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The Influence of Macroeconomic Variables on Manufacturing Sectors: A Case of Nigeria

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ABSTRACT

This study has examined the influence of macroeconomic variables on manufacturing sectors with a particular reference to Nigerian economy. The objective of the study is to investigate the effects of macroeconomic variables on manufacturing sectors (proxy businesses, productivity sectors and industries) in Nigeria. Econometrics tools were employed to analyse the variables sourced from the Central Bank of Nigeria Statistical bulletin within the period of 1985 up to 2022. Among the pre-test conducted on the variables are unit root test, descriptive statistics and co-integration bound test**.** Meanwhile, post-diagnosis test conducted include: stability test, heteroskedacity test, and serial correlation test. The findings show that macroeconomic variables have mixed influences on the manufacturing sector in Nigeria. It is, therefore, recommended that the government should effectively stabilise and manage interest rate, exchange rate and inflation rate with a view of creating enabling environment for manufacturing firms and potential investors in Nigeria. The government should intensify the efforts of garnering more foreign earnings by harnessing international trades.

Key Words: macroeconomic variables, manufacturing sector, trade openness

INTRODUCTION

The interplay between macroeconomic variables and the productivity of the manufacturing sector is a critical determinant of overall economic development in any given economy. The manufacturing sector, being a vital component of the secondary sector, holds considerable potential to drive economic growth, particularly in developing nations. The pivotal role of a robust manufacturing sector is underscored by its capacity to foster increased production and availability of goods, enhance employment opportunities, elevate income levels, optimize operational efficiency, and fortify the balance of payments, as elucidated by Paulo et al. (2017). Thus, fostering a thriving manufacturing sector is strategically positioned as a catalyst for sustainable economic development.

The manufacturing sector serves as a cornerstone for technological progress and a key driver of economic growth, as emphasized by Ullah et al. (2020), Lawal et al. (2017), and Akinuli et al. (2023). Substantial empirical evidence supports the notion that the manufacturing sector plays a pivotal role in fostering economic growth, as highlighted by the works of Lawal et al. (2018, 2019) and Meier & Quaas (2021). Leveraging its capacity for maximizing return to scale, generating high synergies, and fostering linkage effects, the production structure of the manufacturing sector proves particularly advantageous for emerging nations, as articulated by Arjun et al. (2020). Notably, the manufacturing sector stands as an indispensable bridge for economies transitioning from primary production or crude economies to service-oriented economies, a phenomenon underscored by Meier & Quaas (2021) and Ajao et al. (2021). This transitional role is crucial, as the manufacturing sector acts as a conduit facilitating the evolution of economies. Furthermore, the manufacturing sector serves as a strategic platform for developing nations to address technology imbalances effectively, contributing to their overall technological advancement.

As asserted by Ullah et al. (2020) and Paulo et al. (2017), macroeconomic variables serve as critical indicators influencing the trajectory of a nation’s economic growth, with a particular focus on the manufacturing sector. The dynamics of macroeconomic variables, including inflation rate, interest rate, and exchange rate, wield significant influence over the manufacturing sector’s performance. Positive movements in these macroeconomic variables, such as inflation rate, interest rate, and exchange rate, are posited to contribute positively to the robustness of the manufacturing sector, as articulated by Papetti et al. (2020) and Zhang et al. (2019). Conversely, the exchange rate emerges as a macroeconomic variable with a discernible negative impact on the manufacturing sector. Its fluctuations alter the value of domestic currency concerning revenues and costs denominated in foreign currency. According to Zhang et al. (2019), these changes in the exchange rate lead to fluctuations in earnings in the home currency, even before factoring in interest costs. Prince and Ibrahim (2011) contribute to this discourse by highlighting the inefficiencies inherent in most stock exchange markets, suggesting that responses to changes often exhibit a time lag. Investors may deliberate until the real effects of changes become apparent, discerning whether the alterations are of a permanent or temporary nature, a decision influenced by certain factors manifesting their effects with a time lag.

As elucidated by Edward et al. (2015), the profound impact of macroeconomic variables extends across the entire economy, exerting influence on all sectors collectively. In the realm of portfolio risk analysis, these macroeconomic variables assume the character of components contributing to unsystematic risks, given their non-firm-specific nature, making them resistant to diversification through the combination of various investment securities in a portfolio. Mismanagement or mishandling of these macroeconomic variables can disrupt the smooth functioning of economies and impede the performance of firms. Consequently, the efficacy of the manufacturing sector is intricately tied to the adept management of microeconomic variables, which possess the potential to either fortify or undermine sectoral performance.

Nigeria’s economic landscape is not immune to pertinent deficiencies that impinge upon firms’ productivity. Factors such as hyperinflation, deflation, elevated interest rates, and escalating exchange rates collectively constrain the capacity of firms to meet investment, finance, and transactional demands. The ability of firms to navigate these challenges hinges on their financial resources and access to capital, whether through debt or equity financing. Adedoyin et al. (2022) underscore the critical role of the exchange rate regime, particularly in import-oriented nations like Nigeria, in shaping the manufacturing sector’s ability to optimize trade openness, facilitating the influx of essential factor inputs such as machinery, raw materials, and technological transfers. Furthermore, the nexus between access to loans and firms’ productivity exhibits a positive correlation, with an increase in money supply being conducive to enhanced productivity.

Previous research indicates that macroeconomic variables such as inflation, interest rates, and exchange rates have adverse effects on the performance of Small and Medium Enterprises (SMEs) (Okeke et al., 2020). Omengbeoji et al. (2021) further observes a negative impact of inflation, interest rates, and corporate taxes on the agricultural sector, leading to a decline in productivity. Contrarily, John (2019) demonstrates a positive influence of money supply, exchange rates, and inflation on stock market performance, with interest rates exhibiting a significant negative effect. Additionally, Rasheed (2010) and Ajinaja et al. (2017) posit that elevated lending rates, contributing to high production costs, significantly impede the growth of

Nigeria's manufacturing sector.

This study aims to delve into the core macroeconomic variables, identified in the existing literature, that exert a substantial influence on manufacturing firms in Nigeria. The focal variables include trade openness, exchange rates, inflation, and interest rates, with the manufacturing growth index serving as a proxy for assessing the performance of the manufacturing sector. The structure of the study is organized as follows: Section one introduces the study, while Section two delves into the literature review. Sections three and four delineate the adopted methodology and present data analysis, respectively. The study concludes with Section five, offering recommendations based on the findings.

LITERATURE REVIEW

Concept of Macroeconomic Variables

Macroeconomic variables serve as critical indicators or benchmarks that illuminate prevailing trends within an economy. The inception of macroeconomics is attributed to John Maynard Keynes, as acknowledged by Hunjra et al. (2014). Keynes contended that the market, left to its own devices, lacks the inherent capability to generate sufficient savings (capital) to sustain investment at full employment levels. According to Keynes, achieving this requires periodic substantial increases in government spending. To effectively manage the macroeconomy, governments, like all experts, must rigorously study, analyze, and comprehend the key variables influencing its current behavior. This entails a comprehensive understanding of the forces driving economic growth, the factors triggering recession or inflation, and the ability to anticipate these trends. Furthermore, governments must formulate a judicious mix of policies that can effectively address and rectify economic challenges.

