Analyzing MSME Export Performance in India: Insights from the ARIMA Model on Trends and Volatility

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Abstract: The Micro, Small, and Medium Enterprises (MSME) sector plays a vital role in India's economic growth, contributing significantly to GDP, employment, industrial output, and exports. This study explores the relationship between MSME exports and total national exports in India from 2000-01 to 2019-20, analyzing their influence on export fluctuations. Using secondary data from government sources, the research applies regression analysis and the Autoregressive Integrated Moving Average (ARIMA) model to examine the trends and variations in MSME exports. The results demonstrate a strong positive correlation, with MSME exports accounting for approximately 91.53% of the variation in total exports. The regression analysis shows that an increase in MSME exports leads to a substantial rise in total exports, emphasizing the sector's crucial role in India's trade framework. The ARIMA model-based volatility analysis reveals that while MSME exports contribute to export fluctuations, external factors also play a significant role. Dickey-Fuller test confirms that both MSME exports and total exports are non-stationary, requiring differencing for proper time series analysis. However, ARIMA regression results suggest that past values and forecast errors have a limited impact on current total exports. These insights highlight the importance of targeted policy interventions to enhance MSME competitiveness, address financial and technological constraints and mitigate external volatility effects. Despite their considerable contribution, MSMEs continue face challenges like restricted access to credit, technological challenges and stiff global competition. Addressing these issues is necessary for the development of MSMEs growth. This study provides valuable recommendations for policymakers to boost MSME exports and enhance economic stability.

Keyword: MSMEs exports, total exports, Regression analysis, ARIMA model, volatility, economic growth

1. Introduction

The Micro, Small, and Medium Enterprises (MSME) sector is a key component of Indian economy, playing an essential role in its overall growth. MSMEs are responsible for a considerable portion of the country's Gross Domestic Product (GDP), which measures the economic output of a nation. These businesses also create a significant number of jobs, providing employment to millions of people, thereby addressing unemployment and contributing to income generation. In addition, MSMEs contribute to industrial output by producing a wide range of goods and services, often filling gaps in various sectors such as manufacturing, textiles, food processing, and information technology. These enterprises are also crucial to India's export economy, as they produce products that are sold abroad, boosting the country's export performance and helping to improve the trade balance.

By fostering inclusive growth and reducing regional disparities, MSMEs plays an important role in nation-building and economic diversification. As globalization intensifies, MSMEs have emerged as key players in international trade. They supply raw materials and intermediary goods to large industries while also functioning as independent exporters. Their ability to operate across manufacturing, trade and service sectors further highlight their importance in achieving sustainable economic progress. In recent years, globalization has expanded the role of MSMEs in international trade, allowing them to integrate into global value chains. These enterprises supply raw materials and intermediate goods to large industries while also emerging as independent exporters in their own right. Given their growing significance, analyzing their export performance and the necessary policy interventions is crucial for enhancing their global competitiveness.

1.1. Global Significance of MSMEs

MSMEs are crucial for economic growth, job creation, and innovation worldwide, especially in emerging economies. They contribute significantly to GDP expansion and industrial development. According to the World Bank (2015), MSMEs account for over 50% of global GDP and 75% of new employment opportunities. Their role in providing jobs and fostering innovation makes them vital for economic stability and inclusive growth. Their impact is particularly felt in developing nations, where they drive both economic and social progress. The significance of MSMEs in job creation is evident across various countries, with Canada reporting 85% of its

workforce is employed in this sector, following China at 75%, Japan stands at 60%, and Ukraine at 55% (Gonzales, 2014). These enterprises are valued for their agility, resource efficiency and ability to drive local entrepreneurship, making them essential for economic resilience and industrial diversification (Dey, 2014). Furthermore, MSMEs contribute significantly to technological innovation, market expansion and supply chain integration, ensuring inclusive economic participation. International organizations like the WTO, UN, and IMF recognize the vital role of MSMEs in global economies. They emphasize the need for capacity-building programs to enhance MSME capabilities. These programs focus on improving skills, technology, and management practices. Additionally, policy support is crucial to help MSMEs access resources and overcome barriers to growth. By strengthening MSMEs, these organizations aim to improve their competitiveness in global markets.

