EMPIRICAL EVIDENCE FROM NIGERIA ON THE RELATIONSHIP BETWEEN INFLATION AND MANUFACTURING GROWTH

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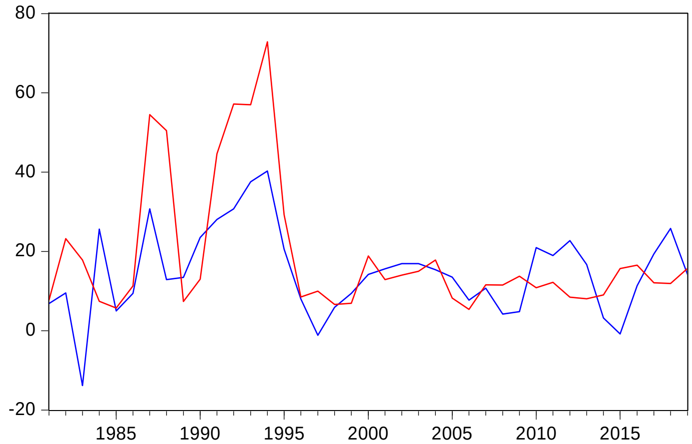
ABSTRACT
This research investigated the relationship between inflation and Nigerian manufacturing sector growth between 1981 and 2019, utilizing performance measures such as inflation rate, money supply, and gross domestic investment. The data was collected from secondary sources such as the Central Bank of Nigeria's Statistical Bulletin and the World Bank. The major finding is that in the short and long run, inflation and manufacturing sector growth are unrelated. Changes in Nigeria's inflation rate do not explain changes in the manufacturing sector's growth. The data also suggest that inflation does not assist producers with pricing power and that a fall in money supply has resulted in a decrease in manufacturing sector growth. The paper suggests that policymakers make huge investments in infrastructures that is insufficient, such as power supply and road network.
Keywords: Manufacturing; Growth; Inflation; Regression.
Jel Code: O14; O47; E31; C32.

1 INTRODUCTION
When the price of manufactured goods in a country rises, it affects the entire economy. Rising prices of these goods, known as inflation, impact the purchasing power of citizens. Inflation can be both advantageous and detrimental to the manufacturing sector. If inflation gets extremely high, the manufacturing sector may suffer; on the other hand, if inflation is kept under control and at normal levels, the manufacturing sector may thrive. With controlled, reduced inflation, the manufacturing sector's output will rise as a result of increasing demand, resulting in greater employment.

The manufacturing sector has recorded significant growth in the last four decades, with over 14 percent growth in the last decade (CBN, 2020). The impressive growth was attributable to the immense natural resources and the entrepreneurial spirit of Nigerians. Within the period of study, the manufacturing sector recorded its highest growth in 1994 (40 percent) and lowest in 1984 (-13 percent); see figure 1. Nigeria Inflation in the last four decades has averaged 19 percent and has impeded and distorted consumer spending by rising domestic prices relative to foreign prices. The trend inhibited exports and enhanced imports, thus depleting the nation's scarce foreign resources.

As a result of the inflationary situation, manufacturers discover that the value of their savings is eroding, forcing them to increase their current spending, thereby impeding capital development and the manufacturer's output. Inflation works against the manufacturer's long-term savings goal and hence plays a role in improving an unsatisfactory lifetime production pattern for the manufacturer.

Figure : Growth Rate of Manufacturing Sector and Inflation Rate (1981-2020)



Source: CBN Statistical Bulletin, 2020

The link between inflation and economic growth, as measured by output growth over time, is undeniable; inflation depreciates the value of the currency, preventing the same bundle of goods and services from being consumed tomorrow, resulting in a reduction in consumption capacity and, as a result, output growth (Obi, Yuni, & Ihugba, 2016). However, empirical data differs in terms of whether it has a positive or negative impact on economic growth, as well as whether it has a significant impact or not, depending on the countries studied, the periods covered, and the methodology used. According to Temple (2000), there is no "conclusion" regarding the theoretical impact of inflation on growth, whereas López-Villavicencio & Mignon (2011) believe that the effects of inflation on growth are primarily determined by how money is introduced into the models, and they report mixed evidence of an inflation-growth relationship. Sidrauski (1967) similarly included money in the utility function in the 1960s, and his results show a transitory effect of inflation on output growth. "Money growth has no significant effect on the steady state," he says.

Loto (2012) discovered that variables such as capacity utilization (CU), inflation rate (INF), and lending rate (LR) both had a favorable but small impact on Nigerian manufacturing performance from 2005 Q1 to 2006 Q4 and 2007 Q1 to 2008 Q4. Chaudhry, Ayyoub, & Imran (2013) discovered a considerable detrimental effect of inflation on Pakistan's manufacturing sector from 1972 to 2010. Houthakker (1979) discovered that changes in output at the industrial level are certainly associated with price changes, but that the association is predominantly negative. The purpose of this study is to evaluate Houthakker's observation using aggregated industrial production growth.

