Journal of Global Economics and Business **October 2024, Volume 5, Number 19, 54-74**
ISSN: Print 2735-9344, Online 2735-9352

EXCHANGE RATE VOLATILITY AND MANUFACTURING EXPORTS IN NIGERIA: 1986-2020

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ABSTRACT
The study examines the effect of exchange rate volatility on manufacturing exports in Nigeria using data from World Bank and United Nations Conference on Trade and Development (UNCTAD). The study employed Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) to estimate the volatility and generate the volatility series (EXCHVOL) and Vector Error Correction Mechanism (VECM) as a form of Vector Auto-regression (VAR) to estimate the effects and forecast results. The results proved there is significant volatility in the endogenous variable EXCH and the further estimates found that the effect of EXCHVOL on MEX is positive but short-lived and the effect of FDI on MEX is near-zero. However, the most prominent effect on MEX is of INF which impacts it negatively and does not get corrected in the forecasted period of 10 years. The study suggests greater loan services to manufacturing companies to boost productivity and better infrastructural provision to better support industrial activities.

Keywords: *EGARCH, Exchange Rate Volatility, Manufacturing Export, Unctad, Foreign Direct Investment.*

DOI: 10.58934/jgeb.v5i19.293

1. INTRODUCTION

The current global trade dynamics require some level of trade with other countries, making the study of the values of those currencies to one another a must. However, for uniformity and ease, countries typically value their exchange rate by measuring its strength to the United States Dollar (USD). Therefore, this research will make use of the Naira to Dollar ratio as an estimate of the exchange rate. On the other hand, manufacturing can be described as the transformation of any material substance from one form to another for use through a mechanical or chemical process (Arikawe, 1984). Nigeria's manufacturing sector is said to be the foundation for development as industrialization cannot be realized without its contribution (Onuoha, 2012). Recently, the manufacturing sector has shown steady growth from being 6.5% of the Gross Domestic Product (GDP) in 2010 to 12.7% in 2020 (World Bank, 2020).

Many African nations have promising manufacturing sectors whose productivity is on the rise (Polodoo, Sannassee, & Seetanah, 2016). Nigeria's major However, this sector is mainly used to serve the domestic economy and is not able to competitively export its products beyond Nigeria's borders (Yakub, Sani, Obiezue, & Aliyu, 2019). Therefore, many researchers have investigated the effect the floating exchange rate has on various aspects of the Nigerian economy such as economic growth (Okoye, Okorie, Okoh, Olokoyo, & Ezeji, 2019). Others looked into the relationship between the exchange rate and balance of trade of Nigeria such as (Ijirshar, Ushie, Adi, Bundepuun, & Udoji, 2021). However, the study of exchange rate volatility in relation to the manufacturing exports has a prominent gap. This essay will attempt to fill that gap.

Prior to the 1940s, every country determined the value of their currency through comparison with the value of gold – the most precious metal of the time – at a fixed rate (Mishkin, 2019). However, this posed several issues as central banks could not develop monetary policies independent of gold prices and therefore stunted economic growth. Furthermore, as gold mines spread all over the world yielding more amounts of gold in circulation, the currencies were unnecessarily affected while in periods of low gold production, the amount of money supply could not grow. Between 1944 and 1973, the Bretton Woods System was used to aid foreign trade and give stability in the increasingly complex post-war world (Hodara, 2014). This system introduced the International Monetary Fund and International Bank of Reconstruction and Development (currently known as the World Bank) as well as set the US Dollar as the international reserve currency for all foreign assets. The Dollar at the time was fixed to the

price of gold at $35 per ounce (Mishkin, 2019). The fixed exchange rate system brought stability to the global economy but also brought to light how many nations had "overvalued" currencies. In such cases, the IMF required them to be devalued and adjusted (Hodara, 2014).

During colonial rule, Nigeria and other Anglophone West African countries made use of the British currency. Following independence from Britain, Nigeria introduced the Naira and Kobo we use today (CBN, n.d.). The post-Bretton Woods era is germane for understanding the problem of exchange rate volatility. The end of the Bretton Woods system ushered in an age of floating exchange rate which caused the US Dollar to become a fiat currency which is not pegged to any other currency/asset to determine its value. Bartolini & Bodnar (1996) observed that exchange rate volatility became a global phenomenon following the end of the Bretton Woods System. Currencies such as the Japanese Yen, Deutsche Mark and Nigerian Naira experience high levels of uncertainty and shocks in their exchange rates.