1.2. MSMEs and the Indian Economy

MSME sector is a key contributor to India's economic framework. According to the Micro, Small and Medium Enterprises, Growth for 12th Five Year Plan report, this sector makes a significant contribution to the nation's output, employment, and exports (2012-17). With regard to the value, the MSMEs sectors constitutes around 45 percent of the country's manufacturing output and more than 48 percent of its export. In India, at present there are nearly 6.34 crore MSME enterprises in industries, employing 11.1 crore people. Currently, this sector contributes for 30 percent of GDP in India. More than 14 percent of these enterprises are owned by women and more than 60 percent have their head office in rural areas (Ministry of Finance and Ministry of MSME, Standing Committee on Finance, 2021-22). In addition, nearly 31.9% of enterprises are involved in manufacturing activities while remaining 68 percent engage in service activities. Apart from that, contribution of employment in this sector has grown from 7.50 million in 1981-1982 to 80.52 million in 2006-2007. According to the NSS 73rd round 2015-16, the unincorporated non-agricultural MSME employed 11.10 million in a range of activities including non-captive electricity generation, trade, manufacturing and other services.

Apart from that, Indian MSME labor to capital ratio is much higher than the large counterparts. The labour intensity in this industry is four times greater than that of large industry (Sharma & Sharma, 2010). As per Annual reports of MSME 2018-19, 51 per cent of Indian MSME are based in rural areas. This means that the sector has major contribution to economic empowerment and social integration

of the disadvantaged and least developed regions. Furthermore, this industry is important to the Indian economy not just for exports and job creation but also for equitable regional development and poverty reduction. Examining the export performance of MSMEs in the Indian economy is crucial. Thus, the primary goal of the research is to examine the performance of MSME exports in India between 2000-01 and 2019-20, as well as their share of the country's overall exports.

2. Literature Review

Micro, Small, and Medium Enterprises (MSMEs) are vital to the economic landscape of India contributing significantly to GDP, employment, output and exports. Zanjurne (2018) highlights importance of MSMEs in economic development, supported by various government initiatives to promote growth. Khanna and Singh (2018) emphasize MSME's contribution to reducing economic backwardness in rural and underdeveloped regions, emerging as a vibrant sector in the Indian economy. Venkatesh and Muthiah (2012) MSMEs are rapidly expanding across sectors like manufacturing, food processing, textiles, information and technology, engineering, retail, agro and service sector. Shastri et al. (2011) investigate how India's small-scale industries (SSIs) are affected by both domestic economic liberalization and globalization. The study concludes that sustainability and competitive growth of SSIs in the context of liberalized and globalized economy. Dey (2014) adds that MSMEs provide affordable goods and services and give innovative solution to the economy. Shelly et al. (2020) identify MSMEs as an engine of growth essential for reducing unemployment and poverty as well as achieving Sustainable Development Goals. Dixit and Pandey (2011) demonstrate the role of MSMEs in India's in terms of GDP, output, export and employment from 1973-74 to 2006-07 and also highlighting their role in economic stability.

In Export Performance, MSMEs have shown remarkable potential but continue to face challenges. Baral (2013) highlights the critical role of the manufacturing sector within MSMEs in contributing to employment and export growth. However, Mukherjee (2018) notes that MSMEs have seen an increase in global exports but their earning have not grown significantly due to stiff competition, Limited availability of credit and technological degradation. Shelly et al. (2020) shows the importance of addressing these barriers by improving resource accessibility to enhance export contributions. Sadeghi et al. (2017) identified a Negative U-shaped relationship between managerial competencies and MSME work performance in international

trade, suggesting that managerial skills initially boost trade performance but eventually plateau. They also observe that technological advancements, though important, had only a limited impact on MSME's trade performance. (Sharma & Singh, 2024) observed that the export share of MSME products declined from 49.77% in 2019-20 to 42.67% in 2022-2023. This decline highlights the challenges faced by MSMEs in maintaining their export growth.