The few empirical studies that have explored the relationship between inflation and manufacturing sector production have yielded inconsistent results, which spurred the current study. The following are the research questions that underlie the paper: (1) What is the nature of the short-run link between inflation and output in the manufacturing sector? (2) What is the nature of the long-run link between inflation and output in the manufacturing sector? The study is predicated on the notion that inflation has a considerable short- and long-run impact on manufacturing sector output. The remainder of the paper is organized thus: the next section is the review of related literature, while the third is on the methodology of the study. This is followed by a presentation and discussion of the findings in Section 4, while Section 5 concludes the study.

2 LITERATURE REVIEW

1 Theoretical

The link between inflation and growth's theoretical underpinnings is still up for debate. Early studies by Mundell (1963) and Tobin (1965) contended that inflation and economic growth were positively correlated. They contended that real-money balance and investment are interchangeable terms. Stockman (1981), in contrast to Tobin and Mundell, has established that inflation has a detrimental effect on economic growth. Stockman believed that real-money balance and investment went hand in hand. By assuming that money is superneutral, Sidrauski (1967) concluded that there is no connection between inflation and economic growth. Monetarists concur that inflation happens when the money supply expands more quickly than the pace of economic expansion. They claim that because the money supply influences inflation, the government should enact monetary policies that lessen it. Additionally, a decline in the money supply causes the unemployment rate to rise, which slows down economic growth because inflation is harmful to it (Snowdon & Vane, 2005). According to structuralists, inflation is crucial for growth in developing countries (Guru, 2016). According to the endogenous growth theory, human capital taxation causes inflation to have a detrimental impact on economic growth (Lucas, 1988).

2 Empirical

Modebe & Ezeaku (2016) used annualized time-series data from 1982 to 2014 to investigate the effect of inflation on manufacturing sector performance in Nigeria, with the main goal of investigating the short-run and long-run relationship between them. In the estimations, Johansen's cointegration test, the Granger causality test, and the vector error correction model (VECM) were used. The baseline regression results show that inflation and interest rates have a negative and non-significant impact on manufacturing sector growth, whereas exchange rates appear to have a positive and significant impact on manufacturing sector value-added growth. The Granger causality results show a unidirectional connection from exchange rate to output growth. Inflation and interest rates, on the other hand, are not causal for production growth, viz.

Using annual time series data for Ghana, Bans-Akutey, Yaw, & Mohammed (2016) investigated the effect of inflation on manufacturing sector productivity from 1968 to 2013. The Johansen test (JT), the Vector Error Correction Model (VECM), and the Ordinary Least Squares (OLS) regression test were used for empirical verification. Their findings point to a considerable long-run consistent link between inflation and manufacturing sector productivity. The VECM analysis, however, revealed an insignificant short-run connection between inflation and manufacturing sector productivity. The OLS test results show a negative significant relationship between inflation and manufacturing sector productivity. According to the data, inflation has resulted in a decline in manufacturing sector productivity. According to the study, policymakers should carefully manage inflation to boost manufacturing sector productivity.

Mbutor (2014) examined the impact of money supply on inflation in Nigeria. According to the impulse response function, there is a consistent positive link between inflation and money supply. The variance decomposition of inflation, on the other hand, revealed that GDP was the most important contributor to inflationary developments in Nigeria, and that money supply accounts for less than half of aggregate price changes. According to Umaru & Zubairu (2012), inflation has a beneficial impact on economic growth through increasing productivity, production level, and total factor productivity. In contrast, Eze (2015) found that inflation is inversely associated with economic growth in his analysis.

Chaudhry, Ayyoub, & Imran (2013) investigated the influence of CPI inflation on Pakistan's overall economic growth. Using OLS methodology and annual time series data (1972–2010), they show that an increase in inflation affects the growth of agriculture, manufacturing, and services in distinct ways. They discovered an adverse link between consumer pricing index (CPI) inflation and manufacturing sector growth, whereas inflation was shown to stimulate agricultural and service sector value-added growth. They recommend that inflation should be kept to single digits in general.

Mwakanemela (2013) used time-series data from 1990 to 2011 to investigate the impact of inflation on economic growth in Tanzania. To analyze the data, the study used the Johansen co-integration test. Inflation harms economic growth, according to the findings. The study also found a long-run link between inflation and economic growth in Tanzania during the study period. Bakare, Kareem, & Oyelekan (2015), on the other hand, examined the influence of inflation on economic growth and development in Nigeria. According to Mamo (2012), the debate between inflation and growth is not just about whether there is a positive or negative relationship between them, but also about the necessity to determine the causal direction between these two components. Some research suggests that the relationship between inflation and economic activity is unidirectional, whilst others show bidirectional, or even no, causality. Understanding these obvious conflicts, the purpose of this study is to investigate the link and causality between inflation and manufacturing sector growth in Nigeria.

