
IMPACT OF EXCHANGE RATE VOLATILITY ON COMMODITY TRADE: EVIDENCE OF ASYMMETRY FROM INDIA'S MAJOR TRADING PARTNERS

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INTRODUCTION

1.1 Introduction

The evolution of international monetary system had profound implications on international trade. Historically, the international monetary system has transitioned from the fixed exchange rate regime, epitomized by the Bretton Woods Agreement post-World War II, to a more flexible exchange rate system that emerged following the collapse of Bretton Woods in the early 1970s. Under the fixed exchange rate system, currencies were pegged to the US dollar, which was convertible to gold. This provided a stable trading environment, minimizing the uncertainty associated with currency fluctuations.

However, the shift to a flexible exchange rate regime brought significant volatility into the foreign exchange markets. This transition marked a new era where currency values were determined by market forces such as supply and demand, interest rates, inflation, and economic stability. For a rapidly globalizing economy like India, which significantly liberalized its trade policies in the 1990s, this meant navigating a new landscape where exchange rate risks became a critical factor affecting international trade.

Exchange rate risks can broadly be categorized into three types: transaction risk, translation risk, and economic risk. Transaction risk arises from the time lag between entering into a contract and settling it. For instance, if an Indian exporter signs a contract to export goods to the United States and the rupee depreciates against the dollar before the payment is received, the exporter incurs a loss due to the unfavorable exchange rate movement. Conversely, an appreciation of the rupee can negatively impact Indian importers who have to pay more in their local currency for the same amount of foreign goods.

Translation risk affects companies that deal in multiple currencies and need to consolidate their financial statements. For example, an Indian multinational with subsidiaries in Europe may face adverse effects on its balance sheet when the euro depreciates against the rupee, reducing the value of its European earnings when reported in rupees.

Economic risk, also known as operating risk, involves the long-term impact of exchange rate fluctuations on a company's market value. For instance, if the rupee persistently depreciates, it might make Indian exports cheaper and more competitive abroad, but it also increases the cost of imported raw materials, squeezing profit margins for Indian manufacturers who rely on these imports.

An illustrative instance of significant loss due to exchange rate volatility was the 2008 global financial crisis. During this period, the Indian rupee depreciated sharply against the US dollar, leading to substantial losses for Indian companies engaged in international trade. Exporters found themselves grappling with increased costs of hedging against such fluctuations, while importers faced higher import bills, significantly affecting their profitability and operational costs.

Exchange rate asymmetry refers to the unequal impact that currency fluctuations can have on an economy or trade flows. It highlights how the same magnitude of currency appreciation or depreciation can have different effects depending on the direction of the change. For instance, a depreciation of the rupee might boost Indian exports by making them cheaper for foreign buyers, but the same rate of appreciation might not lead to an equivalent reduction in exports, as other factors like price elasticity of demand and competitive dynamics come into play. An example of this can be seen in India's trade with the Eurozone. When the rupee depreciates against the euro, Indian goods become more attractive in Europe, potentially increasing export volumes. However, if the rupee appreciates, the corresponding decrease in exports might not be proportionate due to established trade relationships and contracts that do not adjust immediately to currency movements.

The symmetric effect of exchange rate volatility on trade implies that fluctuations in exchange rates have an equal impact on trade activities regardless of whether these fluctuations increase or decrease by the same percentage. In this scenario, importers and exporters would respond similarly to both increases and decreases in volatility. However, the asymmetric effect suggests that traders behave differently when exchange rate volatility increases compared to when it decreases by the same percentage.

This thesis seeks to explore these dynamics in depth, analyzing the asymmetric impact of exchange rate volatility on India's commodity trade with its major trading partners. By examining historical data and employing econometric models, this study aims to provide insights into how exchange

rate movements affect trade flows, offering valuable implications for policymakers and businesses engaged in international trade. The findings are expected to contribute to a better understanding of the complexities of exchange rate risk management in the context of a globalized economy.

1.2 Scope of the Study

This study focuses on the Impact of Exchange Rate Volatility on Commodity Trade: Evidence of Asymmetry from India's Major Trading Partners, specifically emphasizing on India's trade with China and the United States. Conducting a commodity-level analysis is crucial as different commodities exhibit varied price elasticity, supply chain structures, and demand sensitivities to exchange rate fluctuations. By examining these factors at the commodity level, the study can provide a granular understanding of how exchange rate volatility impacts specific sectors, thereby, offering more targeted insights for policymakers and businesses. For instance, agricultural products, industrial goods, and technological exports each respond differently to currency movements due to their unique production processes and market dynamics. A commodity-level analysis allows for the identification of sector-specific vulnerabilities and opportunities, facilitating more effective risk management and strategic planning.