Despite their achievements, MSMEs continues deal with numerous challenges that hinder their full potential. Ali and Hussain (2014) identify several pressing issues, including high credit costs, lack of technological advancement, inadequate financial support, insufficient infrastructure, competition from larger firms, and complex labor regulations. Sugiarto I. (2019) highlighting problems such as limited access to capital, low level of skill development, weak planning capabilities, and poor technological integration, which often lead to the failure of many MSMEs. Mukherjee (2018) emphasizes the need to overcome obstacles such as global competition, restricted credit access and technological deficits to enhance the export potential and overall success of MSMEs. Therefore, MSMEs play a vital role in India's economic growth and export performance, they continue to face significant challenges, such as financial constraints, technological gaps and intense competition from larger firms. Addressing these barriers through targeted policy support and innovation is essential for enhancing their global competitiveness and sustaining long term-growth.

MSMEs contribute significantly to economic expansion, employment opportunities, and exports yet they encounter Various barriers limiting their growth. Restricted financial support, inadequate infrastructure, technological limitations, and competition from larger enterprises pose significant hurdles. Additionally, regulatory burdens, market entry difficulties, and skill gaps further hinder their growth. To ensure their sustainability and global competitiveness, it is crucial to implement effective policy measures and foster innovation within the sector.

Category	Challenges	Sources
Financial constraints	Difficulty accessing affordable credit, high interest rates, lack of collateral	Ali & Hussain (2014), Chaudhary & Goswami (2016), Nagpal et al. (2009), Shanker (2012), Reddy & Kumar (2019) & Bonga (2014)
Technological Barriers	Limited access to advanced technology, low innovation and outdated machinery, poor capacity utilization	Mukherjee (2018), Reddy & Kumar (2019)

Category	Challenges	Sources
Infrastructure Gaps	Inadequate export hubs, insufficient transportation networks	Sugiartio I. (2019), Maheshkar & Soni (2022), Ghouse (2017)
Global Competition	Intense competition from larger firms, inability to meet standards.	Shelly et al. (2020), Patil & Chaudhary (2014),
Lack of Skilled Workforce	Lack of skilled labor, low managerial competencies, poor planning	Sugiartio I. (2019), Maheshkar & Soni (2022), Bonga (2014)
Management Challenges	Inadequate managerial skills, lack of strategic planning and weak leadership	Yadav & Tripathi (2018), Bhoghanadam et al. (2017)
Market Access	Limited market reach, inadequate marketing strategies	Reddy & Kumar (2019), Yadav & Tripathi (2018), Senapati (2014)
Trade Policy Challenges	Unfavorable trade policies, tariff and non-tariff barriers, unstable foreign exchange rates	Singh & Choudhary (2022), Kapoor & Mehta (2023)
Supply Chain issues	High transportation costs, supply chain disruptions	Khan & Das (2021), Kapoor & Mehta (2023)
Regulatory Barriers	Complex export documentation, compliance issues and bureaucratic hurdles	Jain & Sharma (2021)

Source: Literature Review

The above table highlights the challenges faced by MSMEs into distinct areas, consolidating insights from various academic sources. It provides a structured overview of the barriers impeding MSME growth and export performance. Each category highlights specific issues, such as financial constraints, technological barriers, infrastructure gaps, global competition, lack of skills, management challenges and market access along with their respective studies. These challenges indicate policy implications and broader significance of overcoming these barriers for MSME development and export enhancement.

3. Objectives of the Study

This study has two main objectives. Firstly, it seeks to evaluate the connection between MSME exports and total exports in India, examining how variations in MSME export performance affect the overall export sector. Secondly, the study aims to explore whether MSME exports contribute to the volatility of total exports, looking into whether fluctuations in MSME exports are associated with instability in the broader export market. Through these objectives, the research intends to offer valuable insights into the significance of MSMEs in India's export economy.

4. Hypotheses of the Study

- **H$_0$:** There is no significant relationship between MSME exports and total exports.
- **H$_1$:** There is a significant positive relationship between MSME exports and total exports.
- **H$_0$:** MSME exports do not have significant impact on the volatility of total exports.
- **H$_1$:** MSME exports contribute to fluctuations in total exports, but other external factors also play a key role in export volatility.

The main goal of this analysis is to explore the impact of MSME exports on total exports. This relationship is important, as MSME exports are becoming a more significant component of the overall export economy, particularly in developing countries where MSMEs make substantial contributions to the export market. By determining whether the relationship between MSME exports and total exports is positive or negative, policymakers and business leaders can create more effective strategies to enhance MSME involvement in the export sector.