Hunjra et al. (2014) have identified pivotal variables shaping the current behaviour of the macroeconomy, including (1) average prime rate, (2) consumer price index, (3) Dow Jones average, (4) foreign balance of payments, (5) inflation rate, (6) money supply, and (7) exchange rate. In this framework, it is essential to recognize that macroeconomic variables are subject to the influence of government policies designed to regulate and stabilize the economy over time. This involves the implementation of monetary policy, fiscal policy, and supply-side economies, all geared towards mitigating fluctuations in the economy. The fundamental variables characterizing the macroeconomy remain consistent, yet the manner in which they are applied varies from one country to another due to the unique political processes from which policies emerge. This divergence arises from the distinct nature of each country's political landscape. Notably, three primary distinctions exist between microeconomics and macroeconomics.

Firstly, microeconomics focuses on the study of individual components within the economy, while macroeconomics takes a holistic approach, examining the economy as a unified entity. Secondly, in microeconomics, government involvement is relatively limited, predominantly confined to areas such as public goods, regulation, and welfare. Conversely, in macroeconomics, government intervention is considerably more substantial and pervasive. It is the government that formulates and enforces monetary and fiscal policies, playing a pivotal role in shaping the macroeconomic landscape. Despite any controversies surrounding this involvement, the government's influence in macroeconomics is almost comprehensive.

Thirdly, microeconomics has a historical foundation dating back to the mid-eighteenth century, whereas macroeconomics emerged as a distinct field in response to the challenges posed by the Great Depression of the 1930s. The inception of macroeconomics marked a paradigm shift, reflecting the need for a comprehensive understanding and management of the economy on a broader scale, particularly in times of significant economic upheaval.

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Theoretical Review

International Fisher Effect Theory

The study is grounded in the International Fisher Effect (IFE) theory, which elucidates the interconnections among interest rates, inflation rates, and exchange rates. The IFE theory posits that an appreciation or depreciation of one currency relative to another may be counteracted by a shift in the interest rate differential. Specifically, if the US interest rate exceeds Nigeria's interest rate, the US dollar should depreciate against the Nigerian Naira to eliminate arbitrage opportunities. In the context of this theory, the forward exchange rate, as illustrated in the example above, is considered to be at a discount when the dollar purchases fewer Nigerian Naira in the forward exchange rate compared to the spot rate, signifying that the Naira is at a premium.

Consequently, according to the International Fisher Effect, countries with relatively high nominal interest rates, which contribute to inflationary pressure, are inclined to experience depreciating currencies (exchange rate depreciation). Conversely, nations with comparatively low nominal interest rates may witness appreciating currencies (exchange rate appreciation) (Madura, 2010). This dynamic was evident during the deregulation of the exchange rate in Nigeria in 1988, marked by a 16.62% interest rate and an exchange rate of 4.53 to 1 US dollar. However, this scenario was accompanied by a high inflation rate of 34.24%. The result was that the import of raw materials became costly, while exports became more affordable. Nevertheless, Nigerian products encountered fierce competition from international counterparts and, as a consequence, became relatively expensive. This had an adverse impact on the performance of manufacturing output in Nigeria.

Managerial Theory of the Firm by Bumole (1967)

The Managerial Theory of the firm, pioneered by Bumole in 1967 within his work 'Business Behaviour, Value, and Growth,' posits a dynamic perspective on the manufacturing environment. This theory acknowledges the inherent dynamism resulting from technological advancements, shifts in economic activities, and changes in economic policies within the modern manufacturing sector. The central objective of firms, according to this theory, revolves around the effective and efficient utilization of resources to minimize costs, thereby enhancing shareholder value and fulfilling broader social responsibilities. The essence of employing managers, as outlined by the theory, is to maximize revenue while minimizing costs, ultimately adding value to invested capital—a primary objective of all businesses. The theory underscores the pivotal role of creating enabling facilities and establishing laws that foster the growth of existing and new firms for a country to experience rapid development.

Performance evaluation, as highlighted by Richard et al. (2009), involves three major perspectives: financial performance, assessed through accounting variables like profit before tax, return on assets, return on equity, and return on investment; product market performance, gauged by sales volume and market share; and shareholders' return, measured through total shareholder return and economic value added. Firm performance serves as a crucial variable, reflecting the effective utilization of financial resources to achieve overall corporate objectives. Widely employed by researchers, it acts as a mechanism to ensure that managers prioritize shareholder value creation over individual objectives. Acting as a check, firm performance evaluates past performance, maintains control over present operations, and positions the organization for future opportunities. Improved performance indicates adept management of both external and internal resources, fostering better financial outcomes based on past experiences.

Review of Empirical Studies

Ezeaku and Modebe (2016) conducted a comprehensive study titled 'Dynamics of Inflation and Manufacturing Sector Performance in Nigeria: Analysis of Effect and Causality' spanning the period from

1982 to 2014. Utilizing progression analysis and vector error correction model techniques with secondary data from the Central Bank of Nigeria (CBN) and Nigerian Bureau of Statistics (NBS), their research revealed that inflation and interest rates exhibited a negative and non-significant impact on the growth of the manufacturing sector. Conversely, the exchange rate was identified as exerting a positive and statistically significant influence on the value-added growth of the manufacturing sector.

In a related study, Idaka et al. (2021) investigated the impact of economic variables on the financial performance of listed firms manufacturing consumer goods in Nigeria. The economic variables considered included the Consumer Price Index (CPI), Interest Rate, Exchange Rate, and Net Asset Per Share (NAPS). The data, gathered from CBN statistical bulletins and various manufacturing firms, covered a 17-year period for both independent and dependent variables. The research employed regression analysis and descriptive statistics, revealing a strong correlation between CPI, interest rates, exchange rates, and net asset per share. Specifically, CPI demonstrated a significant effect on NAPS, and a short-run relationship, as indicated by the coefficients from the Autoregressive Distributed Lag (ARDL) model. However, exchange and interest rates showed no significant effect on NAPS in the short run.

Ezu et al. (2020) conducted an extensive study measuring the relationship between macroeconomic variables and the performance of the manufacturing sector in Nigeria spanning the period from 1981 to 2019. Data for the study were collected from sampled firms, complemented by economic data from the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS). The research focused on how macroeconomic variables, including real interest rates, exchange rates, and inflation rates, are associated with the manufacturing sector’s performance. Performance was assessed through the output contribution ratio to real gross domestic product and average capacity utilization over a 36-year timeframe. The study’s findings indicated a significant relationship between macroeconomic variables and performance at a 5% significance level. Augmented Dickey-Fuller and simple regression analyses were employed to test time series data for stationarity and ascertain the correlation between dependent and independent variables.

In a similar vein, Ghareli and Mohammadi (2016) investigated the impact of macroeconomic factors and firm characteristics on the quality of financial reporting in Iran. Secondary data spanning the years 2005 to 2013, obtained from the Ministry of Finance and the Central Bank, informed the study. The researchers employed the elimination technique to select a sample of 91 companies listed before 2005. Independent variables included exchange rates, inflation rates, interest rates, and gross domestic product, while dependent variables comprised working capital, firm size, and financial leverage. Utilizing multiple linear regression and Spearman correlation tests for analysis, the results revealed that exchange rates, interest rates, and leverage exhibited positive and significant effects. Gross domestic product had a negative and significant impact, whereas the inflation rate, and firm size were found to be nonsignificant.