Following the dissolution of the Bretton Woods system in the 70s, the use of market forces to set the exchange rate of currencies has been adopted by many countries, including Nigeria. This causes exchange rates to become subject to change as a country's currency can appreciate and depreciate over time. As exchange rates are the price of one currency compared to another currency, rapid upward and downward changes in exchange rates can be problematic by deterring potential investors and can make long-term planning difficult to undertake (Steinberg & Walter, 2013). Exchange rate is an important economic indicator because it has the power to affect the volume of imports and exports in a country. However, in the decades past, governments have grappled with the maintenance of a stable exchange rate to reduce trade risks and maximize the ideal outcomes.

Since the discovery of crude oil, Nigeria has struggled with industrialization and has been saddled with a mono-economy dependent on oil exports for 88% of its export revenue (World Bank, 2020). This has left the economy vulnerable to oil price shocks which typically spell a catastrophe for the entire nation. Moreover, the dependence on oil has caused other vital sectors to be underdeveloped. The manufacturing sector in particular produces textiles, foodstuff, pharmaceuticals, machinery etc. which are invaluable to the nation. Despite its importance, World Bank (2020) estimates that the manufacturing sector only constitutes 12.66% of the GDP and manufacturing exports only contribute 7.8% of total exports with even lower volumes in the previous years, such as; 0.95% in 2016, 0.17% in 2017 and 3.4% in 2018.

The manufacturing sector's low productivity could be attributed to a number of factors such as; competition from imported goods, unpredictable electricity and power supply, high start-up costs, poor business environment, political instability and terrorism, befuddling tax laws and exchange rate fluctuations (Sokunle & Harper, 2017). Moreso, the Nigerian industrial sector is rather unique because it requires machinery and certain raw materials to be imported. Whereas, the exports are stunted due to uncertainty in the currency exchange markets. The floating exchange rate is supposed to bring about more freedom and fairness to international trade but its negative effects appear substantial in the trade records. This research will investigate if the manufacturing sector can truly trace the cause of its woes to the exchange volatility or not. This study hopes to provide empirical evidence of the strengths and weaknesses of the floating exchange rate system as well as identify its impact on the level of manufacturing goods and services can be exported. It will also prescribe solutions to the deficiencies observed in this study. Furthermore, this can form the basis of further research in this field.

2. EMPIRICAL LITERATURE

Polodoo, Seetanah and Sannassee (2016) estimated that there is a significant negative relationship between volatile exchange rates and manufacturing exports using Exponential General Autoregressive Conditional Heteroskedastic model (EGARCH), Vector Auto Regressive Model (VAR) and Random Coefficients (RC) on time series data from 1995 to 2012 of selected African countries. Conversely, exchange rates were found to have no significant impact on manufacturing exports in a study of Indonesian data using Vector Error Correction Model (VECM) (Sumiyati, 2020).

An analysis of Nigeria's exchange rate data from 1986 to 2014 on non-oil exports using GARCH and Error Correction Model (ECM) estimated a prominent negative impact of exchange rate volatility on non-oil exports in the long and short run (Akanbi, Alagbe, Yusuf, & Oluwaseyi, 2017). This is in-line with the findings of Ndidi & Alaba (2019) whose data ranges 1981-2017. Finally, Inam & Oscar (2018) made use of Granger Causality test as well as Johansen Cointegration test and ECM to ascertain that volatility in exchange rates require a period of 4 years to correct the deviation in the dependent variable.

Vo, Vo and Zhang (2019) investigated the effect of exchange rate devaluation on various areas of manufacturing exports using Dynamic Ordinary Least Squares (DOLS) and GARCH to

estimate data from 2000-2015. The researchers found that currency devaluation does cause volatility in the currency of Vietnam but with positive effects in the short run and negative effects in the long run.

Bahmani-Oskooee and Gelan (2017) estimated there is a negative long run Influence of real exchange rates on Nigerian exports using bounds-testing approach while the same test found positive long run effect on Egyptian exports. Furthermore, Njoroge (2020) assessed a similar phenomenon following a panel gravity approach of certain East and Southern Africa nations. This is consistent with the results of an analysis of Vietnam's export performance (Nguyen & Do, 2020).