China and the United States have been chosen as the focal points of this study due to their significant roles in India's international trade landscape. USA is India's largest trading partner, with bilateral goods trade reaching approximately \$132 billion in 2022, with significant exports in goods from pharmaceuticals, textiles, and jewelry. On the other hand, the China, India's second-largest trading partner, saw trade volumes surpassing \$117 billion in 2022, encompassing a broad spectrum of goods from electronics and machinery to organic chemicals and textiles. Analyzing trade dynamics with these major partners not only reflects their substantial trade shares but also their diverse economic structures and trade policies, providing a comprehensive view of how exchange rate volatility can affect India across different trading environments. Through a detailed empirical investigation, this study aims to uncover the asymmetric effects of exchange rate fluctuations on India's trade, offering actionable insights for enhancing trade resilience and informing trade policy in a volatile global economy.

1.3 Objectives of the Study

The objectives of this study are as follows:

- To analyze the asymmetric effect of exchange rate volatility on a commodity level trade between India and major trading partners
- To identify and categorize industries that are significantly affected by increases in exchange rate volatility compared to those that are more impacted by declines in volatility.

1.4 Data & Methodology

The study draws inspiration from the methodological framework used by Kenin & Rodrik (1986) Bahmani-Oskooee & Mitra (2008), Bahmani & Aftab (2017) & Bahmani-Oskooee & Saha (2020). Building upon their innovative approach, we have tailored the methodology to suit the nuances of India's trade dynamics with its major partners. Among India's major trading partners are the USA and China, which together account for around 22% of India's goods trade in the year 2022. The monthly trade data between India and the USA spans from August 1996 to October 2023, while the data for India and China covers the period from May 2005 to October 2023. The data has been sourced from CMIE Trade dx, IFS (IMF), and UNIDO.

1.5 Organization of the Chapters

The chapters of our study are structured to provide a clear progression of our research journey. Beginning with the introduction, we establish the context and significance of exchange rate volatility on international trade. Following this, our literature review and identification of research gaps pave the way for Chapter 3, where we detail about the data and methodology used in the study. Moving forward, Chapter 4 presents our empirical findings and analysis, focusing on the asymmetric effects of exchange rate volatility in India's trade relationships with the USA and China. Finally, in Chapter 5, we summarize our key findings, draw conclusions, and suggest future directions for research, encapsulating the essence of our study in a concise yet comprehensive manner.

REVIEW OF LITERATURE

2.1 Review of Literature

The shift from a fixed to a flexible exchange rate system in March 1973 marked a significant change in the international monetary landscape, with critics of the flexible exchange rate system arguing that it could introduce uncertainty into trade flows. Early theoretical work by Clark (1973) and Kolhagen & Hooper (1978) supported this concern, demonstrating that exchange rate volatility could negatively impact cross-border trade. These early models, however, relied on assumptions that have since been considered unrealistic, such as perfect competition, a significant role for the invoicing currency, the absence of imported materials, high risk aversion, small firm sizes, and the impracticality of using financial instruments for hedging exchange rate risks.

Recent models developed in the past few decades exhibit greater pragmatism and flexibility, reflecting the complex relationships between exchange rates, the supply of goods, and export decisions. Broll and Eckwert (1999), for instance, illustrated that increased exchange rate uncertainty could encourage some firms to enter international markets, as heightened volatility might lead to unexpected gains from global trade. Viaene and de Vries (1992) also suggested that access to financial hedging through forward markets could mitigate the uncertainty caused by volatile exchange rates. On the contrary, Obstfeld and Rogoff (1998) argued that while risk-averse firms might hedge against exchange rate uncertainties, the costs of hedging could increase export prices, thereby reducing the volume of cross-border trade.

Empirical investigations into the effects of exchange rate volatility on trade have yielded mixed results. Arize (1998) found that exchange rate volatility had a significant negative impact on the real exports of seven industrialized nations. Arize et al. (2008) provided evidence that exchange rate volatility negatively affected export in both the short and long run for Latin American countries. Ozturk and Kalyoncu (2009) found that during 1980–2005, exchange rate volatility adversely impacted trade for countries such as Pakistan, Poland, South Korea, and South Africa, but had a positive effect in Hungary and Turkey. Chit et al. (2010) corroborated these findings by showing a significant negative effect of exchange rate volatility on trade among five emerging East Asian nations.