Maimunah and Patmawati (2018) conducted a study utilizing secondary data from Malaysia’s main board of Bursa Malaysia as of June 2016. The data, sourced from financial statements of 50 manufacturing firms for the period 2011 to 2015, included variables such as inflation, gross profit, and production costs. The cluster sampling technique was employed for the study. The findings indicated that inflation contributed to an increase in gross profit, attributed to price adjustments to mitigate its effects. However, the study also revealed that an increase in inflation led to a corresponding increase in production costs.

In a related empirical analysis, Nnado and Ugwu (2016) investigated the impact of inflation on the profitability and value of selected manufacturing firms in Nigeria. They used profitability, proxied by return on assets (ROA), firm value, and economic value added (EVA) to measure the inflationary impacts. Data were gathered from secondary sources, including economic bulletins and financial statements of the sampled companies. The results showed a strong negative relationship between inflation and firm value. Additionally, an insignificant negative relationship was observed between inflation and return on assets, acting as a proxy for profitability. Furthermore, the study found that the relationship between return on assets and economic value added is also insignificant. The conclusion drawn from the study was that inflation leads to a decline in firm value, attributed to a reduction in fixed assets or the value of investment.

METHODOLOGY

Research Design

This study systematically explores the influence of macroeconomic variables on manufacturing firms in Nigeria. The key dependent variable under consideration is the manufacturing index, serving as a proxy for industrial output or growth index. Concurrently, various explanatory variables encompass trade openness (TOP), interest rate (INTR), inflation rate (INF), and exchange rate (EXCR), each designed to gauge pricing dynamics across borders. Through the analysis of these variables, the study aims to discern and quantify the intricate relationships between the identified macroeconomic factors and the performance of manufacturing firms in the Nigerian business landscape.

Sources of Data and Variables

This research relies on secondary data obtained from the Central Bank of Nigeria Statistical Bulletin and the National Bureau of Statistics (2022), spanning various issues from 1985 to 2021. The validity of this study is contingent upon the precision and authentication of the periodic reports released by the Central Bank of Nigeria and the National Bureau of Statistics (2022) in their annual publications.

Model Specification

General Objective: Evaluate the impact of macroeconomic variables, specifically exchange rate, inflation rate, and interest rate, on the manufacturing growth index in Nigeria. This modified model aligns with the perspective presented by Emmanuel (2016). In accordance with the overarching goal of scrutinizing the association between exchange rate and interest rate with the development of the manufacturing sector in Nigeria, the model is formulated in an implicit form for comprehensive examination:

MGFI = *f*(TPN, INF, EXC, INTR) ….. (i)

In explicit form/or mathematical form, the short-run equation for ARDL model can be expressed as:

$$\Delta MGFI_t = \propto_{01} + \sum_{i=1}^{P} \propto_{1i} \Delta MGFI_{t-1} + \sum_{i=1}^{q} \propto_{2i} \Delta TPN_{t-1} + \sum_{i=1}^{q} \propto_{3i} \Delta INF_{t-1} + \sum_{i=1}^{q} \propto_{4i} \Delta EXC_{t-i} + \sum_{i=1}^{q} \propto_{5i} \Delta INTR_{t-i} + \mathrm{e}_{1t} \dots\dots\dots (ii)$$

ARDL Long run model specification (in case there long-run relationship among the variables)

$$\Delta MGFI_t = \propto_{01} + \sum_{i=1}^{P} \propto_{1i} \Delta MGFI_{t-1} + \sum_{i=1}^{q} \propto_{2i} \Delta TPN_{t-1} + \sum_{i=1}^{q} \propto_{3i} \Delta INF_{t-1} + \sum_{i=1}^{q} \propto_{4i} \Delta EXC_{t-i} + \sum_{i=1}^{q} \propto_{5i} \Delta INTR_{t-i} + \lambda ECM_{t-1} + \mathrm{e}_{1t} \dots\dots\dots (iii)$$

Where:

MFGI = Manufacturing growth index

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EXC = exchange rate

INTR= Interest rate

TPN = Trade openness

INF = Inflation rate

U_t = error term

α_0 = constant term

$\alpha_1 - \alpha_4$ = parameters to be estimated

And also,

α_0 = constant/intercept

α_1 = co-efficient of trade openness

α_2 = co-efficient of exchange rate

α_3 = co-efficient of inflation

α_4 = co-efficient of interest rate

$e1t$ = error term/stochastic disturbance

$$\lambda = (1 - \sum_{i=1}^{p} \delta i\ ) \ \Leftrightarrow this\ represents\ the\ speed\ of\ adjustment\ parameter\ with\ a\ negative\ sign$$

ECM = ($MGFI_{t-1} - \theta_{xt}$), the error correlation term is the extracted residuals from the regression of the long-run equation

A Priori Expectation

As previously mentioned, the variables encompass the Manufacturing Growth Index (MFGI) as the dependent variable, while EXC, TPN, INF, and INT represent the independent variables. The anticipated relationship posits that all explanatory variables will exhibit a direct correlation with the dependent variable. In other words, a unit increase in any of these variables is expected to result in a corresponding increase in the dependent variable. This mathematical expression can be articulated as follows:

$$\alpha_1,\ \alpha_2\alpha_3 > 0,\ \alpha_4 < \mathbf{0}$$

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

Unit Root Test

In addressing the potential issue of spurious regression resulting from non-stationary data, it becomes imperative to ensure the stationarity of the dataset. This validation is conducted through the application of the Augmented Dickey-Fuller (ADF) unit root test. The decision criterion involves comparing the ADF test statistic value with the Mackinnon critical value, both at a 5% significance level and in absolute terms. The

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summary of the unit root test conducted on the parameters at the level is presented in the table below, offering a comprehensive assessment of the data's stationarity.

Table 1 Unit root test at level. (Trend and Intercept)

Variables	ADF Test Statistic Value	Mackinnon critical Value at 5%	Prob.	Remark
MFGI	-2.4530	-2.9484	0.1354	Non-stationary
EXC	1.9706	-2.9458	0.9998	Non-stationary
INT	-2.7115	-2.9458	0.0819	Non-stationary
TPN	-1.9719	-2.9458	0.2973	Non-stationary
INF	-4.1043	-2.9458	0.0029	Stationary

Source: Author's Computation, 2024

Upon careful examination of Table 1, it is discerned that among the five variables, only the interest rate (INF) is stationary at the level, as evidenced by its ADF statistics value surpassing the Mackinnon critical values at a 5% significance level. Conversely, the remaining variables exhibit non-stationarity, given that their Mackinnon critical values exceed the Augmented Dickey-Fuller (ADF) statistics at 5%. This incongruity prompted the exploration of stationarity at the first and second differences. The order of integration is elucidated in Table 2, presented under the remarks column.

It is imperative to emphasize that maintaining the stationarity of the data series is crucial, as failure to do so may compromise the reliability and consistency of the entire analytical framework and yield unreliable results.