A 2019 analysis of Nigeria's monthly exchange rate and trade flows data from 1997 to 2016 using GARCH, ARDL and Granger Causality models found that exchange rate volatility only negatively impacts trade flows in the short run (Yakub, Sani, Obiezue, & Aliyu, 2019). Moreover, a study of Turkey's annual data from 2002-2013 uncovered that exchange rate volatility affects trade flows in different ways; the exports were negatively affected while various import sectors were either affected negatively or positively (Alper, 2017). Interestingly, another research yielded consistent results and discovered that positive trade balance and economic growth has the capacity to correct exchange rate volatility in the long run (Ijirshar, Ushie, Adi, Bundepuun, & Udoji, 2021).

Asteriou, Masatci & Pilbeam (2016) investigated the impact of exchange rate volatility on international trade in Turkey, Nigeria, Indonesia and Mexico using GARCH and Autoregressive Distributed Lag (ARDL) and found that there is no significant link between the aforementioned variables. Similar results were established in a study using Pooled Ordinary Least Squares (POLS), Fixed and Random Effects model on West African trade data (Fofanah, 2020). Furthermore, an analysis of Sub-Saharan Africa produced the same results (Senadza & Diabia, 2018).

Olaleye & Ojomolade (2019) estimated the relationship between exchange rate volatility and industrial performance using annual data from primary and secondary sources which made use of ARDL and Bound Test. This uncovered a negative relationship between the variables due to an increase in cost of raw materials and machinery for production.

Furthermore, a study making use of Autoregressive Distributed Lag (ARDL) on Nigeria's time series data from 1987 to 2018 prove that volatile exchange rates have a negative relationship

with the manufacturing sector as a whole (Nura, 2020). A similar study by Onwuka (2021) corroborated these results using data from 1981 to 2020 and the same data estimation technique. Finally, a panel data estimation using Fully Modified Least Squares (FMOLS) and Pooled Mean Group Estimator (PMG) on member states of the South African Customs Union (SACU) yielded results consistent with the aforementioned studies (Mlambo, 2020). In contrast, Ojeyinka (2019) discovered a significant negative impact of exchange rate volatility on the dependent variable in Nigeria.

Following a study of Nigeria's exchange rate from 1970 to 2016 using GARCH, it was estimated that exchange rate volatility has a substantial negative effect on economic growth (Okoye, Okorie, Okoh, Olokoyo, & Ezeji, 2019). A study using ARDL on data from 1981-2017 corroborated the aforementioned phenomenon (Musa, Muhammad, Mohammad, & Adamu, 2019). However, Khandare (2017) determined that exchange rate fluctuation actually has a positive relationship with economic growth but the impact is insignificant using Correlation Analysis on time series data of India from 1987-2014 while Regression Analysis proved a negative relationship between the two variables. Whereas Umaru, Aguda & Davies (2018) and Ozata (2020) established that there exists a significant negative impact of exchange rate volatility on the dependent variable.

3. METHODOLOGY

This study makes use of annual time series data derived from two sources. The data on Exchange rate and Inflation Rate were obtained from the World Bank Statistics from 1986 to 2020. The data on Manufacturing Exports and Foreign Direct Investment were sourced from United Nations Conference on Trade and Development (UNCTAD). This research involves the two main analysis techniques, they are: Exponential General Autoregressive Conditional Heteroskedastic Model (EGARCH) and Vector Auto Regressive Model (VAR) of which the Vector Error Correction Model (VECM) will be used. However, prior to the conduct of the analysis, the data will be subject to certain diagnostic tests.

Unit Root testing is an essential preliminary before conducting time series analysis. Unit Root is the "random walk with drift" which renders any time series data nonstationary and therefore unusable. To correct this impurity, differencing is usually done to cleanse the data. This involves using the Augmented Dickey-Fuller test on all the variables of the study to ensure

their stationarity. The stationarity of variables is a core criterion that must be met for any analysis to be undertaken because stationary variables are cleansed of unit root and will therefore produce a result devoid of spuriousity. Co-integration Test: This test measures the long-run correlating relationship between the endogenous and exogeneous variables of the model. This is another critical condition that must be tested to know if the results of the study will be sustained in the long-run or are only useful for understanding short-run dynamics. The Johansen Cointegration Test will be utilized for the purpose of this research.