Logue & Sweeney (1981) used industrial production growth as a proxy to quantify the variability of real economic growth in 24 nations. Using annual data, they discovered a positive association between the average inflation rate and the unpredictability of real economic growth. Their findings underline the significance of paying more explicit attention to the influence of inflation on output variability. Their analysis is based on previous research that suggests a positive association between higher average rates and increased volatility in inflation. This link has been observed to increase the level of uncertainty in production, investment, and marketing decisions, resulting in more unpredictability in actual growth. By taking into account sectoral growth variations and inflation.

Scan & Osberg (1998) were unable to discover a significant relationship between production growth variability and inflation from 1961:1 to 1995:4. They use quarterly data from 131 Canadian industries, excluding the public sector, and divide the sample primarily into goods and services sectors. Furthermore, they show that the variances of sectoral production growth and inflation (the first difference of the logarithm of the GDP deflator) are connected. Their research shows that achieving reduced inflation is a difficult task due to the influence monetary policy has on the real exchange rate. The essential element of their findings, which are equally relevant to our research, is that they have separated between goods-producing and service-producing industries. This is especially significant since service businesses often smooth output in response to short-term relative pricing volatility. After eliminating lagged inflationary values from the model, their findings demonstrate that the coefficients of inflation factors are inconsequential in the goods sector but substantial in the service sector.

3 METHODOLOGY

This paper employs a vector error correction method (VECM) to analyze the effect of inflation on the growth of Nigeria's manufacturing sector using Johansen's cointegration analysis to determine the long-run relationships between the variables. The stochastic properties of the data will be checked before estimating the cointegrated VAR using the Augmented Dickey-Fuller (ADF) and Phillips–Perron unit root tests.

1 Data Sources

The analysis relied on secondary data from the Nigerian Central Bank and the World Bank. The study's time frame ranges from 1981 to 2019. Except for the inflation rate, all data for time series processing will be converted to a log-log equation. As a result, the coefficient might be regarded as elastic. The variables and their sources are listed in Table 1.

Table 1: Measurement of Variables and Data Sources

S/No	Variables	Measurement	Expected sign	Sources of Data
1.	Manufacturing sector's growth rate (MGRT)	It measures the percentage change of manufacturing sector's output within the period of study (1981-2019).		Central bank of Nigeria (CBN) statistical bulletin volume 30, December 2019
2.	Inflation rate (INF)	Annual percentages of average consumer prices a year-on-year change	Negative	https://data.worldbank.org/indicator
3.	Gross domestic investment (GDI)	This refers to government expenditure on machinery, plant, equipment purchases and land improvements (fences, drains, ditches, and so on). It also includes the construction of railways, roads, private residential dwellings, and industrial buildings.	Positive	https://data.worldbank.org/indicator
4.	Labour force (LF)	Comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but	Positive	https://data.worldbank.org/indicator/LF

		seeking work as well as first-time job-seekers.		
5.	Money supply (MS)	Money Supply (in billions), total quantity of money in circulation at a point in time. (In billions)	Positive	Central bank of Nigeria (CBN) statistical bulletin volume 30, December 2019

Source: Compilation of Researchers, 2023

2 Model Specification

The baseline model for this study will be patterned after Modebe & Ezeaku (2016) which examined inflation and manufacturing sector performance in Nigeria: The model applied in the study is of the form;

$$MANGR = \beta_0 + \beta_1 INFL_t + \beta_2 INTR_t + \beta_3 EXR_t + U \qquad (1)$$

Where, MANGR = Annual growth rate for manufacturing value added, INFL = Inflation, EXR = Exchange rate, INTR = Interest rate, ε = Error term, β_0 = Constant term, and β_1 = Parameter estimate. The above model was modified to suit our purpose hence we represent our baseline equation thus;

$$LMGRT_t = \beta_0 + \beta_1 INF_t + \beta_2 LGDI_t + \beta_3 LMS_t + \beta_4 LF_t + \varepsilon \qquad (2)$$

In the production function, LMGRT is the natural log of manufacturing sector growth rate; LGDI is the natural log of gross domestic investment; LMS is the natural log of money supply; LF is the natural log of labour force; β_0 is the intercept or autonomous parameter estimate; $\beta_1 ..... \beta_4$ is the Parameter estimate associated with the determinants of manufacturing growth in Nigeria and ε is the stochastic error term.

The estimated approach is broken down into six steps: the unit root test, lag selection, cointegration test, estimation of the error correction model, Granger causality, and VAR stability model. The unit root test is the first stage in the estimated approach. The following hypotheses are used to examine the relationship between MGRT and INF, GDI, MS, and LF, as well as their co-integration: There are two questions that need to be answered: (i) Does LMGRT have a short-term relationship with the independent variables in Nigeria? (ii) Does MGRT have a long-term relationship with INF, GDI, MS, and LF in Nigeria?

4 RESULTS AND DISCUSSION OF FINDINGS

1 Analysis of Result

Prior to the estimation of the error correction model, time series stationary is tested through Augmented Dickey-Fuller and Phillips–Perron unit root tests to determine the order of integration. The unit root test results are presented below.