Table 2 Unit root test at first/second difference. (Trend and Intercept)

Variables	ADF Test Statistic Value	Mackinnon critical Value at 5%	Prob.	Remark
MFGI	-4.0710	-2.9484	0..32	$I(_1)$
EXC	-5.1392	-2.9484	0.0002	$I(_1)$
INT	-6.2499	-1.9510	0.0000	$I(_1)$
TPN	-5.3047	-2.9511	0.0001	$I(_1)$
-4.1043	-2.9458	0.0029	Stationary	$I(_0)$

Source: Author's Computation, 2024

Referring to Table 2, the analysis indicates that INF has achieved stationarity at the level, as denoted by the remark column signifying the order of integration. This is substantiated by the probability value being less than 5%. Notably, the other variables—MFGI, TPN, EXC, and INTR—attained stationarity after the first difference, as evidenced by their ADF test statistics surpassing the Mackinnon critical values at a 5% significance level. The divergence in the stationarity levels among these variables implies that they are not co-integrated at the same order. This distinction in the order of integration underscores the nuanced dynamics within each variable, emphasizing the importance of accounting for the varying levels of stationarity. Such discernment is essential for conducting a robust and reliable analysis of the relationships among the variables under consideration which were computed using trend and intercept as slope.

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Table 3 Descriptive Statistics

Table 3	EXC	INF	INTR	MGFI	TPN
Mean	104.5413	18.21595	19.88459	126.2811	0.034776
Median	111.9433	13.00000	18.99000	135.2000	0.020175
Maximum	387.0000	72.80000	36.09000	218.6000	0.118631
Minimum	0.724100	5.400000	11.50000	59.30000	-0.032320
Std. Dev.	104.8304	15.40417	5.649952	34.06253	0.040613
Skewness	1.107271	1.936560	0.849870	0.228596	0.666061
Kurtosis	3.722161	6.319984	3.546530	3.153738	2.158216
Jarque-Bera	8.364636	40.11934	4.914539	0.358684	3.828185
Probability	0.015263	0.000000	0.085669	0.835820	0.147476
Observations	37	37	37	37	37

Source: Author's computation using E-view 9 version (2024)

Examining Table 3, the descriptive statistics present pertinent and applicable results for the variables under consideration. The means for exchange rate (EXC), inflation (INF), interest rate (INTR), manufacturing sector growth index (MFGI), and trade openness (TPN) are 104.5413, 18.21595, 19.88459, 126.2811, and 0.034776, respectively. Kurtosis, measuring the peakedness or flatness of the series, is provided for each variable. It's noteworthy that the normal distribution for Kurtosis is 3, where values exceeding 3 indicate a peaked (leptokurtic) distribution, and values below 3 indicate a flat (platykurtic) distribution relative to the normal. The results reveal that MFGI exhibits a nearly normal distribution with a Kurtosis result of 3.153873. Conversely, TPN's distribution is flat (platykurtic) with a Kurtosis result of 2.158216, while INTR, INF, and EXC can be described as peaked (leptokurtic) with Kurtosis values of 3.546530, 6.319984, and 3.722161, respectively.

Considering the Jarque-Bera test results, Jarque-Bera serves as a statistical tool for assessing the normality of the distribution. The decision criterion stipulates that the null hypothesis is rejected if the probability is less than 5%, and vice versa. The Jarque-Bera probability values indicate that the null hypotheses for MFGI, INTR, and TPN should be accepted, as they are higher than 5%. Conversely, the null hypotheses for EXC and INF should be rejected, as their Jarque-Bera probabilities are less than 5%. The dataset comprises 37 observations after adjustments.

Optimal Lag Selection

The determination of the optimal lag selection is crucial in estimating the Autoregressive Distributed Lag (ARDL) model, especially when the unit root test directs the choice of ARDL in our estimation. This crucial information is derived from the vector autoregressive (VAR) model. The optimal lag lengths for the variables are meticulously outlined in Table 4 below, providing essential guidance for the subsequent modeling and analysis.

Table 4: appropriate lag length for dependent variables:

Dependent Variables	Lag Length Criteria
MGFI	3

Source: (Author's computation using E-views 10 version using Data extracted from CBN statistical Bulletin, 2022 and World Development Indicator, 2022)

Table 4 delineates the selected lag lengths deemed appropriate for the manufacturing firm's output, which serves as the dependent variable in the models, aligning with the objectives outlined in Chapter One of this study. Notably, the explanatory variable, MGFI, is identified with an optimal lag length of 3 in this particular study. This meticulous determination ensures that the chosen lag length is reflective of the specific dynamics and nuances associated with the manufacturing sector, facilitating a more accurate and contextually relevant analysis.

Result of Co-integration Test

In this sub-section, the Autoregressive Distributed Lag (ARDL) model bound test approach is employed to assess the presence of a long-run relationship among the variables. It is imperative to underscore that, in order to draw any meaningful conclusions regarding the long-run relationship between the series, the prerequisite condition is the existence of co-integration among the variables. This pivotal consideration ensures the robustness and reliability of the subsequent analysis and findings.

ARDL Bounds Co-integration Test

Building upon the insights gleaned from Table 1 and Table 2, where certain variables exhibited stationarity at the level and others required first difference for stationarity, the decision was informed to employ the ARDL bounds co-integration test for analyzing the long-run relationship among the variables in this study. The results of the ARDL bounds co-integration test are meticulously presented in Table 5, providing a comprehensive assessment of the interplay and potential co-integration dynamics among the variables under consideration.

Table 5: F-Bounds Test

	Model 1	
Bound significance	I(0)	I(1)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06
F-Statistics	6.683968	
D.F	4	

Source: (Author's computation using E-views 10 version and Data extracted from CBN statistical Bulletin (2020), National Bureau of Statistics (2020) and World Development Indicator (2020))

The F-Bound test could be used to evaluate co-movement among the variables as it provides useful result in determining the long run relationship among the variables

Decision Rule: at 5% Significance value

If F-Statistics (BT) < Lower Limit Bound ↔ No Long-run relationship exist

If Lower Limit < F-Statistics (BT) > Upper Limit ↔ Long-run relationship exist

If F-Statistics (BT) > Upper Limit (I1) ↔ Long-run relationship exist

In interpreting the results of the Bounds Test (BT) in the context of the ARDL bounds co-integration test:

- If BT is less than the lower limit, the appropriate action is to accept the null hypothesis, signifying the absence of a long-run relationship among the variables.
- If BT falls between the lower and upper limits, the appropriate course of action is to reject the null hypothesis, indicating the presence of a long-run relationship among the variables.
- If BT exceeds the upper limit, the recommended action is to reject the null hypothesis, reinforcing the assertion that a long-run relationship exists among the variables.

This structured approach provides clear guidelines for drawing meaningful conclusions from the ARDL bounds co-integration test results.

Nota bene: The selection of an appropriate level of significance is contingent upon the researcher's margin of confidence, and in this study, a 5% level of significance is chosen as the margin of safety or confidence.

Upon scrutiny of Table 5, it becomes evident that a long-run relationship among the variables is established, as affirmed by the F-Bound test. The model's postulated F-Statistics bound test computed result, standing at 6.683968, surpasses the Upper Limit Bound I(1) at a 5% level of significance (2.86 I(0) and 4.01 I(1)). This outcome signifies that the variables are jointly co-integrated at the same level, providing compelling evidence for the existence of a long-run relationship.