3.1 Model Specification

The EGARCH Model at AR_1 specified by Polodoo, Seetanah and Sannassee (2016) is expressed thus:

$$MEX_{i,t} = f(EXRV_{it}, Inf_{it}, FDI_{it})$$

From this, the following model is derived as such:

$$EXRV_t = \alpha + \sum_{i=1}^{q} \theta_i EXRV_{t-1} + \varepsilon_t \text{ ----------1}$$

$$\ln(\sigma_t^2) = \omega + \sum_{j=1}^{q} \eta_j \left| \frac{u_{t-j}}{\sqrt{\sigma^2}_{t-j}} \right| + \sum_{j=1}^{q} \lambda_j \frac{u_{t-j}}{\sqrt{\sigma^2}_{t-j}} + \sum_{i=1}^{p} \beta_i Ln(\sigma^2{}_{t-i}) + \psi_n EXCH \text{ -----2}$$

While the GARCH model is specified below

$$EXRV_t = \alpha + \theta_i EXRV_{t-1} + \varepsilon_t \text{ ----------3}$$

$$\ln(\sigma_t^2) = \omega + \eta \left| \frac{u_{t-j}}{\sqrt{\sigma^2}_{t-j}} \right| + \lambda \frac{u_{t-j}}{\sqrt{\sigma^2}_{t-j}} + \beta \ln(\sigma_{t-1}^2) + \psi EXCH \text{ ----------4}$$

Where;

MEX: Manufacturing exports as a percentage of total exports

EXRV: Exchange Rate Volatility

Inf: Inflation Rate

FDI: Foreign Direct Investment

ω is the constant term, η is the effect of the conditional shock, λ for asymmetry effect, β measures the persistent of shocks and ψ measures the effect of MEX on $EXRV$.

The VAR model specified below is following the research by Ozigbu, Ezekwe & Morris (2019)

$$MEX_t = b_1 + \sum_{i=1}^{P} \pi_{11}^{1} MEX_{t-i} + \sum_{i=1}^{P} \pi_{12}^{2} EXRV_{t-i} + \sum_{i=1}^{P} \pi_{13}^{3} Inf_{t-i} + \sum_{i=1}^{P} \pi_{14}^{4} FDI_{t-i} + e_{1t}$$

$$EXRV_t = b_2 + \sum_{i=1}^{P} \pi_{21}^{1} MEX_{t-i} + \sum_{i=1}^{P} \pi_{22}^{2} EXRV_{t-i} + \sum_{i=1}^{P} \pi_{23}^{3} Inf_{t-i} + \sum_{i=1}^{P} \pi_{24}^{4} FDI_{t-i} + e_{2t}$$

$$Inf_t = b_3 + \sum_{i=1}^{P} \pi_{31}^{1} MEX_{t-i} + \sum_{i=1}^{P} \pi_{32}^{2} EXRV_{t-i} + \sum_{i=1}^{P} \pi_{33}^{3} Inf_{t-i} + \sum_{i=1}^{P} \pi_{34}^{4} FDI_{t-i} + e_{3t}$$

$$FDI_t = b_4 + \sum_{i=1}^{P} \pi_{41}^{1} MEX_{t-i} + \sum_{i=1}^{P} \pi_{42}^{2} EXRV_{t-i} + \sum_{i=1}^{P} \pi_{43}^{3} Inf_{t-i} + \sum_{i=1}^{P} \pi_{44}^{4} FDI_{t-i} + e_{4t}$$

Where;

b_i is the number of intercepts, π_I is the coefficient and e_{it} is the error term in fulfilment of the white noise principle.

The dependent variables EXRV and Inf are expected to have a negative relationship with the endogenous variable MEX. However, the variable FDI is expected to have a positive relationship with the regressand.

Econometric models are abstractions of reality used to explain a phenomenon. Such models have been developed and trusted due to their reliability and simplicity. The EGARCH model is member of the ARCH family used not only to measure volatility but also allows for asymmetric shocks. Moreover, the VAR model is a highly acclaimed model that shows the relationship between variables and has a high forecasting power.

MEX: This research makes use of the manufacturing exports as a percentage of total exports. Manufacturing exports in Nigeria consist of merchandise sales such as textiles, processed food, pharmaceuticals etc. The sale of those to buyers across the border and then compared to the total oil and non-oil exports recorded in a year is what constitutes the data of this variable. This

is the regressand in the model because the research seeks to investigate how it responds to shocks from the other variables.

