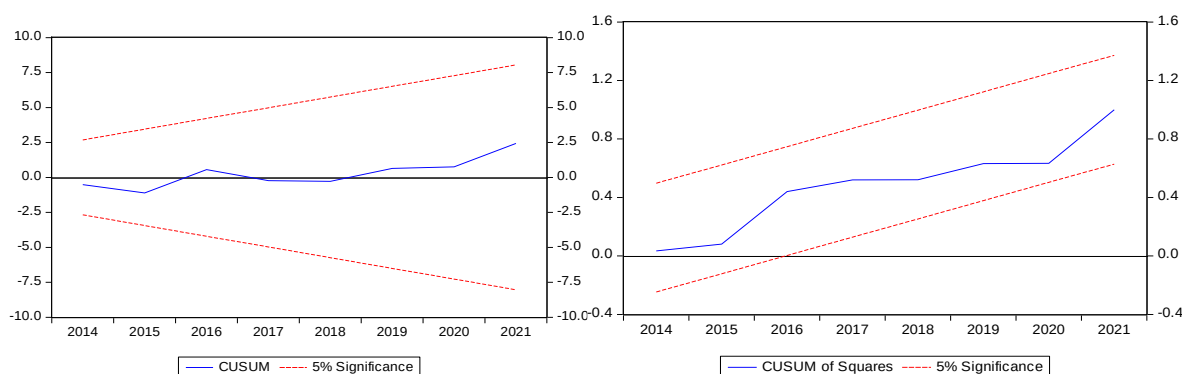
Diagnostics Test

Serial correlation, heteroskedasticity, normality, and specification bias diagnostic tests are presented in the table below. Based on the results, the model successfully went through all tests since the study did not reject the null hypothesis of all tests since the p-values were insignificant.

Tests	Test Statistics	Prob.Value
Serial Correlation	4.21514	0.1215
Heteroskedasticity	19.7145	0.1394
Normality	0.280614	0.869091
Ramsey Rest Tests	0.027933	0.8688

Source: Authors' Computation Using EViews Version 9

Furthermore, the stability of the model was evaluated using the CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMQ (Cumulative Sum of Squares of Recursive Residuals) tests. The findings reveal that the recursive residuals in both tests stay within the two critical boundary lines, suggesting that the estimated model and its parameters are stable over time. This stability is visually demonstrated in the figure below.



4 CONCLUSION AND RECOMMENDATIONS.

The paper reveals that fluctuations in the oil prices, inflation, lending rates, and the real effective exchange rate decrease manufacturing production whereas federal capital expenditure increases production. It also ascertains a long-term relationship between output and these things. In case the external shocks strike the job creation, it would take the sector approximately ten years to re-establish the long-run equilibrium.

The study shows statistically significant decrease in manufacturing output with an increase in oil prices and this proves a long-term relationship. These findings can be utilized by policymakers in crafting economic strategy. The policy experts, stakeholders, researchers, investors, and think tanks should translate the recommendations to practical and efficient strategies in the manufacturing sector of Nigeria which is a significant exporter of crude oil and petroleum products. The report recommends that the government should put in place regulatory mechanisms that will ensure that the rates charged by commercial lending are maintained at a low level. This will stimulate more investment in production which will increase production, productivity, employment, and exports. They should also work on diversifying energy sources in order to ensure the sector is less susceptible to changes in the price of oil. More investment in infrastructure and capital development will also help in manufacturing. There is also the recommendation to keep a stable exchange -rate regime. Lastly, the government must be keen on constructing operational refineries to refine crude oil in the country so that it does not rely on imports and instead, it alleviates inflationary pressures.

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