PRESENTATION OF ARDL RESULTS

Table 6: ARDL Long-Run and Short-Run Results for Model 1

Dependent Variable: LOG MGFI (Proxy for output of manufacturing companies)							
Short-Run Estimation				**Long-Run Estimation**			
Variable	**Coefficient**	**t-Statistic**	**Prob**	**Variable**	**Coefficient**	**t-Statistic**	**Prob**
LOG(MGFI(-1))	0.837847	5.312786	0.0000	DLOG(MGFI(-1))	0.792450	3.776696	0.0010
LOG(MGFI(-2))	-0.317477	-1.522904	0.1420	DLOG(MGFI(-2))	0.474972	2.167914	0.0413
LOG(MGFI(-3))	-0.474972	-2.167914	0.0413	D(TPN)	0.919617	0.876541	0.3902
TPN	0.919617	0.876541	0.3902	D(TPN(-1))	4.530516	3.970727	0.0006
TPN(-1)	2.011131	1.378074	0.1820	D(EXC)	-0.000005	-0.014007	0.9890
TPN(-2)	-4.530516	-3.970727	0.0006	D(INTR)	0.019284	2.731559	0.0122
EXC	-5.13E-06	-0.014007	0.9890	D(INTR(-1))	0.015801	2.170995	0.0410
INTR	0.019284	2.731559	0.0122	D(INF)	0.004957	2.378247	0.0265
INTR(-1)	0.011212	1.614559	0.1207	ECM(-1)	-0.954603	-3.638099	0.0015
INTR(-2)	-0.015801	-2.170995	0.0410				
INF	0.004957	2.378247	0.0265				
C	4.238767	3.646726	0.0014				

Source: Author's Computation using E-view 10 and Data extracted from

Central Bank of Nigeria Statistical Bulletin (2023)

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*implies significant at 1%, **implies significant at 5%

Table 7: Statistical Properties and Post Diagnostic Results for Model 1

Statistical Properties		**Post Diagnostic Test Results**	
R-Squared	0.861192	B-G Serial Correlation LM (F-Statistics)	0.911307
Adj R-squared	0.791788	B-G Serial Correlation LM Prob F (1, 28)	0.4166
F-statistics	12.40842	Heteroskedasticity Test	0.917429
Prob(F-statistcis)	0.000000	Breusch-Pagan-Godfrey Prob	0.5337
Durbin Watson Statistics	2.303369		
Akaike Info Criterion			
Model Selection	3		
ARDL Best Model	(3, 2, 0, 2, 0)		

Source: Author’s Computation using E-view 10 and Data extracted from

Central Bank of Nigeria Statistical Bulletin, 2022

DISCUSSION OF FINDINGS FROM SHORT-RUN ESTIMATION

From the Table 9 and Tables 10 above, the results of the short-run and long run estimation are explained in turns below:

Exchange Rate (EXC)

The observed result signifies that exchange rate (EXC) exhibits an indirect and negative relationship with the Manufacturing Growth Index (MFGI). A change in EXC is associated with a marginal decline of 0.00000513 or 0.000513% in the Manufacturing Growth Index, acting as a proxy for business development or output, within the studied period. This outcome, however, is statistically insignificant, deviating from the anticipated direction, as indicated by the probability value of 0.9890, surpassing the 5% threshold. Moreover, in the long run, exchange rate maintains its negative relationship with manufacturing firm growth or output. The coefficient value of 0.000005 implies that a unit increase in exchange rate corresponds to a marginal decline of 0.0005 in the manufacturing growth. Similar to the short-term relationship, this result is statistically insignificant, reinforcing the observation made in the short-run analysis.

Interest Rate

In the short run, the result for interest rate reveals a direct and positive relationship with the Manufacturing Growth Index (MFGI). A unit increase in interest rate is associated with a substantial boost of 0.019284 or 1.9284% in the Manufacturing Growth Index, acting as a proxy for business development or output. This outcome is statistically significant, as indicated by the probability value of 0.0122, aligning with the anticipated relationship. Similarly, in the long run, both the current and lagged interest rates demonstrate positive relationships with the dependent variable, MFGI. The coefficient results of 0.01928 and 0.015801 for the current and lagged periods, respectively, signify that a unit change in interest rate induces a 1.928% and 1.5801% boost in manufacturing firm growth or output within the investigated period. These results are statistically significant, with probability values of 0.0122 and 0.0410 for the current and lagged periods, respectively. The observed outcomes align with the a priori expectation, reinforcing the positive relationship anticipated.

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Trade Openness

In the short run, trade openness exhibits both positive and negative relationships in the current and lagged periods, respectively. This implies that a unit increase in trade openness results in a 91.96% and 453.05% decline and incline, respectively, in the Manufacturing Growth Index (MFGI). The results are statistically insignificant at the current period, while they are statistically significant at the lagged period, as evidenced by TPN(-2) with probability values of 0.3902 and 0.0006, respectively. Conversely, in the long run, trade openness (TPN) maintains a positive relationship with MFGI. The coefficient result of 4.530516 for TPN-1 indicates that a unit increase in trade openness induces a substantial 453.0516% boost in manufacturing growth or output in the long run. This suggests that trade openness has a sustained positive effect on manufacturing firms over an extended period. The result is statistically significant, with a probability value of 0.0006, falling below the 5% threshold.

Inflation Rate

In the short run, the coefficient value of 0.004957 reveals a positive relationship between inflation rate and the growth of the manufacturing business in Nigeria. This implies that a unit change in inflation will stimulate a corresponding 0.4957% boost in the manufacturing business growth, and the result is statistically significant with a probability value of 0.0265.

Similarly, in the long run, inflation rate maintains a positive relationship with the Manufacturing Growth Index (MGFI), indicating that a unit change in inflation rate will induce a 0.4957% boost in the industry or manufacturing business growth in Nigeria. This long-term result is also statistically significant, with a P-value of 0.0265. The observed outcomes align with the a priori expectation, reinforcing the anticipated positive relationship.

Error Correction Model Mechanism (ECM (-1))

The result of ECM(-1) is appropriately signed, and its significance indicates that any shock or deviation from the long-run equilibrium observed in the previous period can be corrected or adjusted in the subsequent period with a speed of 95.46%. This finding is highly noteworthy and statistically significant, as evidenced by the P-value of 0.0015. The observed result satisfies the necessary and significant conditions for the Error Correction Mechanism (ECM), underlining its effectiveness in capturing and rectifying deviations from the long-run equilibrium in the model.

Constant (C)

The constant term (C) also signifies a direct and positive relationship with the Manufacturing Growth Index (MFGI). This intercept (C) implies the value of the dependent variable when all other parameters are equal to zero. Specifically, a unit increase in the constant term (C), with all other estimated parameters fixed, is associated with a substantial 4.238767 or 423.8767% increase in the Manufacturing Growth Index, serving as a proxy for business development. This result aligns with the a priori expectation and is statistically significant in elucidating variations in the MFGI, as indicated by the probability value of 0.0014.

