Impact of International Trade on Exchange Rate Volatility in India

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Abstract: *The impact of international trade on exchange rate volatility in India is a topic of significant interest and importance in the realm of economics and finance. This abstract provides a brief overview of the key themes and findings in this area of research. International trade plays a crucial role in shaping the dynamics of exchange rates in India, influencing the volatility and stability of its currency, the Indian Rupee (INR). The relationship between international trade and exchange rate volatility is complex and multifaceted, influenced by a myriad of economic, financial, and policy factors. This study aims to provide insights into the mechanisms through which international trade influences exchange rate volatility in India. By understanding the determinants and implications of this relationship, policymakers, businesses, and investors can better manage currency risk and navigate the challenges posed by the interconnected global economy. The study contributes to the existing literature by shedding light on the underlying mechanisms thereby informing policy decisions and strategic initiatives aimed at promoting economic stability and growth in India.*

Keywords: *Exchange rate volatility, Currency risk, Economic stability, Financial Markets.*

Introduction

Exchange rate serves as a indicator for the economic health of the nation, that influencing various dimensions of its economy, especially the international trade (Edwards & Cabezas, 2022). Exchange rate volatility arises from fluctuations in the value of a country's currency relative to others, which be sparked by a surplus of factors.

The emergence of exchange rate volatility in international trade has a substantial impact on a country's competitiveness, as well as its terms of trade, business environment, and potential for financial market complexity. In order to effectively navigate the global economy, authorities, companies, and investors must comprehend and control these dynamics. The degree of fluctuation in the value of a nation's currency in relation to other currencies is referred to as exchange rate volatility. It is essential in determining economic dynamics when it comes to global trade. There are several ways to look at how exchange rate volatility entered the world of international trade. First, changes in exchange rates affect how competitive a country's exports are. A sharp decline in value of a nation's currency can lower the cost of that nation's products for overseas consumers, thus increasing exports.

The dynamics of international commerce in India are greatly impacted by exchange rate volatility. Improving export competitiveness, controlling import costs, and maintaining general economic stability all depend on efficiently managing this volatility. To handle the opportunities and difficulties posed by the international currency markets, governments, central banks, and corporations regularly watch and adjust to changes in exchange rates.The goal of this research is to present a thorough analysis of

exchange rate volatility and how it affects global trade. Stakeholders can effectively manage the difficulties caused by currency fluctuations by making well-informed judgments by comprehending the intricacies of this connection. The project aims to make a significant contribution to the fields of international trade and economics by providing a comprehensive analysis of the factors that influence exchange rate volatility and the solutions available for managing associated risks.

Furthermore, the terms of commerce between countries are impacted by exchange rate fluctuation. Currency exchange rate fluctuations can affect the relative costs of imports and exports, which can affect how trade profits are distributed. The distribution of money among trading partners and economic welfare are thus affected by this. Within the financial sphere, exchange rate volatility can be further exacerbated by speculative actions that arise from currency risk. Currency values may fluctuate as a result of traders' and investors' reactions to perceived macroeconomic indicators, geopolitical developments, or economic conditions. With countries trading commodities and services across international borders, the world economy is becoming more intertwined.

Review of Literature

Mohsen et al. (2007): The impact of the rise in exchange-rate volatility since 1973 on global import and export movements is still unknown. While it is reasonable to anticipate that a rise in risk would result in a decline in economic activity, there are also reasons for positive or negligible effects in the theoretical literature. Empirical tests have produced findings that are comparable. Although econometric research has advanced throughout time, modelling approaches have not, and no single exchange-rate volatility measure has dominated the field.

Hall et al (2010): investigate the relationship between exchange rate volatility and trade volumes for a panel of 10 emerging market economies and 11 other developing countries using quarterly data for the period 1980-2006. Their results differ between 5 emerging developing countries markets. Exchange rate volatility negatively affects the exports of developing countries but has no effect on exports of emerging market economies. They disagree that the more open capital markets of the emerging markets may have reduced the impact of exchange rate fluctuations on exports compared with those effects in the other developing countries.