5. Database and Methodology

This study employs both descriptive and inferential statistical methods to analyze the relationship between MSME exports and total exports in India. The analysis covers the period from 2000-01 to 2019-20, using secondary data sourced from the Annual Report of MSMEs and the Economic Survey published by the Government of India. To meet the study's objectives, the following methodologies are utilized:

5.1. Regression Analysis

The association between MSME exports and total exports is investigated using a straightforward linear regression model. The model's specifications are as follows:

$$\text{Total Exports}_t = \beta_0 + \beta_1 \times \text{MSME Exports}_t + \epsilon_t$$

Where,

- **Total Exports$_t$:** Total exports in year t
- **MSME Exports$_t$:** MSME exports in year t
- β_0: Intercept term
- β_1: Coefficient representing the impact of MSME exports on total exports
- ϵ_t: Error term

5.2. ARIMA Model for Volatility Analysis

Using an Autoregressive Integrated Moving Average (ARIMA) model, the effect of MSME exports on overall export volatility is examined. The ARIMA model in its generic form is used. The ARIMA model's general form is:

$$\Delta Y_t = \mu + \phi_1 \Delta Y_{t-1} + \phi_2 \Delta Y_{t-2} + \theta_1 \epsilon_{t-1} + \epsilon_t$$

Table 1: Models Specification

Component	Explanation	Value (from results)
ΔYt (First-differenced total exports)	The difference of total exports at time t, i.e. $Y_t - Y_{t-1}$ represents the change in total exports.	Calculated from the data (not provided directly in the output)
μ (Constant term)	The baseline changes in total exports when all other factors are zero.	105,720.3
ϕ_1 (AR coefficient at lag 1)	The coefficient for the autoregressive term's first lag. Indicates the impact of the previous period's change on the current change.	Not significant (p-value 0.980)
ϕ_2 (AR coefficient at lag 2)	The coefficient for the autoregressive term's second lag. It shows how the change from the second period before affected the present change.	Not significant (p-value 0.928)
θ_1 (MA coefficient at lag 1)	The coefficient for the moving average term's first lag. shows how previous mistakes (forecast errors) have affected the current change.	Not significant (p-value 0.928)
εt (White noise/error term)	The difference between the actual value and the value predicted by the model is represented by the random error or residual at time t.	Not provided directly in the output

6. Results and Discussions

6.1. Summary statistics

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    Variable │       Obs        Mean    Std. Dev.        Min         Max
─────────────┼─────────────────────────────────────────────────────────
        year │        20      2009.5     5.91608        2000        2019
total_expo~s │        20     1139150     745903.7      201000     2307000
msme_exports │        20    461.0805     387.5952      69.797     1105.71
```

The dataset spans the years 2000 to 2019, with an average year of around 2009. Regarding the exports, the total exports (total_expo~s) fluctuate significantly, ranging from a minimum of 201,000 to a maximum of 2,307,000, with an average of around 1,139,150. This wide range, coupled with a high standard deviation of 745,903.7, indicates that there is considerable variability in the total export figures across the observations. Similarly, MSME exports (MSME_exports) show substantial variation, with values ranging from 69.80 to 1,105.71 and an average of 461.08. The standard deviation for MSME exports is 387.60, which reflects a significant degree of spread around the mean, indicating that MSME export values are not consistent and vary widely within the data-set. Overall, the data reveals notable fluctuations in both total and MSME exports, suggesting diverse performance across the years.

6.2. Regression Results

A substantial correlation between MSME exports and total exports is seen by the regression results. The model is statistically significant overall, with a p-value of 0.0000 and an F-statistic of 194.62, suggesting that the independent variable (MSME exports) accounts for a sizable portion of the variance in total exports. The R-squared value of 0.9153, which shows that MSME exports explain roughly 91.53% of the variation in total exports, suggests a strong fit of the model. A strong model fit is indicated by the adjusted R-squared of 0.9106, even after controlling for the number of predictors. For the specific relationship between MSME exports and total exports, the coefficient for MSMEs_exports is 1841.178, meaning that for each additional unit of MSME exports, total exports increase by 1,841.178 units. This is statistically significant and far lower than the typically accepted significance level of 0.05, with a p-value of 0.000 and a t-statistic of 13.95. We are 95% certain that the