Post-Diagnosis Test

Table 8

Diagnostic Test	Statistics	P-Value
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.917429	0.3337

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Breusch-Godfrey Serial Correlation LM Test	0.911307	0.4166

Source: Author's computation using E-view 10 (2024)

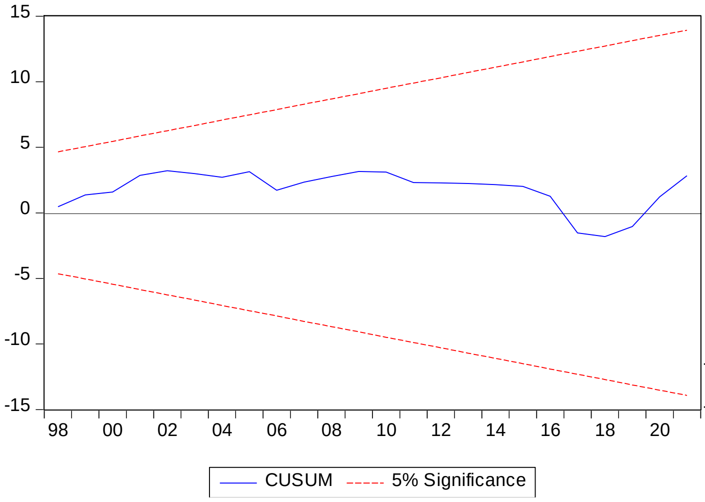
The post-diagnostic results for the specified model in this study are examined in Table 7 and Table 8. The coefficient of determination (R-Squared) stands at 0.8611, indicating that the explanatory variables contribute to approximately 86.11% of the information concerning the variation in exchange rate, interest rate, inflation rate, and trade openness affecting the manufacturing sector's performance in Nigeria. This outcome is supported by the adjusted R-squared value of 79.18%, suggesting that the model is likely free from wrong specification and omission of crucial variables.

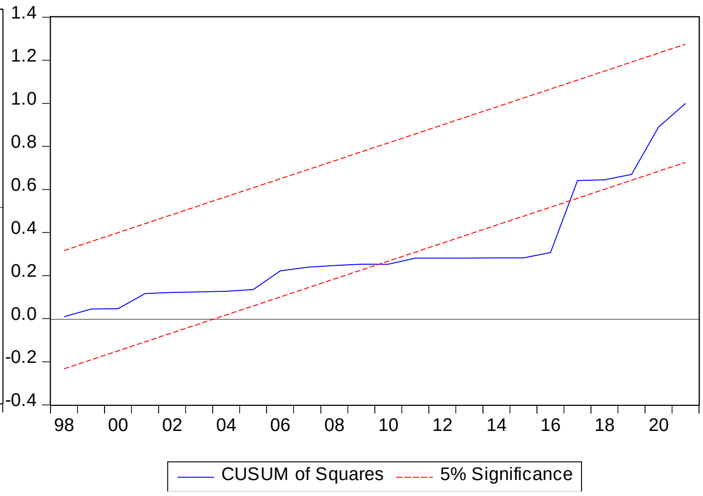
The Durbin Watson statistic of 2.303369 suggests a lack of autocorrelation problems in the study. The F-statistics test result of 12.40842, with a probability value of 0.000000, confirms the overall statistical significance of the regression analysis.

The Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test, used to assess higher-order Autoregressive Moving Average (ARMA) errors and detect lagged dependent variables or serial correlation, yields a probability result of 0.4166, surpassing the 5% threshold. This indicates acceptance of the null hypothesis of no serial correlation, signifying that the model is free from higher-order correlation.

Furthermore, the Breusch-Pagan Godfrey (BPG) test, employed to identify heteroskedasticity in the regression result, provides a probability value of 0.5337, which exceeds 5%. This suggests an absence of heteroskedasticity in the regression result. Overall, these diagnostic tests contribute to the robustness and reliability of the model.

Stability Test





Graph 4.1: CUSUM result

Graph 4.2: CUSUM of Squares result

Graph 4.1 and Graph 4.2 illustrate the results of the cusum and cusum of squares tests at the 5% significance level, respectively. The outcomes of both tests indicate the relative stability of the regression, as they fall within the acceptable region at the 5% significance level. In summary, the comprehensive post-diagnostic tests conducted and examined provide sufficient evidence to corroborate the validity and reliability of the model postulated in this study.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it is concluded that exchange rate, trade openness, inflation rate, and interest rate—key macroeconomic variables—have mixed effects on business development, proxied by the manufacturing growth index, in Nigeria. While exchange rate exhibits an indirect and negative relationship with business development, interest rate demonstrates a direct and positive influence on the manufacturing growth index in both the short run and long run during the review period in Nigeria. In light of these conclusions, the following recommendations are proposed: Define and improve the process of ease of doing business in Nigeria to foster the growth of the productive sector. Focus on boosting and enhancing infrastructural development to positively impact business development and the productive sector in Nigeria. Diversify the economy to ensure sustainability and increased foreign exchange earnings, considering the potential unsustainability of revenue from oil in the near future. Prioritize the growth of the real sectors of the economy and create an enabling environment for foreign investors to attract trade with the rest of the world, contributing to the growth of the economy and manufacturing firms in Nigeria. Address insurgency within the country promptly to boost the confidence of local investors and attract foreign investors, leading to positive effects on foreign exchange earnings and external assets. Implement measures to manage interest rates effectively, reducing the burden on fund borrowers during principal and interest repayments. Encourage further research that can positively impact the outcomes of this study, such as incorporating additional variables into the model and employing more sophisticated econometric methods to determine the impact of macroeconomic variables on manufacturing firms' development in Nigeria.

REFERENCES

1. Adedoyin, I. L., Eziekel, O., Bukola, B. L., Joseph, I, O., Abiola, J. A., Henry, I., Santanu, A., Dick, T., Opeyemi, O., & Ogunwole, E. (2022). Impact of macroeconomic variables on the Nigerian manufacturing sector. *Cogent Economics & Finance*, *10*(1), 2090664. https://www.doi.org/10.1080/23322039.2022.2090664
2. Ajao, G. M., Ajinaja, T. O., and Akinuli, B. O. (2021). Bank peculiar variables and profit maximization of deposit money banks: the Nigerian experience. *Fuoye Journal of Finance and Contemporary Issues*, 1(1), 122 – 133.
3. Ajinaja, T. O., Adedayo, O. C. and Akinuli, B. O. (2017). The implication of credit creation by banks on economic growth in Nigeria, *Research Journal of Finance and Accounting*, 8(10), 155 – 160.
4. Akinuli, B. O., Osagiede, M., Adegoroye, A., Mope, C., and Oluwatosin, A. O. (2023) The influence of deposit money banks on agricultural financing in Nigeria, *ISRG Journal of Economics, Business and Management*, 1(2), 10 -17.
5. Anochie, U. C., Okereafor, G. and Bashir, M. O. (2023). Macroeconomic variables and productivity of Nigeria's manufacturing sector. *Nigerian Journal of Management Sciences*, 24(1), 244 – 254.
6. Arjun, K., Sankaran, A., Kumar, S., & Das, M. (2020). Heliyon an endogenous growth approach on the role of energy, human capital, finance and technology in explaining manufacturing value-added: A multi-country analysis. Retrieved from https://doi.org/10.1016/j.heliyon.2020.e04308.
7. Ezu, G. K., Jeff-Anyeneh, S. E., & Ogbonnaya-Udo N. A. (2020). Macroeconomic Variables and Performance of the manufacturing sector in Nigeria (1981-2019). *Journal of Business and Management (IOSR-JBM)*, 22 (11), 2278-487.
8. Ghareli, S. & Mohammadi, A. (2016). A study on the effect of macroeconomic variables and firm characteristics on the quality of financial reporting of listed firms in the Tehran stock exchange. *Journal of Fundamental and Applied Sciences, 8(25)*, 1777-1797.
9. Idaka S. E., Ugwoke R. O., Ajuh, A. I., & Edith O. O. (2021) Effect of Economic Variables on the Financial Performance of Listed Firms Manufacturing Consumers Goods in Nigeria. *Universal Journal of Accounting and Finance* 9(6), 1235-1246.