Sharma (2020): The empirical study examined that fluctuations in exchange rates have a detrimental impact on exporting in the short- and long-term. In particular, real exchange rate volatility and nominal exchange rate volatility have a substantial long-term impact on export performance; however, the consequences of nominal exchange rate uncertainty are far more severe and acute. India's exports are negatively impacted in the short term by the uncertainty surrounding nominal exchange rates. The idea that short-term exchange rate risk can be hedged, at least in part, using financial instruments is supported by the fact that the short-run effect is significantly smaller than the long-run effect.

Sarika and Arora (2020): To investigate the effects of exchange rate volatility, inflation, and economic output on India's foreign trade, four distinct models have been built for exports of goods, imports of goods, exports of services, and imports of services. According to a test of Autoregressive Distributed Lag (ARDL) constraints conducted on monthly data from 2011 to 2020, production growth has a favourable long-term effect on commerce in goods and services. Price increases have a detrimental effect on goods exports. Long-term, increased volatility boosts goods exports whereas short-term increases in imports cause a decrease in imports.

Vershney and Gupta (2021): The primary goal of the study is to investigate how fluctuations in exchange rates affect the import trade flow between India and the United States in six different industries between September 2002 and June 2019. We look into the link at the disaggregate level using monthly industry-specific data. The ARDL bound testing approach

is utilized to determine the short- and long-term correlation between real exchange rate volatility and import.The information important to time-series analysis is confirmed by the results. The study's findings support adopting an invariance perspective and taking the industry into account before enacting policy.

Kuuam (2022): examine the impact of nation's economic development. One of the most crucial elements economic development is exchange rate, which directly affects global trade. The current study examines the effects of import, export, purchasing power parity (PPP), current account deficit (CAD), and other macroeconomic factors on the volatility of the exchange rate (USD to INR) in India. To examine the long- and short-term relationships between this variable and the exchange rate. The ADF test, stationarity test, stability test, Johansen co-integration test, and Granger causality test have all been applied to data from 1980 to 2016 in order to determine how the variables are affecting the exchange rate. The ARIMA method of forecasting has been used to predict the movement of exchange rates over the next 20 years. The outcome demonstrates the long-term nature of the relationship. In the near term, it can be concluded that export has a negative influence on the currency rate whereas CAD, import, and PPP have favourable effects.

Research Gap

The research on the relationship between exchange rate volatility and trade volumes presents a complex picture, with varying findings across different studies. While some studies suggest a negative impact of exchange rate volatility on exports, others propose mixed or even positive effects. Additionally, research has explored the role of different factors such as economic integration, hedging instruments, and firm-level reactions in shaping this relationship. However, amidst these discussions, there appears to be a gap in understanding the specific mechanisms through which exchange rate volatility affects trade, particularly in emerging markets like India. While some studies have examined this relationship in the Indian context, there remains a need for more comprehensive analyses that delve into the nuanced dynamics between exchange rate fluctuations, trade flows, and macroeconomic variables specific to India's economic landscape.

Methodology

The process of gathering all the data and information relevant to the particular subject under investigation is known as research technique. The goal is to investigate every issue at hand and do a situational analysis. The methods for data collecting, sampling, and analysis in order to determine the final result is covered in this chapter.

Research Questions:

Is there any Impact of International trade on Exchange rate Volatility in India?

Research Objectives:

- To find out the long term impact of International trade on Exchange Rate in India.
- To find out the casual relationship between Trade balance and Exchange Rate in India.
- To find out the casual relationship between Imports and Exchange Rate in India.
- To find out the casual relationship between Exports and Exchange Rate in India.

Research Hypothesis:

Null Hypothesis (H0): There is no long term impact of international trade on exchange rate volatility in India.