In contrast, Bredin et al. (2003) found that exchange rate volatility had no short-term impact but a positive long-term impact on Ireland's exports to the European Union. Hondroyiannis et al. (2008) did not find significant effects of exchange rate volatility on export demand for 12 developed nations. Boug and Fagereng (2010) similarly found no evidence that exchange rate movements adversely affected export performance. Hall et al. (2010) also reported no significant dampening

effects of exchange rate volatility on trade in 11 emerging market economies. Bahmani-Oskooee et al. (2013) concluded that most industries in the U.S.-Brazil bilateral trade were unaffected by exchange rate volatility in the long run.

Recent studies have continued to explore these dynamics. Baek (2014) identified that South Korea-U.S. bilateral trade, particularly South Korea's export performance, is highly vulnerable to exchange rate volatility. Karagedikli et al. (2016) found significant negative impacts of exchange rate shocks on New Zealand's tradable sectors. Bahmani-Oskooee and Gelan (2018) demonstrated that the impact of exchange rate volatility on trade is more pronounced in the short run for 12 African nations. Senadza and Diaba (2018) confirmed the short-term negative impact of exchange rate volatility on imports for 11 African nations.

The literature also delves into the asymmetric effects of exchange rate fluctuations. Symmetric effects imply a direct proportional relationship between exchange rates and trade volume, whereas asymmetric effects occur when traders react differently to increases versus decreases in exchange rate volatility. Cheung et al (2012) and Rose (1991) noted that traders might reduce trade when volatility rises but increase it more significantly when volatility falls, leading to asymmetric effects. Delatte & Anne-Laure (2012) and Bussiere (2012) showed that domestic prices, import and export prices, and trade balances respond asymmetrically to exchange rate changes. Bahmani-Oskooee & Fariditavana (2015) extended this analysis to exchange rate volatility.

Rahman and Serletis (2009) found that export demand responds asymmetrically to exchange rate volatility. Bussiere (2012) showed that both import and export prices react asymmetrically to exchange rate movements. Verheyen (2013) provided evidence that exports to the U.S. from 12 Economic and Monetary Union nations are asymmetrically linked to exchange rate changes. Choudhury and Hassan (2015) suggested that exchange rate volatility has a significant asymmetric effect on the U.K.'s imports. Bahmani & Aftab (2017) demonstrated this asymmetry in Malaysia's bilateral trade with the U.S. Arize et al. (2017) and Bahmani-Oskooee & Halicioglu (2017) reported asymmetric impacts of exchange rate changes on the bilateral trade balances of Japan and Turkey.

The literature on measuring exchange rate volatility is broadly divided into three approaches. The first approach, used by researchers such as Dell'Aricecia (1999) and Devereux and Lane (2003) employ the standard deviation of the first difference of the log exchange rate. The second approach, used by Klassen (2004) utilizes the moving average standard deviation of the log real exchange rate. The third and increasingly popular approach, used by Vita & Abbott (2004), Asteriou et al. (2016) and Bahmani & Aftab (2017) employs the generalized autoregressive conditional heteroskedasticity (GARCH) modeling approach. GARCH models are preferred for their ability

to capture time-varying conditional variance and provide more accurate measures of risk.

There is also a debate in the literature regarding the use of real versus nominal exchange rate-based volatility measurements. Researchers such as Bahmani-Oskooee and Harvey (2011) and Bahmani-Oskooee et al. (2013) argue for the use of real exchange rates as they capture both the variance of nominal exchange rates and relative prices, which present additional risks for traders.

In the context of India, research on the asymmetric effects of exchange rate volatility on trade is limited. Doroodian (1999) found negative impacts of exchange rate volatility on aggregate real exports for India, Korea, and Malaysia. Mukhtar & Malik (2010) identified long-term negative effects of GARCH-based volatility on India's exports. Srinivasan & Kalaivani (2013) reported negative effects of exchange rate volatility on India's exports to the world. Hooy & Choong (2010) focused on bilateral trade flows between India and three Asian partners—Bangladesh, Pakistan, and Sri Lanka—and found positive coefficients for volatility, although their studies assumed symmetric effects. Bahmani-Oskooee & Saha (2020) examined the asymmetric effects of exchange rate volatility on India's trade with the USA at the commodity level.

2.2 Research Gap

This study addresses a significant research gap by delving into India's commodity trade dynamics with its primary trading partners, China and the USA. While previous studies have analyzed the asymmetric effects of exchange rate volatility on India's trade with the USA, they often relied on annual data and simplistic volatility calculation methods like standard deviation. This approach overlooks the intricacies of exchange rate dynamics and fails to capture the full spectrum of effects. By employing more robust techniques such as GARCH modeling and focusing on commodity-level analysis using monthly data, this study aims to provide a deeper understanding of how exchange rate volatility influences trade outcomes between India and its partners. By bridging this gap in the literature, we seek to offer valuable insights into the complex interactions shaping India's trade landscape.