Table 2: Unit Root Test Result

Variables	ADF Test Statistic				PP Test Statistic			
	Constant	Constant & Trend	None	First Difference	Constant	Constant & Trend	None	First Difference
LMGRT	-0.95	-1.50	4.39	-7.48*	-1.12	-1.56	4.03	-7.40*
INF	-2.91	-4.01*	-1.92	-5.68*	-2.78	-2.86	-1.79	-9.69*
LGDI	-0.76	-0.75	4.39	-4.63*	-0.74	-1.25	3.46	-4.60*
LMS	-1.38	0.52	0.47	-3.66*	-1.12	-0.41	3.77	-3.71*
LF	0.50	-1.49	2.83	-5.94*	0.56	-1.49	2.85	-5.94*

Notes (ADF): Test critical values at 5% (At level: constant = -2.94, Constant and trend = -3.53, none = -1.92 while at First difference = -2.94); P-value= Probability value, * signifies stationarity.
Notes (PP): Test critical values at 5% (At level: constant = -2.92, Constant and trend = -3.53, none = -1.94 while at First difference = -2.94); P-value= Probability value, * signifies stationarity.

When examined at levels with a constant, constant & trend, and none, all variables are non-stationary, as indicated by the asterisk. Because the series is not stationary when examined at constant and trend, it is argued that they are non-stationary at the level, except for inflation, which is stationary at constant and trend. However, ADF tests are frequently influenced by the lag length (p) chosen and lose power when estimating a large sample. As a result, the results of the ADF tests are confirmed by the Phillips–Perron (PP) test. As a result, we infer that all series are stationary at first difference because data is stationary when the PP test statistics are less than the test critical values of $5\%(ADF\ test\ \ statistics < test\ critical\ value\ at\ 5\%)$.

2 Lag Determination

The results of lag-order selection are shown in Table 3. The lag order for the SC, HQ, and FPE selection criteria is one, while the lag order for the AIC selection criteria is three. Because AIC has the lowest value, the investigation will move on to other tests using lags (3).

Table 5: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-63.15719	NA	3.03e-05	3.786510	4.006444	3.863273
1	130.7093	323.1107	2.60e-09*	-5.594959	-4.275360*	-5.134383*
2	150.0942	26.92359	3.86e-09	-5.283013	-2.863748	-4.438625
3	185.5392	39.38331*	2.73e-09	-5.863290*	-2.344359	-4.635089

Source: Researcher's calculations from EViews 9, 2023. * Indicates lag order selected by the criterion

The Johansen method was used to determine the existence of a long-run relationship between the variables. The results in Table 4 showed a long-run relationship, as the test indicated three co-integrating equations for the Trace statistic and two co-integrating equations for the Max-Eigen Statistic.

Table 4: Johansen Cointegration Results

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	133.9985	69.81889	0.0000	None *	65.45943	33.87687	0.0000
At most 1 *	68.53911	47.85613	0.0002	At most 1 *	37.43081	27.58434	0.0020
At most 2 *	31.10830	29.79707	0.0351	At most 2	17.28288	21.13162	0.1591
At most 3	13.82542	15.49471	0.0879	At most 3	7.944814	14.26460	0.3843
At most 4 *	5.880610	3.841466	0.0153	At most 4 *	5.880610	3.841466	0.0153

Source: Researcher's calculations from EViews 9, 2023.
* Denotes rejection of the null hypothesis at the 0.05 level

3 Estimation of the Vector Error Correction Model (VECM)

To determine the most accurate model for the empirical relationship between the growth of the manufacturing sector in Nigeria and other variables, two vector auto-regression models (VAR and VEC) were developed using the same variables. The VEC model was effective as a confined substitute, even though it was less structural than the VAR. In the meantime, the VAR was meaningless because the variables had a cointegration connection, as indicated in Table 4 of the results. The ideal model to utilize in this situation is the Vector Error Correction Model (VECM). The findings of the vector error correction model (VECM) for the first, second, and third cointegrated series are displayed in Table 5. Two sections are used to provide the results: the first portion shows the cointegrating equations, and the second section shows the outcomes of the vector error correction models. The results of the regression are shown in Table 8.

Table 5: The Result of Vector Error Correction Model

Cointegrating Eq	**CointEq1**	**Std. Error**	**t-Statistic**		
LMGRT(-1)	1				
INF(-1)	-0.02413	-0.0104	[-2.32084]		
LMS(-1)	-9.98063	-1.53702	[-6.49348]		
LGDI(-1)	7.729062	-1.63892	[4.71594]		
LF(-1)	47.10741	-6.01889	[7.82659]		
C	-425.689				
Error Correction:	D(LMGRT)	D(INF)	D(LMS)	D(LGDI)	D(LF)
CointEq1	-0.05604	3.237047	0.028669	-0.02278	-0.01271
D(LMGRT(-1))	-0.83734	43.33241	0.291439	0.336648	-0.04751
D(LMGRT(-2))	-0.64275	4.361255	0.463367	0.122058	-0.15206
D(LMGRT(-3))	-0.26907	107.6252	0.272394	-0.21327	-0.0695
D(INF(-1))	0.001132	0.091221	-0.00066	0.001215	-0.0002