EXRV: This is the sharp upward and downward movement of the exchange value of Nigerian Naira compared to the United States Dollar. The data used is the recorded annual rates of Naira which is used as a means of payment for merchandise sales. This is then computed to measure the volatility using EGARCH. Its relationship with the regressand is the focus of this study.

Inf: Inflation is the increase in general price level of goods and services in a country over time. The effect of inflation of the level of productivity and export performance in an economy is a very important factor as inflation generally affects the price of manufacturing inputs negatively and can cause the price of exports to rise causing an eventual decrease in demand.

FDI: This is the amount of capital is invested by a foreign body in a Nigerian firm. Foreign direct investment spurs production and increases supply because of the increase in capital base of firms. Manufacturing firms that wish to be internationally competitive require a large capital base to support production and export activities.

4. RESULTS AND DISCUSSION

Descriptive Statistics and Correlation of the Variables

This analysis of the above variables extracted their descriptive statistics. In Table 1, the variable of Foreign Direct Investment is the sole variable in natural logarithm. Manufacturing Exports and inflation rate maintain their original statuses because they are percentages while the Exchange Rate variable has also been left unchanged as the author will estimate the volatility of the variable in subsequent tests. The highest means observed is in the Exchange Rate (EXCH) and inflation Rate (INF) variables with 115.0494 and 19.51238 respectively. While the natural log of Foreign Direct Investment (LNFDI) and percentage of Manufacturing Exports (MEX) have the mean scores of 7.623085 and 2.670390 respectively. EXCH and MEX have the standard deviation of 99.78363 and 2.656879 respectively while LNFDI and INF have standard deviations of 0.926932 and 17.82654 respectively. In terms of normality, EXCH, MEX and INF are all positively skewed while LNFDI is moderately negatively skewed. In terms of kurtosis, the variables EXCH and LNFDI are both platykurtic while MEX and INF both indicate leptokurtic structure. The probability value of the Jacque-Bera statistic indicate normality in the variables EXCH and LNFDI due to their values being greater than 5%.

However, the probability value observed in the variables MEX and INF are less than 5% exhibiting abnormality.

Table 1: Summary Statistics

	EXCH	MEX	LNFDI	INF
Mean	115.0494	2.670390	7.623085	19.51238
Median	120.5782	1.767538	7.662468	12.55496
Maximum	358.8108	10.74753	9.095491	72.83550
Minimum	1.754523	0.024477	5.262690	5.388008
Std. Dev.	99.78363	2.656879	0.926932	17.82654
Skewness	0.761910	1.423848	-0.334223	1.703080
Kurtosis	2.857484	4.281263	2.826724	4.547383
Jarque-Bera	3.415908	14.22022	0.695398	20.41130
Probability	0.181236	0.000817	0.706312	0.000037
Sum	4026.730	93.46364	266.8080	682.9332
Sum Sq. Dev.	338530.3	240.0062	29.21289	10804.71
Observations	35	35	35	35

Source: Authors Computation, 2022 using E-Views 10

Table 2 shows the Correlation Matrix which tested the level of correlation among variables. The variables exogenous variables LNFDI and INF both have a low correlation with the variable EXCH with values 0.307343 and -0.408746 accordingly. However, the variable MEX has high correlation with the variable EXCH with the value 0.620141.

Table 2: Correlation Analysis

	EXCH	MEX	LNFDI	INF
EXCH	1.000000			
MANU	0.620141	1.000000		
LNFDI	0.307343	0.441365	1.000000	
INF	-0.408746	-0.319926	-0.204555	1.000000

Source: Authors Computation, 2022 using E-Views 10

Stationarity Test

This study made use of the Augmented Dickey-Fuller test to check for unit root of individual series (see Table 3). The following results were collated from this test: the variables EXCH, MEX, LNFDI were found to be nonstationary at level, requiring a first difference which rendered them stationary at order of one I(1). The variable INF was however found to be stationary at level I(0). All of this were conducted at 5% significance.