```
. regress total_exports msme_exports
```

Source	SS	df	MS		Number of obs	=	20
					F(1, 18)	=	194.62
Model	9.6761e+12	1	9.6761e+12		Prob > F	=	0.0000
Residual	8.9494e+11	18	4.9719e+10		R-squared	=	0.9153
					Adj R-squared	=	0.9106
Total	1.0571e+13	19	5.5637e+11		Root MSE	=	2.2e+05

total_expo~s	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
msme_exports	1841.178	131.9794	13.95	0.000	1563.899	2118.456
_cons	290218.8	78670.55	3.69	0.002	124938.2	455499.5

genuine coefficient falls within the range of 1,563.899 to 2,118.456, which is the 95% confidence interval for the coefficient.

The constant (_cons) term is 290,218.8, which represents the expected value of total exports when MSME exports are zero. With a p-value of 0.002, this coefficient is likewise statistically significant. Overall, the results suggest that MSME exports have a strong, positive, and statistically significant impact.

6.3. Partial Autocorrelation Function (PACF) Plot for Differentiated Total Exports
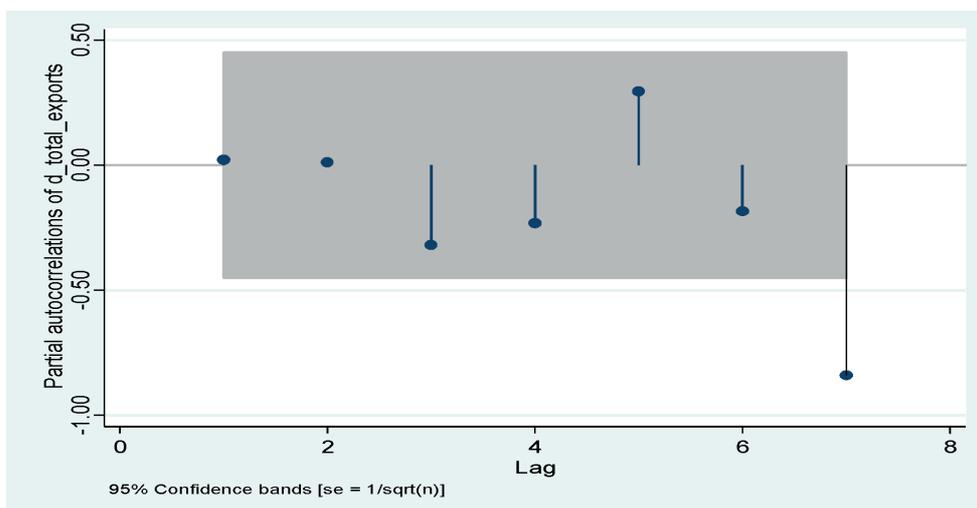

Figure 1: Partial Autocorrelation Function (PACF) graph for total exports

This plot is a Partial Autocorrelation Function (PACF) graph for the differenced series of total_exports (denoted as d_total_exports). Y-axis shows the partial autocorrelation values, which indicate the direct effect of a past value on the current value, excluding the effects of intermediate lags.X-axis (Lag): Represents the time lags. Vertical bars indicate the strength and direction (positive or negative) of the partial autocorrelation at each lag. Shaded area represents the 95% confidence intervals. If a bar extends beyond this region, it suggests the partial autocorrelation at that lag is statistically significant. Important trends in the data are revealed by the Partial Autocorrelation Function (PACF) plot for the differenced series of total_exports. Potential autocorrelation that could match an AR (1) model is indicated by the considerable positive spike at lag 1, which implies that the recent past value

has a direct and strong influence on the current value. Meanwhile, the substantial negative spike at lag 6 hints at a more complex dynamic, possibly pointing to a seasonal effect or the necessity for a higher-order ARIMA model to capture this pattern. The absence of significant partial autocorrelations at other lags (within the 95% confidence intervals) implies that only specific lags directly impact the series. Overall, these results suggest starting with an AR (1) model while exploring the significance of the lag 6 effect to refine the model further.

6.4. Dickey-Fuller test for total_exports' unit root