10. Idaka S.E., Gabriel F.G., Okwajie F.A., Andortan A.S. (2023), Effect of Changes in Economic Variables on the Performance of Manufacturing Firms in Nigeria. *African Journal of Accounting and Financial Research*, 6(4), 124-138. DOI: 10.52589/AJAFR-TOCI5HKM
11. Hunjra, A. I, Chani, M. L., Javed, S., Nacem, S., & ljaz, M. S. (2014). Impact of micro economic variables on firm's performance. *International Journal of Economics and Empirical Research*, *2*(2), 65-73.
12. Lawal, A. I., Adebare, S. A., John, A. A., Oseni, E. B. Lawal-Adedoyin, B., Olatunde D. S., Oluwasola, O. E. Oyeronke, D. A., Bolatito, O. E., & Ayopo, B. A. (2022). Economic growth, exchange rate and remittance Nexus: Evidence from Africa. *Journal of Risk and Financial Management*, *15*(6), 235. https://doi.org/10.390/jrfm15060235
13. Lawal, A. I., Asaleye, A. J., IseOlorunkanmi, J., & Popoola, O. R. (2018). Economic growth, agricultural output and tour- ism development in Nigeria: An application of the ARDL bound testing approach. *Journal of Environmental Management and Tourism*, *28*(4), 786– 794. https://doi.org/10.14505//jemt.v9.4(28).12
14. Lawal, A. I., Olayanju, A., Salisu, A. A., Asaleye, A. J., Dahunsi, O., Dada, O., Omoju, O. E., & Popoola, O. R. (2019). Examining rational bubbles in oil prices: Evidence from frequency domain estimates. *International Journal of Energy Economics and Policy*, *9*(2), 166–173. https://doi.org/10.32479/ijeep.7768
15. Madura, J. (2010). "International Financial Management", 10th Edition, South-Western College Publishing.
16. Madura, J. and Nosari, E. (2012). "Speculative Trading in the Eurocurrency Market." *Akron Business and Economic Review* (Winter 1984), 48 –52.
17. Maimunah, A. & Patmati, I. (2018). Inflation and companies' performance: A cross-sectional analysis. *Journal of Computational and Theoretical Nanoscience* 1(2) 1-18· DOI:10.1166/asl.2018.11694.
18. Meier, F. D., & Quaas, M. F. (2021). Booming gas: A theory of endogenous technological change in resource extraction. *Journal of Environmental Economics and Management*, *107*, 102447. https://doi.org/10.1016/j.jeem.2021.102447
19. Papetti, A., Menghi, R., Germani, M., Germani, M., & Marconi, M. (2020). An energy assessment method for SMEs: Case study of an Italian mechanical workshop. *Procedia Manufacturing*, *43*, 56–63. https://doi.org/10.1016/j.promfg.2020.02.107
20. Paulo, E., de Souza, K. B., & Souza, A. (2017). Decomposing Brazilian manufacturing industry dynamics in the mid-2000s: Macroeconomic factors and their sectoral impacts. *EconomiA*, *18*(3), 411–432. http://hdl.handle.net/10419/179658
21. Prince, F. L& Tbrahim, B. A. (2011). The effects of macroeconomic factors on the Nigerian stock returns: A sectoral approach. *Global Journal of Management and Business Research*, *11*(7), 1-8.
22. Richard, P.J., Devinney, T.M., George, S.Y., & Johnson, G. (2009). Measuring Organizational Performance: Towards Methodological Best Practices. *Journal of Management*, *35*, 718-804
23. Ullah, A., Pinglu, C., Ullah, S., Zaman, M., & Haider, S. (2020). Heliyon the nexus between capital structure, firm-specific factors, macroeconomic factors and financial performance in the textile Sector of Pakistan. Retrieved from https://www.doi.org/10.1016/j.heliyon.2020.e04741.
24. Zhang, Y., Chen, X., Wu, Y., Shuai, C., & Shen, L. (2019). The environmental Kuznets curve of CO 2 emissions in the manufacturing and construction industries: A global empirical

Dependent Variable: MGFI			
Method: ARDL			
Date: 01/30/24 Time: 13:10			
Sample (adjusted): 1987 2021			
Included observations: 35 after adjustments			
Maximum dependent lags: 2 (Automatic selection)			

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Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (2 lags, automatic): EXC INF INTR TPN				
Fixed regressors: C				
Number of models evalulated: 162				
Selected Model: ARDL(2, 0, 0, 2, 2)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
MGFI(-1)	1.020799	0.151881	6.721035	0.0000
MGFI(-2)	-0.459558	0.229377	-2.003507	0.0565
EXC	0.040084	0.041193	0.973087	0.3402
INF	0.641677	0.269348	2.382335	0.0255
INTR	1.264726	0.919662	1.375207	0.1818
INTR(-1)	0.212299	0.876576	0.242192	0.8107
INTR(-2)	-2.574709	0.936841	-2.748287	0.0112
TPN	123.7376	130.1773	0.950531	0.3513
TPN(-1)	45.06576	175.8867	0.256220	0.8000
TPN(-2)	-339.5633	128.7413	-2.637562	0.0144
C	69.33052	22.34012	3.103409	0.0048
R-squared	0.807011	Mean dependent var		128.4057
Adjusted R-squared	0.726598	S.D. dependent var		33.69794
S.E. of regression	17.61992	Akaike info criterion		8.827215
Sum squared resid	7451.080	Schwarz criterion		9.316038
Log likelihood	-143.4763	Hannan-Quinn criter.		8.995957
F-statistic	10.03591	Durbin-Watson stat		2.116743
Prob(F-statistic)	0.000002			
*Note: p-values and any subsequent tests do not account for model selection.				

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(MGFI)				
Selected Model: ARDL(2, 0, 0, 2, 2)				
Case 2: Restricted Constant and No Trend				
Date: 01/30/24 Time: 14:00				
Sample: 1985 2021				
Included observations: 35				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	69.33052	22.34012	3.103409	0.0048
MGFI(-1)*	-0.438759	0.202226	-2.169648	0.0402
EXC**	0.040084	0.041193	0.973087	0.3402
INF**	0.641677	0.269348	2.382335	0.0255