Table 3 Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	Level t-statistics	p-value	1st Difference t-statistics	p-value	Order of Integration
EXCH	1.722831	0.9995	-3.944028	0.0047	I(1)
MEX	-0.322193	0.9101	-7.982505	0.0000	I(1)
LNFDI	-2.168520	0.2209	-10.47579	0.0000	I(1)
INF	-4.539566	0.0000	-2.640153	0.0981	I(0)

Source: Authors Computation, 2022 using E-Views 10

Lag Selection Criteria

In the conduct of autoregressive tests such as VAR/VECM, it is necessary to ascertain the lag length at which the variables will be estimated as shown in Table 4. It is important because the effect of a dependent variable on an independent variable is likely to emerge over certain periods of time/lag. With more lag, the chances of multi-collinearity arise due to a shrunken degree of freedom (DoF). That is why the best lag length must be chosen. This study found that the lag 1 is the most adequate to make use of following the Akaike's Information Criteria (AIC).

Table 4: VAR Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-489.8911	NA	8.10e+08	31.86394	32.04897*	31.92426
1	-464.8459	42.01134*	4.57e+08*	31.28038*	32.20553	31.58195*
2	-455.2151	13.66952	7.30e+08	31.69129	33.35657	32.23413
3	-450.8586	5.059171	1.80e+09	32.44249	34.84789	33.22659

Source: Authors Computation, 2022 using E-Views 10

Johansen Cointegration Test

Table 5 contains the results of the Johansen Cointegration Test which is used to determine where two or more individually nonstationary variables converge i.e., become cointegrate. The test includes the Trace Test and the Maximum Eigenvalue with which the latter reaffirms the former. At 5% significance, we reject the null hypothesis and conclude that there are two cointegrating equations in the sample.

Table 5: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of Cointegrating Equations	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.683957	74.89355	47.85613	0.0000
At most 1 *	0.529829	36.88158	29.79707	0.0065
At most 2	0.243830	11.97786	15.49471	0.1580
At most 3	0.080087	2.754716	3.841466	0.0970

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of Cointegrating Equations	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.683957	38.01197	27.58434	0.0016
At most 1 *	0.529829	24.90372	21.13162	0.0140
At most 2	0.243830	9.223146	14.26460	0.2681
At most 3	0.080087	2.754716	3.841466	0.0970

Source: Authors Computation, 2022 using E-Views 10

EGARCH Test for Volatility

The Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) Test is used to determine and forecast volatility and conditional variances. The EGARCH model is flexible enough to capture the volatility clustering but also asymmetric effects of shocks as well.

From Table 6, the results show that the size effect is 2.766 and is significant while the sign effect is -0.251 with inverse relationship (when there is positive shock, volatility decreases and vice versa), however, is not significant. The GARCH term/persistence effect is very low at -0.26 and is significant.

Table 6 EGARCH

Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	7.930129	0.045690	173.5635	0.0000
EXCH(-1)	0.995199	5.18E-07	1920362.	0.0000
Variance Equation				
C(3)	3.721818	1.404064	2.650748	0.0080
C(4)	2.765573	0.640992	4.314522	0.0000
C(5)	-0.250707	0.427134	-0.586952	0.5572
C(6)	-0.269430	0.137087	-1.965400	0.0494

Source: Authors Computation, 2022 using E-Views 10

Post Diagnostic Tests

Following the successful estimation of the data, post diagnostic tests must be undergone to ascertain the validity of the results and capture whatever error is inherent in the data sets. This is done by running selected tests on the residual values of the data. These tests are the Normality test using Jacque Bera statistic, Heteroscedasticity test using Chi-Square and Serial Correlation using LRE Statistic. The normality test is used to check if the data is devoid of bias and is randomly distributed. The results of this process found that the data is not normally distributed at 5% significance. However, as this research made use of a higher order test (VECM), this is not a primary concern and does not affect the validity of the model.

Heteroscedasticity is known as differences in variance of the distributed residual term. The test on this phenomenon yielded a P-value higher than 0.05 which proves that there the residual values are homoscedastic. Serial correlation or autocorrelation is a problem which arises from a variable being correlated with its lag values. Similar to the heteroscedasticity test, the serial correlation test yielded a P-value greater than 0.05, proving that there is no serial correlation in the error term of this model.