```
. dfuller total_exports

Dickey-Fuller test for unit root                    Number of obs    =        19

                          ———————————— Interpolated Dickey-Fuller ————————————
                 Test          1% Critical        5% Critical       10% Critical
             Statistic            Value              Value              Value
```
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-0.050	-3.750	-3.000	-2.630

```
MacKinnon approximate p-value for Z(t) = 0.9542
```

According to the findings of the Dickey-Fuller test for unit root, the variable total_exports is probably stationary because it does not exhibit any signs of a unit root. The crucial values for all significance levels (1%, 5%, and 10%) are significantly lower than the test statistic (Z(t)) for total_exports, which is -0.050. The test statistic of -0.050 is exceeded by the 1% critical value of -3.750, the 5% critical value of -3.000, and the 10% critical value of -2.630. Since the test statistic falls below any of the critical values, the null hypothesis of the Dickey-Fuller test, which states that the series has a unit root (i.e., is non-stationary), cannot be rejected. This result is further supported by the MacKinnon p-value of 0.9542, which shows that the null hypothesis cannot be rejected when the p-value is higher than the usual significance level (e.g., 0.05). Therefore, based on the Dickey-Fuller test, we conclude that total_exports is non-stationary, suggesting that further steps (such as differencing) may be needed before using the variable in time series modeling.

6.5. Dickey-Fuller unit root test for exports from MSMEs

According to the Dickey-Fuller test results for the unit root on MSMEs_exports, the series appears to be non-stationary. The test statistic (Z(t)) for MSMEs_exports is 0.491, significantly above the critical values at the significance levels of 1% (−3.750),

```
. dfuller msme_exports

Dickey-Fuller test for unit root                    Number of obs   =        19

                         ─────────── Interpolated Dickey-Fuller ───────────
                Test        1% Critical      5% Critical      10% Critical
            Statistic          Value            Value             Value

 Z(t)           0.491          -3.750           -3.000            -2.630

MacKinnon approximate p-value for Z(t) = 0.9846
```

5% (−3.000), and 10% (−2.630). The test's null hypothesis, according to which the series has a unit root (i.e., is non-stationary), cannot be rejected because the test statistic falls below any of the critical values. Furthermore, the standard significance level of 0.05 is significantly smaller than the MacKinnon p-value of 0.9846. With a p-value this high, the conclusion that msme_exports is non-stationary is further supported because there is not enough evidence to reject the null hypothesis. Thus, based on the results of the Dickey-Fuller test, we can conclude that msme_exports exhibits a unit root, meaning it is non-stationary. This suggests that like total_exports, msme_exports may require transformations, such as differencing, before being used in time series analysis.

```
ARIMA regression

Sample:  2001 - 2019                     Number of obs    =        19
                                         Wald chi2(2)     =      0.01
Log likelihood = -251.3548               Prob > chi2      =    0.9954

                                OPG
 d_total_exports    Coef.    Std. Err.     z     P>|z|     [95% Conf. Interval]

 d_total_exports
           _cons  105720.3   45326.92    2.33    0.020    16881.14      194559.4

 ARMA
            ar
           L2.    .0114916   .4479965    0.03    0.980   -.8665653     .8895485

            ma
           L1.    .0262799   .2899169    0.09    0.928   -.5419469     .5945067