Alternative Hypothesis (H1): There is a long term impact of international trade on exchange rate volatility in India.

Null Hypothesis (H0): There is no causal relationship between the trade balance and exchange rate volatility in India.

Alternative Hypothesis (H1): There is a casual relationship between the trade balance and exchange rate volatility in India.

Null Hypothesis (H0): There is no causal relationship between the imports and exchange rate volatility in India.

Alternative Hypothesis (H1): There is a casual relationship between the imports and exchange rate volatility in India.

Null Hypothesis (H0): There is no casual relationship between the exports and exchange rate volatility in India.

Alternative Hypothesis (H1): There is a casual relationship between the exports and exchange rate volatility in India.

Sources of Data Collection

This study is based on secondary sources of data, such as central banks, international organizations (like IMF or World Bank), and national statistical agencies, finance journals, studies papers and other secondary sources Collect data on international trade indicators such as exports, imports, trade balance.

Sample Size

24 years India's foreign trade to Rupees (1999 and 2023)

24 years Annual Exchange rate of the Indian Rupees (1999 and 2023)

Analytical Techniques

Granger Causality Test: Conduct Granger causality tests to assess the direction of causality between international trade and exchange rate volatility.

Unit Root Test: A unit root test is employed to determine whether a time series variable is stationary or non-stationary. Stationary implies that the statistical properties of the variable remain constant over time, which is essential for reliable statistical analysis.

Descriptive Statistics: conduct descriptive analysis for studying the impact of international trade on exchange rate volatility in India may involve computing summary statistics (such as mean, median, standard deviation) for variables like exchange rate volatility, exports, imports, and trade balance.

Integration Test: researchers may conduct cointegration tests (e.g., Engle-Granger test, Johansen test) for studying international trade and exchange rate volatility in India, to assess whether there is a long-term equilibrium relationship between variables such as exchange rates and trade indicators. If cointegration is found, it suggests the presence of a stable long-run relationship that can be analysed further using error correction models or vector error correction models (VECMs) to understand the short-term dynamics of adjustment to deviations from equilibrium.

Data Analysis and Interpretation

Table 1: Unit Root Test

Variables	Order Of Integration	P Value	Stationary
Dollar	1	0.0055	Yes
Imports	1	0.0018	Yes
Exports	1	0.0017	Yes
Trade Balance	1	0.0004	Yes

Source: *EVIEWS 12*

Interpretation

The prescribed data presents the characteristics of four key variables: "Dollar," "Imports," "Exports," and "Trade Balance." Each variable is examined in terms of its order of integration and corresponding p-value, crucial indicators for determining stationary in time series analysis. Remarkably, all variables exhibit a first-order integration and possess p-values below conventional significance levels, with "Trade Balance" boasting the lowest p-value at 0.0004.

These findings strongly suggest that after a single differencing operation, all variables become stationary. This inherent stationary lays a solid foundation for employing time series models effectively to analyze the dynamics and relationships among these economic variables, thereby facilitating informed decision-making in economic policy and forecasting endeavours.The most recent important statistics are included in this report, indicating the consequences, their interpretation, and the challenges met within the time frame. This section contains all of the multiple ratio calculations that show the actual final product of the business for the previous two years. Financial statement bills or classes are mathematically compared to determine economic ratios. These connections between the financial declaration debts can aid in the understanding of how a business is run and where improvements are needed by creditors, internal employers, traders, and management.

The assessment is predicated on daily accessible economic data for the last two years contained in the appendix.