Table 4.8: Post-diagnostic tests

	Jacque Bera	**P-value**
Normality	274.1377	0.0000
	Chi Square	**P-value**
Heteroscedasticity	84.76615	0.8620
	LRE* Stat	**P-value**
Serial Correlation	10.83181	0.8223

Source: Authors Computation, 2022 using E-Views 10

5. CONCLUSION AND RECOMMENDATIONS

The Nigerian export sector has very sharp deficiencies in the realm of non-oil exports. As crude oil is the main export and source of foreign exchange to the country, it is important to diversify the export sector to protect the nation from unforeseen circumstances in the form of oil price crashes. Nigeria is also blessed with a bounty of natural resources that man be used to manufacture clothing, food, pharmaceuticals, technology etc. Unfortunately, these resources are not properly tapped into because of the nation's sole focus on oil. The manufacturing sector has the ability to diversify the export base of the country and increase productivity but numerous issues such as volatile exchange rate, lack of capital, absence of infrastructural support, insecurity, lack of transportation facilities and contradictory trade policies have devastated the sector. The findings of this research have proven that exchange rate volatility does impact the performance of manufacturing exports but more steps must be taken to find a solution that can truly make the nation utilize its potential and industrialise quickly.

Recommendations

Using the results of this study, the following recommendations have been brought forth:

i. Better maintenance of the exchange rate: As exchange rate volatility increases uncertainty and has a negative relationship with manufacturing exports, the CBN should do its best to minimize the large and frequent highs and lows that the currency experiences so there will be less volatility.
ii. Increased government support to manufacturing companies: The government gives capital support to exporting companies of non-oil products through the Nigeria Export-Import Bank (NEXIM), however the size of the agency's share capital should be increased so more loans can be given to boost productivity.
iii. Correct infrastructural deficiencies in the nation: lack of supporting infrastructure for production has hampered the growth of industry in the nation. For more even development among industrial sectors, the government must concern itself with improving the electricity, water supply and transportation in the nation because they are the keys to unlocking the industrial potential of this country.
iv. Control the rate of inflation: As per the results of this research, the effects of inflation are not recovered from within ten periods. Therefore, the CBN must control the rate of

inflation in the country because it negatively impacts the manufacturing sector and export markets of the country as a whole.