D(INF(-2))	0.00048	-0.28205	-0.00038	-0.00093	-0.00038
D(INF(-3))	-0.00016	0.102425	-0.00187	0.001493	-8.98E-05
D(LMS(-1))	-0.29943	183.9734	0.345305	-0.129	0.072088
D(LMS(-2))	-0.26863	-109.024	0.710252	0.407395	-0.26276
D(LMS(-3))	-0.51578	66.63781	0.03833	-0.6394	-0.00503
D(LGDI(-1))	0.435348	-19.1189	-0.18691	0.137613	0.028486
D(LGDI(-2))	0.352805	-53.43	0.012712	-0.05341	0.072141
D(LGDI(-3))	-0.04728	-100.132	-0.02462	0.10214	-0.03665
D(LF(-1))	0.914702	196.0882	-1.3343	-0.78536	0.595254
D(LF(-2))	0.386735	-454.811	-0.90238	1.319748	0.261628
D(LF(-3))	0.509494	-135.885	-0.62806	0.174968	0.308184
C	0.239612	-10.4023	-0.05097	0.061496	0.031785
R-squared	0.74852	0.647774	0.575181	0.636167	0.691102
Adj. R-squared	0.524982	0.334684	0.197565	0.312759	0.416526

Source: Researcher’s calculations from EViews 9, 2023.

The target equation D(LMGRT) has a negative error correction term (-0.06), as shown in Table 5, whereas D(INF) and D(LMS) have positive error correction terms. According to R squared, the VEC model's equations for the variables D (INF), D (LGDI), D (LMS), and D (LF) each explain around 65%, 58%, 64%, and 69% of the variation in those variables, respectively. This shows that all five models fit the data.

VAR creates and calculates a simultaneous equation in Table 5 using the VECM method. The simultaneous equation computed under VAR using the VECM method, on the other hand, only provides coefficients, standard errors, and t-statistics but no probability values. In order to assess the interaction between the manufacturing sector and inflation as well as other explanatory factors affecting manufacturing growth in Nigeria's economy, the simultaneous equation must be roughly approximated. This is so because studies using two samples and a within-group design benefit most from the t-statistic. This simultaneous interpretation of the results based on the t-statistics results is therefore rendered insufficient. Furthermore, for sample sizes bigger than or equal to 30 (n 30), t-statistics are insufficient. The variances of the two groups are present in the independent variables, but they are not homogeneous (Engle & Granger, 1987). In order to determine how the explanatory factors have affected the expansion of Nigeria's manufacturing sector, the study uses OLS to estimate the simultaneous equation.

Table 6: Error Correction Result

	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.056036	0.016788	-3.337857	0.0037
D(LMGRT(-1))	-0.837335	0.184776	-4.531614	0.0003
D(LMGRT(-2))	-0.642752	0.257590	-2.495248	0.0225
D(LMGRT(-3))	-0.269065	0.255331	-1.053788	0.3059
D(INF(-1))	0.001132	0.000958	1.181577	0.2527
D(INF(-2))	0.000480	0.000750	0.639478	0.5306
D(INF(-3))	-0.000163	0.000839	-0.194523	0.8479

D(LMS(-1))	-0.299425	0.273562	-1.094538	0.2881
D(LMS(-2))	-0.268634	0.296436	-0.906212	0.3768
D(LMS(-3))	-0.515782	0.350932	-1.469750	0.1589
D(LGDI(-1))	0.435348	0.214677	2.027921	0.0576
D(LGDI(-2))	0.352805	0.171538	2.056714	0.0545
D(LGDI(-3))	-0.047283	0.159707	-0.296060	0.7706
D(LF(-1))	0.914702	0.846421	1.080670	0.2941
D(LF(-2))	0.386735	0.881226	0.438861	0.6660
D(LF(-3))	0.509494	0.708526	0.719090	0.4813
C	0.239612	0.059079	4.055771	0.0007

R-squared, 75%; Adjusted R-squared, 52%

Source: Researcher's calculations from Eviews 9, 2023.

The error correction term (ECT) in table 6 illustrates the rate of correction of the imbalance between long-run and short-run estimations. According to VECM, 5% of the disequilibrium between long-run and short-run estimations is predicted to be adjusted and brought back to equilibrium every year. With a p-value of 0.0037 at a 1% confidence level and a standard error of 0.016788, this number is noteworthy.

5 Var Model Checking

Table 6 shows the error correction term that indicates the long-run equilibrium, while Table 9 shows the short-run relationship. The VECM model will be evaluated for serial correlation, stability, and normality before being interpreted and used for short-run simulation and ex-ante forecasting.

6 Autocorrelation Residual Lm Test

Table 7: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.153344	Prob. F(3,15)	0.3600
Obs*R-squared	6.560180	Prob. Chi-Square (3)	0.0873

Source: Researcher's calculations from EViews 9, 2023.