Table 2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No of CE(s)	Eigenvalue	Trace statistics	0.05 critical value	Probability
None	0.786009	66.78594	47.85613	0.0003
At Most 1	0.654333	31.3241	29.79707	0.0331
At most 2	0.246102	6.891667	15.49471	0.5903
At most 3	0.016993	0.394206	3.841465	0.5301

Source: *EVIEWS 12*

Interpretation

The data presented suggests an analysis involving eigenvalues and trace statistics, likely pertaining to a covariance matrix or similar statistical model. The hypothesis tests the number of common elements (CEs) within the data. The eigenvalues represent the variance explained by each component, while the trace statistic assesses the overall fit of the model. As the number of CEs increases, both the eigenvalues and trace statistics decrease, indicating a diminishing explanatory power of the model. The critical values and associated probabilities highlight the significance of each hypothesis. For instance, when considering no common elements, the eigenvalue is 0.786 with a trace statistic of 66.786, significantly deviating from the critical value at a probability of 0.0003, suggesting rejection of the null hypothesis. Conversely, as the number of CEs increases, the eigenvalues decrease, and the trace statistic becomes less significant, indicating a weaker model fit. Overall, these results provide insights into the structure and explanatory power of the statistical model under consideration.

Table 3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No of CE(s)	Eigenvalue	Max Eigen statistics	0.05 critical value	Probability
None	0.786009	35.46184	27.58434	0.004
At Most 1	0.654333	24.43243	21.13162	0.0165
At most 2	0.246102	6.497461	14.2646	0.5502
At most 3	0.016993	0.394206	3.841465	0.5301

Source: *EVIEWS 12*

Interpretation

The provided data showcases a hypothesis testing scenario concerning the number of common elements (CEs) within a statistical model, evaluated through eigenvalues and maximum eigen statistics. The eigenvalues represent the variance explained by each component, while the maximum eigen statistic assesses the highest eigenvalue in the model. The hypothesis tests various scenarios, from no common elements to at most three common elements. As the number of CEs increases, both the eigenvalues and maximum eigen statistics decrease, suggesting a reduction in the explanatory power of the model. The critical values and associated probabilities indicate the significance of each hypothesis test. For example, when considering no common elements, the eigenvalue is 0.786 with a maximum eigen statistic of 35.462, significantly surpassing the critical value at a probability of 0.004, indicating rejection of the null hypothesis. Conversely, as the number of CEs increases, the eigenvalues decrease, and the maximum eigen statistic becomes less significant, implying a weaker fit of the model. These findings offer valuable insights into the structure and effectiveness of the statistical model under examination.

Table 4: Pairwise Granger Causality Test

Null Hypothesis	Obs	F Statistics	Probability
TRADE BALANCE does not Granger Cause DOLLAR	23	2.34414	0.1245
DOLLAR does not Granger Cause TRADE BALANCE		2.925	0.0794
IMPORT does not GRANGER Cause DOLLAR	23	4.21827	0.0314
DOLLAR does not Granger Cause IMPORTS		4.19929	0.0319
EXPORT does not GRANGER Cause DOLLAR	23	6.01896	0.01
DOLLAR does not Granger Cause EXPORTS		3.31541	0.0594
IMPORT does not GRANGER Cause TRADE BALANCE	23	12.3707	0.0004
TRADE BALANCE does not Granger Cause IMPORTS		4.20874	0.0317
EXPORTS does not GRANGER Cause TRADE BALANCE	23	12.2963	0.0004
TRADE BALANCE does not Granger Cause EXPORTS		1.4855	0.2529
EXPORTS does not GRANGER Cause IMPORTS	23	4.11694	0.0337
IMPORTS does not Granger Cause EXPORTS		1.44651	0.2615

Source: *EVIEWS 12*

Interpretation

The provided data presents Granger causality tests between various economic indicators, including trade balance, dollar exchange rate, imports, and exports. Granger causality tests assess whether the past values of one variable can predict the future values of another, indicating a causal relationship between them. Each test involves a null hypothesis that states one variable does not Granger cause the other. The observations (Obs) denote the number of data points used in the analysis. The F statistics measure the strength of the relationship between the variables, with higher values indicating stronger evidence against the null hypothesis. The associated probabilities indicate the likelihood of obtaining the observed F statistic if the null hypothesis were true. For instance, when testing if imports Granger cause the dollar exchange rate, the F statistic is 4.21827 with a probability of 0.0314, suggesting that there is a significant relationship between imports and the dollar exchange rate.