DATA & METHODOLOGY

3.1 Data

For the empirical analysis of India's trade with the USA and China, we utilize a comprehensive dataset. For trade with the USA, which accounted for around 12% of India's goods trade in 2022, the dataset spans from August 1996 to October 2023, while for trade with China, which accounted for around 10% of India's goods trade in 2022, it covers the period from May 2005 to October 2023. The primary data sources include industry-level monthly data on bilateral trade between India and the USA, and between India and China, obtained from CMIE Trade dx, with values expressed in rupees. Additionally, nominal bilateral exchange rates are sourced from the International Financial Statistics (IFS) database of the International Monetary Fund (IMF). To account for inflation, Consumer Price Index (CPI) data for India, the USA, and China are also sourced from the IFS database of the IMF. Furthermore, we utilize the Index of Industrial Production (IIP) data for India and the USA from the IFS database of the IMF, and for China, this data is obtained from the United Nations Industrial Development Organization (UNIDO).

3.2 Methodology

We built our model on the lines of Bahmani & Aftab (2017) and Bahmani-Oskooee & Saha (2020). We begin with the following specifications:

$$\text{Ln}X_{i,t}^{IND} = \beta_0 + \beta_1 \text{Ln}IP_{i,t}^{ITY} + \beta_2 \text{Ln}REX_t + \beta_3 \text{Ln}VOL_t + \varepsilon_t \quad (3.2.1)$$

$$\text{Ln}M_{i,t}^{IND} = \alpha_0 + \alpha_1 \text{Ln}IP_{i,t}^{IND} + \alpha_2 \text{Ln}REX_t + \alpha_3 \text{Ln}VOL_t + \varepsilon_t \quad (3.2.2)$$

Xi = The real export flows from India to each trading partner for each industry are denoted by *i*. Due to the unavailability of industry-level price level data on a monthly basis during our study period, nominal exports in terms of rupees are adjusted by the Indian Consumer Price Index (CPI) to derive real export values.

M_i = The real import flows into India from each trading partner for each industry are represented by i . Due to the lack of industry-level price level data on a monthly basis, nominal imports in terms of rupees are adjusted using the Indian Consumer Price Index (CPI) to obtain real import values.

IP_t^{ITY} = The industrial production index of the trading partner serves as an indicator of economic activity within that country.

IP_t^{IND} = India's index of industrial production.

REX_t = The real bilateral exchange rate between the Indian Rupee and a foreign currency, denoted as REX_t , is calculated as follows: $REX_t = (CPI_t^{IND} * NEX_t) / CPI_t^{ITY}$, where NEX_t represents the nominal exchange rate, defined as the number of units of foreign currency per Indian Rupee; CPI_t^{ITY} indicates the price level of the trading partner measured by the Consumer Price Index (CPI); and CPI_t^{IND} represents the price level in India, also measured by the Consumer Price Index (CPI).

VOL_t = The volatility measure of REX_t is constructed utilizing the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) method.

Equation (3.2.1) delineates the principal determinants influencing India's exports of commodity i (X_i^{IND}) to its trading partners. It is posited that these exports are contingent upon the industrial production of India's trading partner (IP_t^{ITY}), the real bilateral exchange rate between the Rupee and the foreign currency (REX), and a measure of volatility or variability in REX denoted as VOL .

Likewise, in equation (3.2.2), it is postulated that, alongside REX and VOL , India's industrial productivity (IP_t^{IND}) plays a pivotal role in determining India's imports of commodity i from its trading partners. Given that heightened industrial productivity typically fosters trade, we anticipate positive estimates for β_1 and α_1 .

The definition of the real bilateral exchange rate dictates that a decline signifies a depreciation of the Rupee against the Foreign Currency. As we anticipate that a depreciation of the Rupee would stimulate India's exports while discouraging India's imports, we expect an estimate of β_2 (α_2) to be negative (positive). Additionally, since exchange rate volatility may yield either negative or positive effects, estimates of β_3 and α_3 could similarly exhibit negative or positive values.