The results of Table 7 shows that the null hypothesis of no serial autocorrelation will be accepted for Godfrey LM test for 3 lags since their p-values are greater than the significance values of 0.05 and 3 lags rejects the null hypothesis that there is serial autocorrelation. Hence we can conclude that there is no serial autocorrelation since the lags accept the null hypothesis.

7 Test for Stability

The stability test results (CUSUM, CUSUMSQ, and recursive coefficient stability) as reported in Figures 2, 3, and 4 show that the estimates and the variance as well as the residuals are not stable, whereas the square residuals are stable since they fall outside the 5% critical boundaries in Figure 2 (CUSUMSQ), and in the case of the CUSUM and recursive coefficient stability, they fall within the 5% critical boundaries. The null assumptions of parameter stability are rejected in the CUSUMSQ test; however, they are accepted in the CUSUM and recursive coefficient stability tests. This entails that we accept the null hypothesis and draw the conclusion that because our parameters are stable, they are correctly specified.

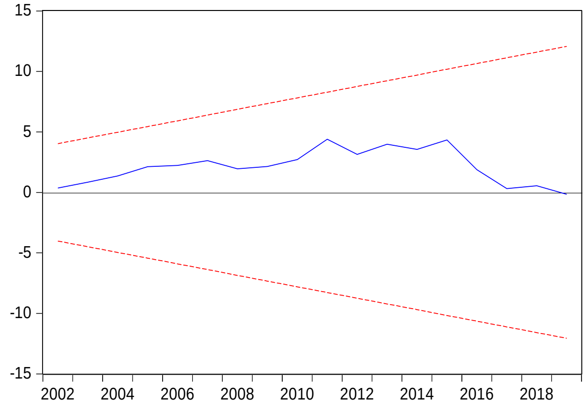


Figure 2

CUSUM ----- 5% Significance

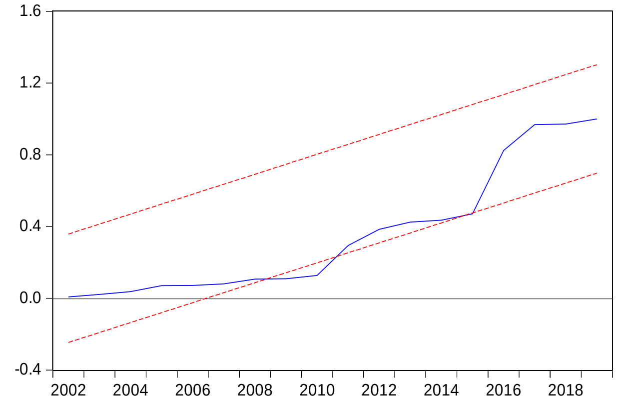


Figure 3

CUSUM of Squares ----- 5% Significance

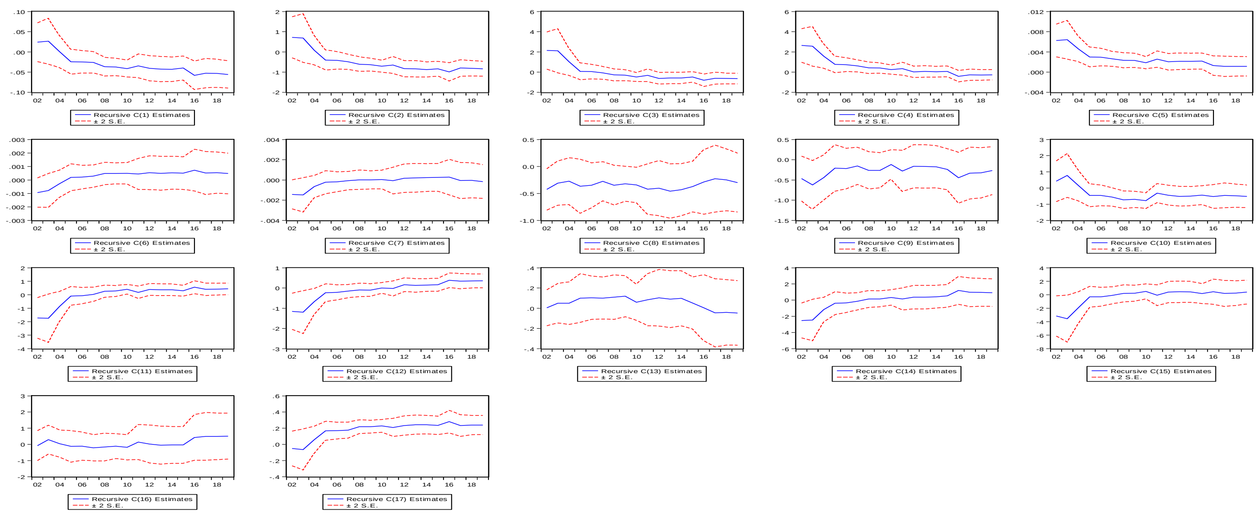
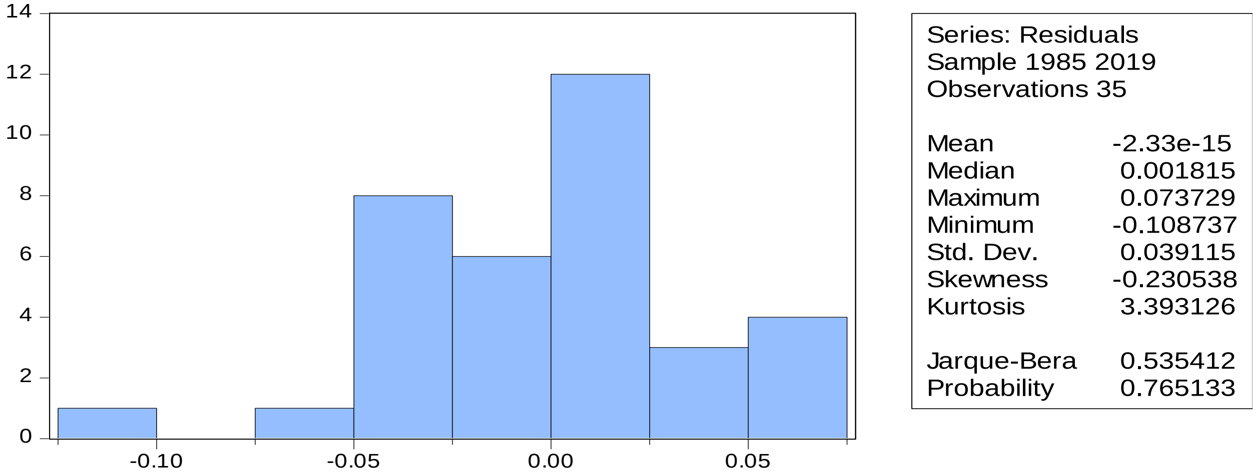