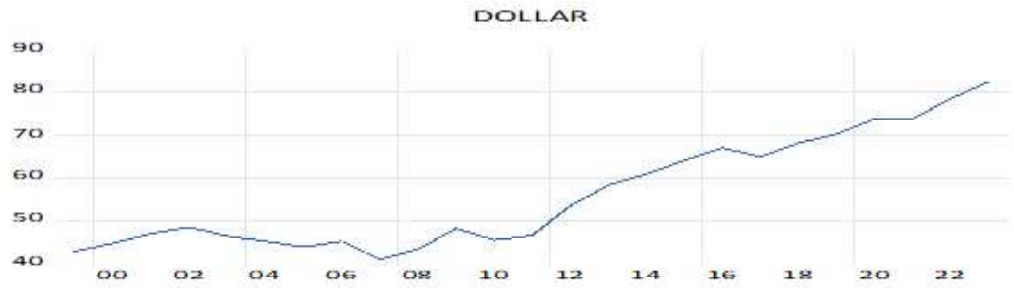
Table 5: Descriptive Statistics Test

	Dollar	Trade Balance	Imports	Exports
Mean	56.33042	-102567.8	312590.4	209889.6
Median	48.5992	-109621	369769	251136
Maximum	82.5953	-6520	715969	451070
Minimum	41.2932	-264898.9	42389	33219
Std. Deviation	12.98278	73055.31	198750.4	127681.1
Skewness	0.558536	-0.183365	0.050086	0.026811
Kurtosis	1.874325	2.17207	1.930248	1.819239
Probability	0.269849	0.652423	0.548125	0.483047
Sum	1408.261	-2564194	7814760	5247240
Sum Sq. Dev.	4045.259	1.28E+11	9.48E+11	3.91E+11
Observation	25	25	25	25

Interpretation

The dataset provides a snapshot of trade dynamics represented by various statistical measures. The mean and median values indicate that while the average dollar value is around 56.33, the trade balance shows a consistent deficit, with both mean and median values in negative territory (-102567.8 and -109621 respectively). Imports and exports exhibit higher means (312590.4 and 209889.6) and medians (369769 and 251136), suggesting robust activity in both inbound and outbound trade. Standard deviations for imports (198750.4) and exports (127681.1) indicate considerable variability around their means, reflecting potential volatility in trade volumes. Skewness values close to zero for imports (0.050086) and exports (0.026811) indicate near-normal distributions, while a slightly positive skew for the dollar value (0.558536) and a slight negative skew for trade balance (-0.183365) hint at deviations from perfect symmetry in their distributions. Overall, the dataset paints a picture of active trade with some asymmetry in specific measures, offering insights into the economic dynamics of the observed trade activities.

Figure 1: Exchange Rate Of Us Dollar To Indian Rupees:

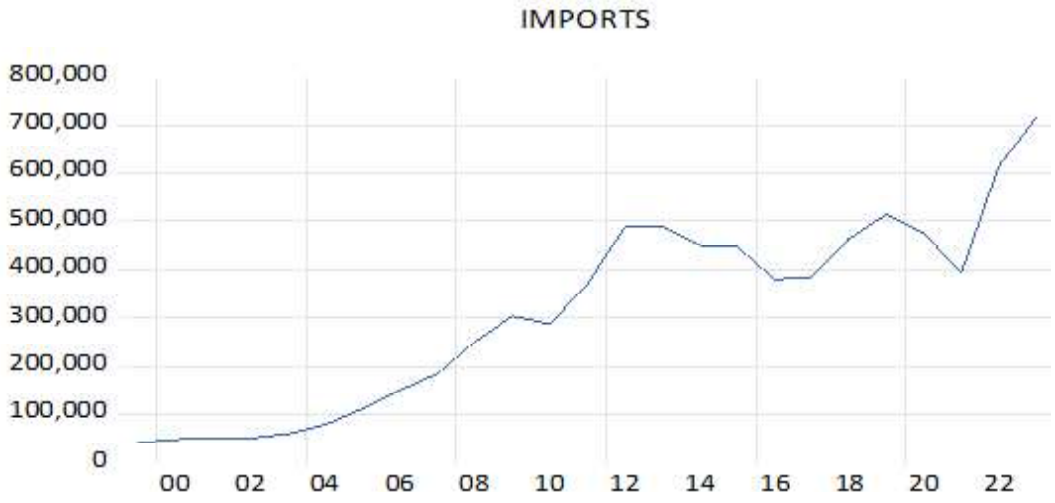


Interpretation

The line graph illustrates the fluctuation in the value of "DOLLAR" over a series of time periods. Initially, the value shows slight fluctuations but remains relatively stable. Around the middle of the time series, there's a noticeable increase in the value, followed by a period of fluctuation. Towards the end of the series, the value experiences a more significant increase, with some periods of rapid growth. This suggests that the variable "DOLLAR" might be subject to volatility

or external influences that cause fluctuations in its value over time. Further analysis would be necessary to determine the factors driving these fluctuations and their potential impact.

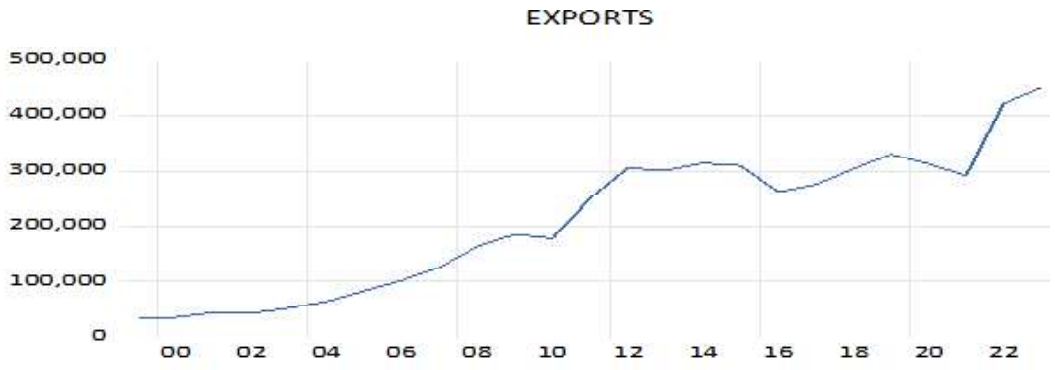
Figure 2: Merchandize Import In Us Dollar



Interpretation

The scatter plot of the given data points reveals a distribution that appears relatively scattered without a clear linear trend. While there are no discernible patterns across the dataset as a whole, a few outliers stand out, particularly towards the higher end of the y-axis. These outliers may indicate instances of significantly larger values compared to the rest of the data. Without additional context or information regarding the nature of these values, it's difficult to draw definitive conclusions. Further analysis, such as identifying potential clusters or trends within subsets of the data, or considering the context in which these values were generated, would be necessary for a more insightful interpretation of the dataset.

Figure 3: Merchandise Export In Us Dollar



Interpretation

The line graph depicts the trend in the given data points over a series of time periods or sequential events. Initially, the values appear to be relatively low but start to increase gradually over time. Around the midpoint of the series, there's a noticeable acceleration in the increase, suggesting a period of rapid growth. This growth continues until reaching a peak, after which there's some fluctuation but with a general upward trend. Towards the end of the series, the values seem to stabilize at a higher level compared to the beginning. This overall pattern suggests a trend of growth or accumulation in the data over time, with some fluctuations along the way. Further analysis could explore the factors driving these trends and any potential implications.