         /sigma  134636.6    28257.9     4.76    0.000    79252.16      190021.1

Note: The test of the variance against zero is one sided, and the two-sided
      confidence interval is truncated at zero.
```

6.6. ARIMA Regression Results

The ARIMA regression results provide insight into the dynamics of d_total_exports (the first difference of total exports) and its relationship with the lagged values and errors over the period from 2001 to 2019, based on 19 observations. A relatively high p-value of 0.9954 and a Wald chi-squared test statistic of 0.01 indicate that the model as a whole is not statistically significant. This indicates that there is insufficient evidence in the model to support the claim that the predictors (AR and MA terms) fully account for the variation in the dependent variable, d_total_exports. With a standard error of 45,326.92 and a constant (_cons) term of 105,720.3, the d_total_exports coefficient yields a p-value of 0.020 and a z-value of 2.33. At the 5% significance level, this suggests that the constant term is statistically significant. When all other variables are equal to zero, it shows the baseline change in total exports.

Looking at the ARMA components:

- With a standard error of 0.4479965 and a coefficient of 0.0114916, the AR (Autoregressive) term at L2 (lag 2) yields a p-value of 0.980 and a z-value of 0.03. Past values (two periods ago) do not aid in predicting the present change in total exports, as seen by this extremely high p-value, which indicates that the second lag of the autoregressive term has no discernible impact on the current value of total exports.

- The MA (Moving Average) term at L1 (lag 1) has a coefficient of 0.0262799, has a z-value of 0.09 and a p-value of 0.928, with a standard error of 0.2899169. Additionally, according to this p-value, the model is not significantly impacted by the initial lag of the moving average term, indicating that historical errors have no discernible impact on current total exports. The /sigma (the estimated standard deviation of the errors) is 134,636.6, with a standard error of 28,257.9 and a p-value of 0.000. This shows that the variance in the model is highly significant, meaning there is substantial variation in the residuals of the model, and the model accounts for the variability in the data.

6.7. Interpretation of Non-Significant AR and MA Terms and Model Implications

The absence of statistical significance in both AR and MA terms suggests that, at least at the included lags (MA lag 1 and AR lag 2), total exports do not exhibit

a strong autoregressive or moving average process. This weak dynamic structure raises the possibility that factors other than internal time-series dynamics—perhaps external economic variables or structural breaks—may be affecting export behavior. Therefore, unless re-specified (e.g., with alternative lags, SARIMA, or the inclusion of exogenous variables), the model may not be the ideal model for forecasting, even though it may capture some residual variability (as indicated by the substantial sigma term).

In conclusion, while the constant term is statistically significant, the autoregressive and moving average terms are not significant in explaining the changes in total exports. The overall model does not seem to fit the data well (as indicated by the high p-value of the Wald chi-squared test), suggesting that the ARIMA model may not be an appropriate choice for modeling d_total_exports in this case. However, the significance of the error variance indicates that the model captures some level of variability in the data, even if the relationships with lagged values and errors are not significant.

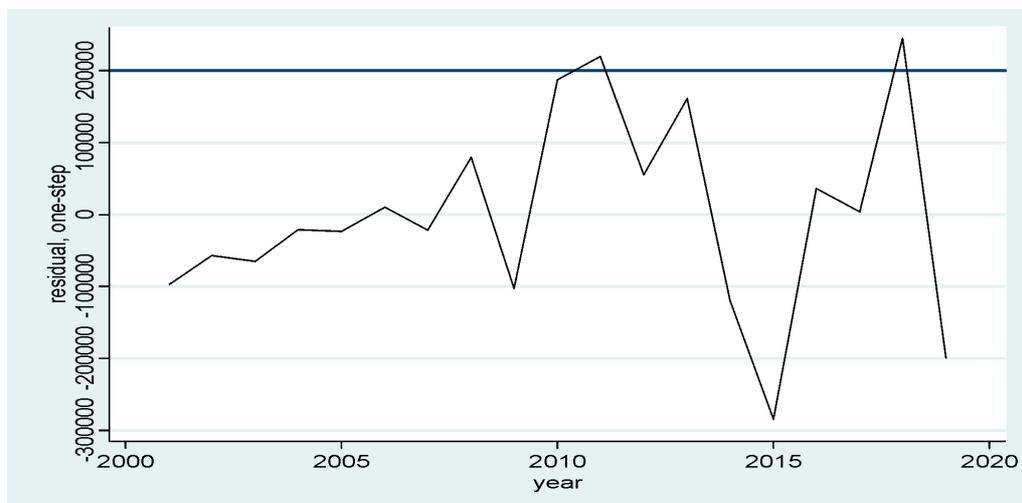### 6.8. Residual Plot forecast of Total exports

Figure 2: Residual Plot forcast for total exports

The residual plot for the one-step-ahead forecast of total_exports reveals significant fluctuations, indicating that the current model struggles to accurately predict the data. The residuals range widely, with noticeable spikes around 2010 and 2015–2017, suggesting that the model fails to capture sudden shocks or changes

during these periods. Additionally, the absence of a consistent pattern around zero implies potential non-stationarity or missing seasonal or structural components. The negative spike observed at lag 6 in the earlier PACF plot further hints at possible seasonal patterns that the model has not accounted for. Given these observations, it may be beneficial to explore a Seasonal ARIMA (SARIMA) model to better capture the underlying patterns and improve forecast accuracy.

7.   Limitations of the Study