Figure 4

8 Test for Normality

A normal model is indicated by residual skewness and kurtosis, and confirmed by JB test.



Our findings indicate that the skewness is -0.23 and the kurtosis is -3.39. A probability value of 0.53 that is not significant at the 5% critical limit indicates the JB. This test indicates that our model has a normal distribution. The stability, serial correlation, and normalcy diagnostic tests revealed that our model is normally distributed because all probability values for the tests are greater than 5%, indicating that the growth equation for the manufacturing sector is appropriate for economic study.

9 Simultaneous Equation Short-Run Simulation and Analysis

The results of the short-run test are presented below:

Table 8: Wald tests and short-run test

Dependent Variable: DLMGRT			
Variables	Chi-square test	Prob.	Relationship
D(INF)	2.04	0.56	No Short-run causality
D(LGDI)	4.18	0.24	No Short-run causality
D(LMS)	6.64	0.08	No Short-run causality
D(LF)	1.87	0.60	No Short-run causality
ALL	18.7	0.09	No Short-run causality

Source: Researcher's calculations from Eviews 9, 2023.

According to our findings, there exist no short-run relationship between the explanatory variables and the independent variable as indicated by the Chi-square joint statistics probability values. The p-value of chi-square test for D(INF), D(LGDI), D(LMS) and D(LF) variables is greater than 0.05, the null hypotheses (H 0): β5=0 will not be rejected, therefore they don't cause LMGRT in the short run. The next step is to conduct exante forecasting involving impulse response and variance decomposition tests.

11 Impulse Response Function

The manufacturing sector growth prediction in Nigeria indicates a positive trend with variations brought on by shocks and innovations. The results show that manufacturing growth (LMGRT),

inflation (INF), gross domestic investment (LGDI), and money supply (LMS) will all contribute to the country's expanding manufacturing sector. A one standard deviation positive own shock will result in a change from 0.053 to 0.045 over the course of three years, and over the course of 10 years, it will continue to rise to 0.081. Second, predictions indicate that INF has both a short-term (0.016) and long-term (0.022) beneficial impact on the expansion of the manufacturing sector. This indicates that the expansion of the manufacturing sector is impacted by inflation.
Third, the simulation shows that a one-positive standard deviation shock from the LMS will improve economic growth in the short run by 0.027. The shocks will continue to be positive in the long run (0.023). Fourth, over a ten-year period, innovations for LGDI boost the growth of the manufacturing sector by 0.012 in the short run and 0.027 in the long run. This indicates that the long-term growth of the industrial sector depends on the amount of money in circulation. Fifth, despite short- and long-term declines, projections indicate that LF won't be a problem for the manufacturing industry.

Table: 9: Impulse Response Analysis

Response of LMGRT:					
Period	**LMGRT**	**INF**	**LMS**	**LGDI**	**LF**
1	0.053759	0.000000	0.000000	0.000000	0.000000
2	0.025202	0.025022	0.021792	0.009009	-0.015347
3	0.044718	0.016393	0.027454	0.011669	-0.013926
4	0.076798	-0.003055	0.017786	-0.003670	-0.025362
5	0.084962	0.006120	0.041791	0.010817	-0.032028
6	0.072199	0.015647	0.026459	0.023819	-0.031966
7	0.092526	0.017212	0.044359	0.026899	-0.028712
8	0.089062	0.009293	0.033596	0.027612	-0.033555
9	0.079262	0.025444	0.031811	0.034385	-0.031944
10	0.081127	0.022517	0.023083	0.026732	-0.026195

Source: Researcher’s calculations from Eviews 9, 2023.