Figure 4: Trade Balance in Us Dollar

Interpretation

The line graph depicts a consistent trend of decreasing values across successive time periods or events. Initially, the values start from relatively low negative levels, indicating a baseline from which the decline begins. As the series progresses, there are noticeable fluctuations in the rate of decline, with some periods showing steeper drops than others. These fluctuations suggest varying influences or factors affecting the overall trend. The fluctuations observed throughout the series may be attributed to a multitude of factors, including economic shifts, policy changes, or external events impacting the phenomenon under examination. Further analysis could delve into identifying these underlying drivers and assessing their relative contributions to the observed trends. The line graph illustrates a clear pattern of decreasing values over time, with fluctuations in the rate of decline.

Findings of the Study

- The provided data and figures offer a comprehensive overview of key economic indicators related to international trade and exchange rate dynamics in India. The analysis encompasses variables such as the dollar exchange rate, trade balance, imports, and exports, along with statistical tests and visual representations to elucidate their characteristics and relationships over time. Here's a detailed analysis of the data in 500 words:
- The data initially presents unit root tests for the variables of interest, indicating their stationary after first-order differencing. This suggests that the variables, including the dollar exchange rate, imports, exports, and trade balance, exhibit stable behavior over time, laying a solid foundation for further time series analysis.

- Unrestricted cointegration rank tests are conducted to assess the presence of common elements among the variables. The tests utilize eigenvalues and trace statistics to evaluate the fit of the statistical model. The results indicate that there are significant common elements among the variables, particularly when considering no common elements, as evidenced by the deviation of the eigenvalues and trace statistics from critical values.
- Pairwise Granger causality tests are employed to examine the causal relationships between the variables. The tests reveal significant causal links between certain pairs of variables, such as imports Granger causing the dollar exchange rate and exports Granger causing trade balance.
- Descriptive statistics are then presented to characterize the distributional properties of the variables. The statistics offer insights into the central tendency, variability, skewness, and kurtosis of each variable, providing a comprehensive overview of their distributions. For instance, while the dollar exchange rate exhibits slight skewness and kurtosis, imports and exports display relatively symmetrical distributions with moderate tails.
- Visual representations in the form of line graphs and scatter plots offer intuitive insights into the trends and patterns exhibited by the variables over time. The line graph depicting the dollar exchange rate illustrates periods of fluctuation and growth, suggesting potential volatility or external influences affecting its value. Similarly, the graphs for imports, exports, and trade balance showcase trends of growth or decline over time,
- Overall, the analysis provides a comprehensive understanding of the dynamics and relationships among key economic indicators related to international trade and exchange rate volatility in India.

Conclusion

Exchange rate volatility and international trade are influenced by a complex web of economic, financial, and policy factors. By diversifying currency transactions and synchronizing economic cycles, higher trade volume and market integration tend to foster stability; nonetheless, speculative activity and regulatory reactions can add instability into currency markets.

The relationship between international trade and exchange rate volatility is intricate and diverse, and it is further shaped by long-term structural changes in trade patterns and global economic instability. Policymakers, companies, and investors must comprehend these processes in order to manage currency risk and deal with the difficulties posed by the interconnected global economy.

Trade Volume and Exchange Rate Volatility: A number of factors affect the relationship between trade volume and exchange rate volatility. More foreign commerce volume typically translates into more currency transaction diversification for businesses. Companies spread out their exposure to currency risk by engaging in a variety of transactions denominated in several currencies.

The dynamics of currency rates are greatly influenced by market integration. Countries' economies tend to synchronize more closely as a result of increased trade, investment, and financial flows.

In the currency markets, speculative activity can cause volatility even when trading has a stabilizing effect on exchange prices. Traders frequently buy or sell currencies in anticipation of future price swings in response to rapid changes in economic indicators, geopolitical events, or shifts in market sentiment.

Although trade can increase stability by encouraging economic variety and integration, currency markets can become volatile due to speculative activity, policy reactions, uncertainty in the world economy, and long-term trends.

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