Despite provide valuable insights into the export performance of MSMEs in India, the study has certain limitations. First, the analysis is based on secondary data from official government sources may limit the comprehensive analysis of the study, as such data often exclude informal and unregistered MSMEs that constitute a considerable share of the sector and contribute to exports. Second, time frame of the study (2000-01 to 2019-20) does not account for recent structural shifts in the global trade environment, including the effects of the COVID-19 pandemic and evolving international trade policies, which may have altered export performance dynamics. Furthermore, the use of aggregate data does not capture the sectoral and regional heterogeneity within MSMEs, potentially overlooking critical industry-specific trends. These limitations are acknowledged as inherent to the scope and data availability, but they do not undermine the broader relevance and contribution of the study.

8.   Conclusion and Discussions

This study highlights the significant role of MSMEs exports in influencing India's overall trade performance. With an exploratory power of more than 91%, the regression analysis validates a robust and statistically significant link between MSME exports and total exports. This indicate that growth in MSME exports directly contributes to an increase in total exports, reinforcing their pivotal role in the country's trade ecosystem. Furthermore, the presence of a significant constant term suggests that even in the absence of MSMEs exports, a comprehensive level of total exports persists, signifying the contributions of other sectors.

However, ARIMA model findings indicate that MSME exports do not significantly exacerbate the volatility in total exports—appears to be more consistent with the ARIMA findings. Although MSME exports are significantly related to the level of total exports, the model does not show significant evidence that MSME

exports contribute to the volatility or instability of total exports. In particular, the model's inability to explain the variation in total exports through the AR and MA terms suggests that factors other than MSME exports are contributing to the observed volatility. Therefore, the alternative hypothesis (H1), which posits that MSME exports exacerbate the volatility, is not strongly supported by the results. Overall, the variations in total exports suggests that although MSMEs are crucial to trade expansion, they are not the primary source of export instability. To sustain the impact of MSMEs on India's exports, a well-rounded approach that integrates innovation, policy-driven support, and trade facilitation is essential. Strengthening institutional frameworks and aligning policies with dynamic global trade trends will be crucial in fostering long-term MSME growth. Future research should explore industry-specific challenges and assess the influence of international trade agreements on MSME expansion. This will provide valuable insights for formulating effective policies to enhance MSME competitiveness and drive sustainable, export-led economic growth.

9. Policy Recommendations

A number of policy recommendations are made in light of the study's acknowledged limitations and empirical findings in order to improve MSMEs' export potential and address the underlying volatility in total exports. First, it is crucial to increase access to export finance and credit. Establishing specialized MSME export credit lines through public sector banks and broadening the Credit Guarantee Fund Trust for Micro and Small Enterprises' (CGTMSE) funding and scope to cover export-specific financial products are two ways to do this. Smaller businesses would be better equipped to expand and effectively satisfy global demand if export financing were easier to get. Second, with special provisions for MSMEs, the government ought to think about reviving or enhancing already-existing export incentive programs like the Service Exports from India Scheme (SEIS) and the Merchandise Exports from India Scheme (MEIS). For high-potential MSME clusters, targeted sector-specific export subsidies should also be implemented, especially in labour-intensive industries like pharmaceuticals, handicrafts, and textiles. These incentives would promote market expansion and reduce cost disadvantages.

Third, it is imperative to assist MSMEs in their digital transition. Their market access can be greatly expanded by facilitating their integration into global e-commerce platforms like Flipkart Export Hub and Amazon Global. In order to

encourage MSMEs to use ERP and CRM software solutions and facilitate more effective inventory management and export planning, the government should also provide financial aid, subsidies, or tax credits. Lastly, to maintain long-term MSME export growth, structural and institutional improvements are needed. To deliver timely, localized assistance, state-level export promotion councils and specialized MSME facilitation cells need to be reinforced. Furthermore, developing public-private partnerships will be essential for spotting trends in the global market, formulating strategic interventions, and enhancing MSMEs' export readiness. When taken as a whole, these policy initiatives can improve MSMEs' resilience and competitiveness in India's changing trading environment.

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