12 Variance Decomposition

Variance decomposition is used to predict the error variance effects for each endogenous variable in a system. Any change in time causes a commensurate change in the dependent variable in a straightforward linear equation (Wickremasinghe 2011). The projection in this study is broken down into three sections: short-term (three years), medium-term (five years), and long-term (ten years), based on the Monte Carlo process and Cholesky's ordering. LMGRT, INF, LGDI, LMS, and LF are the endogenous variables that can be predicted based on variance decomposition.

Table 10: Variance decomposition

PERIOD	LMGRT	INF	LMS	LGDI	LF
SHORT-RUN	79.31	7.82	8.14	1.42	3.31
MEDIUM-TERM	77.36	6.63	9.52	1.43	5.06
LONG-RUN	74.21	4.97	10.89	2.88	7.05

Source: Researcher’s calculations from Eviews 9, 2023.

In the short-run, impulses, innovations or shocks to manufacturing sector growth account for 79.3% of fluctuations in manufacturing sector growth own shock. However, the manufacturing sector growth own shock fluctuations continuously decline to 74.2% in the long run. Meanwhile, inflation shocks account for 7.8% of fluctuations of manufacturing sector growth in the short run. The fluctuations of manufacturing sector growth due to inflation decrease in the long run to 5.0%. In the short-run, shocks to money supply account for 8.1%, gross domestic investment accounts for 1.4% and labour force accounts for 3.3%. In the long run, shocks to money supply increase to 10.9%, gross domestic investment increases to 2.88% and labour force account for 7.1%. The manufacturing sector own shocks will account for the highest fluctuations followed by money supply.

13 Findings

In the first and second lags, the results of the VECM test point to a positive but insignificant association between inflation and manufacturing sector growth, but a negative relationship in the third lag. The insignificant correlation suggests a long-term and short-term lack of a relationship between inflation and the growth of the manufacturing sector. Variations in Nigeria's inflation rate do not explain the growth of the manufacturing sector. It also demonstrates that manufacturers do not have pricing power due to inflation because their profit margins increase at the same rate as their cost of production. The study also reveals that the high cost of transporting manufacturing outputs from the factory to markets as a result of rising energy prices, such as those for premium motor spirit (petrol) and diesel, persistent productivity problems in the major sector (agriculture), subpar output results, and the high cost of imported raw materials due to a lack of foreign exchange are significant factors driving up the price of manufacturing output. The results are consistent with previous studies conducted by Logue & Sweeney (1981), Umaru & Zubairu (2012), Modebe & Ezeaku (2016), and Bans-Akutey et al. (2016). In contrast to Chaudhry et al. (2013) and Obi et al. (2013), the results are different.

Money supply and the first, second, and third lags are inversely related. Despite its tiny size, it shows that there is no long-term correlation between government monetary policy and manufacturing growth. The results also suggest that the expansion of the manufacturing sector has slowed due to the low money supply.

In the first and second lags of gross domestic investment, the variable exhibits a positive association with the expansion of the manufacturing sector. Additionally, the positive and significant coefficient of the GDI equation implies that government investment has a long-term association with the expansion of the manufacturing sector. LMGRT is increased by 44% during the first lag and 35% during the second lag for every 1% increase in LGDI. A negative and insignificant relationship is linked to the third lag. Additionally, Table 6 demonstrates that the labor force has a positive but insignificant impact on the expansion of the manufacturing industry.

There is a causal relationship between independent variables and manufacturing growth over the long term. This is due to the fact that the error correction term coefficient (ECT), which is negative and significant at 0.056036, shows that there is long-term causation between the dependent variables and the growth of Nigerian manufacturing.

5 CONCLUSION AND RECOMMENDATIONS

To achieve the goals of the study, a VECM simultaneous systems model with five endogenous variables was created. An error correction term portion that follows the simulation of the aforementioned VECM system model shows the long-run relationship, and the second half shows the short-run relationship. Before the results were evaluated, the VECM systems model was validated for stability and the absence of serial correlation. The outcomes demonstrate the applicability of the VECM model for policy analysis. Manufacturing growth (the dependent variable) and the independent variables of inflation, money supply, gross domestic investment, and labor force have a long-term relationship, according to the results of the error correction term coefficient. The explanatory factors are thought to have a long-term, absolute relationship based on the value of 3.34. The diagnostic tests for residuals and model stability were then examined. The outcomes demonstrated that the model was stable and that the residuals were devoid of serial correlation. The study recommends that federal and state governments spend money on inadequate infrastructure, like electricity grids and road networks. Future research ought to consider including additional factors like the exchange rate and government spending.

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