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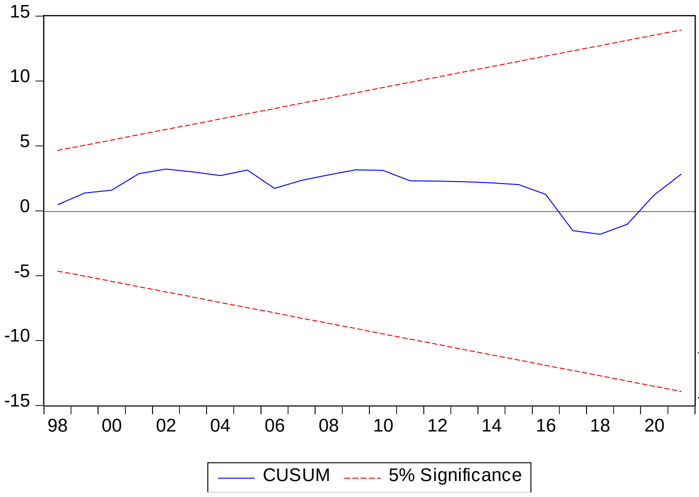
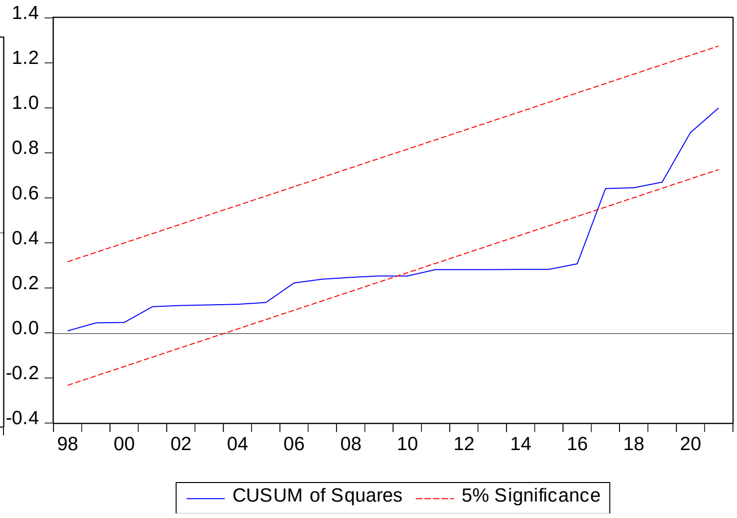
INTR(-1)	-1.097683	1.013059	-1.083533	0.2893
TPN(-1)	-170.7600	108.0947	-1.579727	0.1273
D(MGFI(-1))	0.459558	0.229377	2.003507	0.0565
D(INTR)	1.264726	0.919662	1.375207	0.1818
D(INTR(-1))	2.574709	0.936841	2.748287	0.0112
D(TPN)	123.7376	130.1773	0.950531	0.3513
D(TPN(-1))	339.5633	128.7413	2.637562	0.0144
* p-value incompatible with t-Bounds distribution.				
** Variable interpreted as Z = Z(-1) + D(Z).				
Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXC	0.091359	0.118986	0.767812	0.4501
INF	1.462480	0.880942	1.660133	0.1099
INTR	-2.501790	3.184760	-0.785550	0.4398
TPN	-389.1885	266.1687	-1.462188	0.1567
C	158.0150	57.24028	2.760556	0.0109
EC = MGFI – (0.0914*EXC + 1.4625*INF -2.5018*INTR -389.1885*TPN + 158.0150)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.224906	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	35		Finite Sample: n=35	
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532

ARDL Error Correction Regression	
Dependent Variable: D(MGFI)	
Selected Model: ARDL(2, 3, 3, 2, 0)	
Case 2: Restricted Constant and No Trend	
Date: 01/30/24 Time: 14:01	
Sample: 1985 2021	
Included observations: 34	

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MGFI(-1))	0.437769	0.107728	4.063639	0.0007
D(EXC)	0.107181	0.091522	1.171091	0.2560
D(EXC(-1))	0.426279	0.086358	4.936191	0.0001
D(EXC(-2))	0.413083	0.108810	3.796358	0.0012
D(INF)	1.058224	0.200641	5.274215	0.0000
D(INF(-1))	-0.633092	0.176549	-3.585933	0.0020
D(INF(-2))	-0.444934	0.175985	-2.528251	0.0205
D(INTR)	2.237543	0.623301	3.589828	0.0020
D(INTR(-1))	3.597230	0.714148	5.037092	0.0001
CointEq(-1)*	-0.239611	0.038158	-6.279381	0.0000
R-squared	0.788464	Mean dependent var		2.582353
Adjusted R-squared	0.709137	S.D. dependent var		22.04250
S.E. of regression	11.88789	Akaike info criterion		8.028846
Sum squared resid	3391.726	Schwarz criterion		8.477776
Log likelihood	-126.4904	Hannan-Quinn criter.		8.181944
Durbin-Watson stat	2.890712			
* p-value incompatible with t-Bounds distribution.				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.202651	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37





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Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.917429	Prob. F(10,24)	0.5337
Obs*R-squared	9.679189	Prob. Chi-Square(10)	0.4691
Scaled explained SS	6.163043	Prob. Chi-Square(10)	0.8014

Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 01/30/24 Time: 13:12				
Sample: 1987 2021				
Included observations: 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	786.0491	456.2636	1.722796	0.0978
MGFI(-1)	-1.209909	3.101948	-0.390048	0.6999
MGFI(-2)	2.615311	4.684683	0.558268	0.5818
EXC	-0.113237	0.841306	-0.134597	0.8941
INF	-9.828555	5.501024	-1.786677	0.0866
INTR	-33.50262	18.78273	-1.783692	0.0871
INTR(-1)	-10.58671	17.90276	-0.591345	0.5598
INTR(-2)	23.94996	19.13358	1.251724	0.2227
TPN	-1953.577	2658.678	-0.734793	0.4696
TPN(-1)	-3274.133	3592.222	-0.911451	0.3711
TPN(-2)	1056.122	2629.350	0.401667	0.6915
R-squared	0.276548	Mean dependent var		212.8880
Adjusted R-squared	-0.024890	S.D. dependent var		355.4640
S.E. of regression	359.8606	Akaike info criterion		14.86059
Sum squared resid	3107991.	Schwarz criterion		15.34941
Log likelihood	-249.0603	Hannan-Quinn criter.		15.02933
F-statistic	0.917429	Durbin-Watson stat		2.064358
Prob(F-statistic)	0.533738			

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.911307	Prob. F(2,22)		0.4166
Obs*R-squared	2.677770	Prob. Chi-Square(2)		0.2621
Test Equation:				
Dependent Variable: RESID				
Method: ARDL				
Date: 01/30/24 Time: 13:12				
Sample: 1987 2021				
Included observations: 35				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

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MGFI(-1)	0.220124	0.225597	0.975736	0.3398
MGFI(-2)	-0.258055	0.299288	-0.862229	0.3979
EXC	-0.025556	0.047928	-0.533220	0.5992
INF	-0.198631	0.335622	-0.591830	0.5600
INTR	0.007146	0.925509	0.007721	0.9939
INTR(-1)	-0.102197	0.907357	-0.112631	0.9113
INTR(-2)	0.664614	1.109281	0.599139	0.5552
TPN	27.68811	137.8717	0.200825	0.8427
TPN(-1)	-77.16364	203.4232	-0.379326	0.7081
TPN(-2)	47.76191	142.4650	0.335254	0.7406
C	-1.173844	22.54905	-0.052057	0.9590
RESID(-1)	-0.451547	0.362038	-1.247235	0.2254
RESID(-2)	0.027250	0.272441	0.100023	0.9212
R-squared	0.076508	Mean dependent var		-4.36E-14
Adjusted R-squared	-0.427215	S.D. dependent var		14.80370
S.E. of regression	17.68540	Akaike info criterion		8.861908
Sum squared resid	6881.015	Schwarz criterion		9.439608
Log likelihood	-142.0834	Hannan-Quinn criter.		9.061330
F-statistic	0.151884	Durbin-Watson stat		1.804501
Prob(F-statistic)	0.999181			