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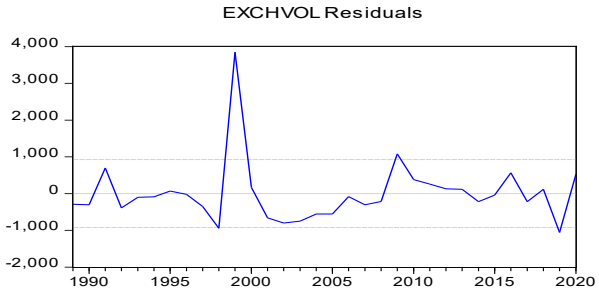
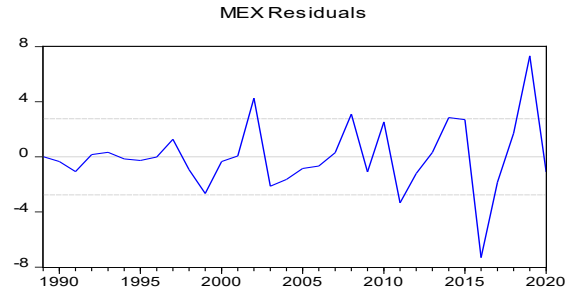
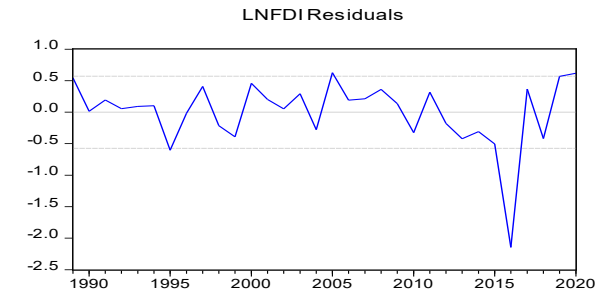
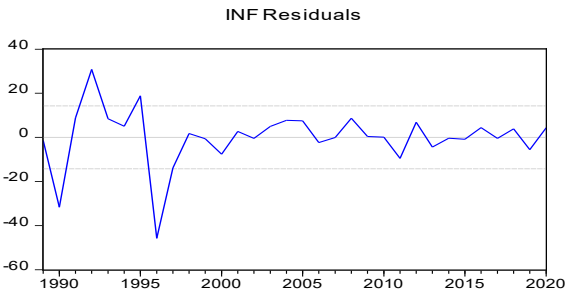
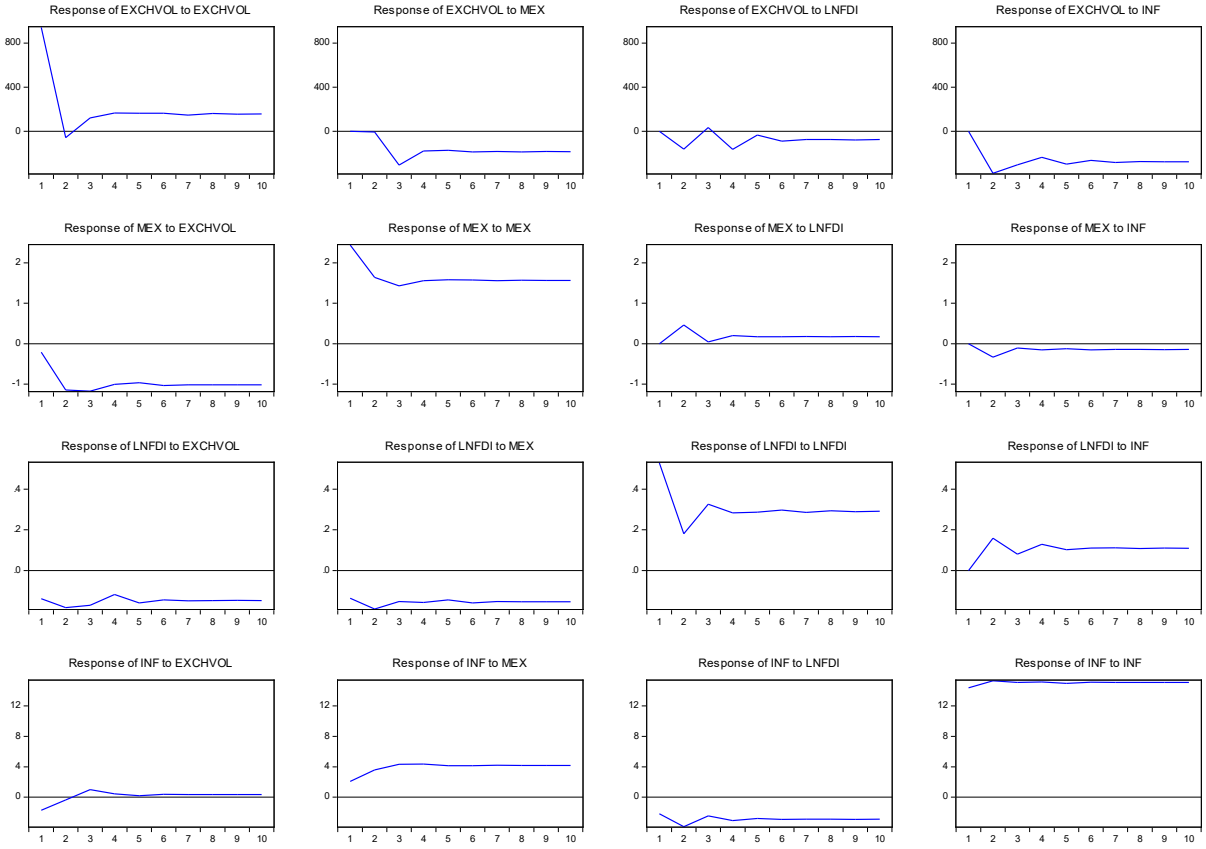
Appendix


EXCHVOL Residuals
4,000
3,000
2,000
1,000
0
-1,000
-2,000
1990
1995
2000
2005
2010
2015
2020


MEX Residuals
8
4
0
-4
-8
1990
1995
2000
2005
2010
2015
2020


LNFDI Residuals
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
1990
1995
2000
2005
2010
2015
2020


INF Residuals
40
20
0
-20
-40
-60
1990
1995
2000
2005
2010
2015
2020


Response of EXCHVOL to EXCHVOL
Response of EXCHVOL to MEX
Response of EXCHVOL to LNFDI
Response of EXCHVOL to INF
Response of MEX to EXCHVOL
Response of MEX to MEX
Response of MEX to LNFDI
Response of MEX to INF
Response of LNFDI to EXCHVOL
Response of LNFDI to MEX
Response of LNFDI to LNFDI
Response of LNFDI to INF
Response of INF to EXCHVOL
Response of INF to MEX
Response of INF to LNFDI
Response of INF to INF