The coefficient estimates of both models encapsulate the long-term effects of exogenous variables on industry-level trade flows. While it is customary to estimate short-term effects as well, achieving both short-term and long-term effects in a single step is facilitated by the ARDL approach introduced by Pesaran et al (2001). However, since our primary objective is to estimate coefficients for asymmetry analysis, we closely adhere to the nonlinear ARDL approach proposed by Shin et al. (2014), particularly the methodology outlined by Bahmani & Aftab (2017). This involves decomposing the LnVOL variable into two distinct time-series variables, where one represents only increases in volatility and the other solely reflects decreases. To achieve this, we initially form ΔLnVOL , encompassing both positive and negative changes. Subsequently, we utilize the partial sum concept to construct our two series accordingly.

$$POS_t = \sum_{j=1}^t \max(\Delta \text{LnVOL}_j, 0), \quad NEG_t = \sum_{j=1}^t \min(\Delta \text{LnVOL}_j, 0) \quad (3.2.3)$$

The variable POS, representing the partial sum of positive changes exclusively, serves as a time-series indicator reflecting increases in volatility. Conversely, NEG, the partial sum of negative changes, exclusively depicts declines in volatility. Subsequently, the LnVOL variable is substituted with the POS and NEG variables to facilitate the following adjustments:

$$\begin{aligned} \Delta \text{Ln}X^{IND}_{i,t} = & e_1 + \sum_{j=1}^{n^1} e_{2j} \Delta \text{Ln}X^{IND}_{t-j} + \sum_{j=0}^{n^2} e_{3j} \Delta \text{Ln}IP^{ITY}_{t-j} + \sum_{j=0}^{n^3} e_{4j} \Delta \text{Ln}REX_{t-j} \\ & + \sum_{j=0}^{n^4} e_{5j} \Delta POS_{t-j} + \sum_{j=0}^{n^5} e_{6j} \Delta NEG_{t-j} + \omega_1 \text{Ln} X^{IND}_{t-1} + \omega_2 \text{Ln} IP^{ITY}_{t-1} \\ & + \omega_3 \text{Ln}REX_{t-1} + \omega_4 POS_{t-1} + \omega_5 NEG_{t-1} + \varepsilon_t \end{aligned} \quad (3.2.4)$$

$$\begin{aligned} \Delta \text{Ln}M^{IND}_{i,t} = & f_1 + \sum_{j=1}^{n^6} f_{2j} \Delta \text{Ln}M^{IND}_{t-j} + \sum_{j=0}^{n^7} f_{3j} \Delta \text{Ln}IP^{IND}_{t-j} + \sum_{j=0}^{n^8} f_{4j} \Delta \text{Ln}REX_{t-j} \\ & + \sum_{j=0}^{n^9} f_{5j} \Delta POS_{t-j} + \sum_{j=0}^{n^{10}} f_{6j} \Delta NEG_{t-j} + \end{aligned}$$

$$\pi_1 \ln M^{IND} + \pi_2 \ln IP^{IND} \quad (3.2.5)$$

$j=0$

$j=0$

$i,t-1$

$t-1$

$$+\pi_3 \text{LnREX}_{t-1} + \pi_4 \text{POS}_{t-1} + \pi_5 \text{NEG}_{t-1} + \varepsilon_t$$

Once we estimate the (3.2.4) & (3.2.5) equations subsequently, we can scrutinize and evaluate various assumptions regarding asymmetry. Initially, we can discern adjustment asymmetry if the two partial sum variables within each model exhibit distinct lag orders. Additionally, we will detect short-term asymmetric effects of volatility on trade flows if, at a specific lag, the coefficient estimates for the two partial sum variables differ. While this could be validated through statistical tests such as the Wald test, we will refrain from conducting statistical tests due to the abundance of results and instead focus on testing the null hypothesis. of $\Sigma \hat{e}_{5j} = \Sigma \hat{e}_{6j}$ against the alternative of $\Sigma \hat{e}_{5j} \neq \Sigma \hat{e}_{6j}$ in (3.2.4) and null of $\Sigma \hat{f}_{5j} = \Sigma \hat{f}_{6j}$ against the alternative of $\Sigma \hat{f}_{5j} \neq \Sigma \hat{f}_{6j}$ in (3.2.5).

Should the Wald test invalidate the null hypothesis, it would suggest the presence of short-term cumulative or impact asymmetry. Subsequently, we will examine for long-term asymmetric effects of exchange rate volatility on trade flows, provided that the Wald test refutes the null hypothesis

$$\frac{\hat{\omega}_4}{1} = \frac{\hat{\omega}_5}{1} \text{ against the alternative of } \frac{\hat{\omega}_4}{-1} \neq \frac{\hat{\omega}_5}{-1} \text{ in (3.2.4)}$$

$$\text{and the null of } \frac{\hat{\pi}_4}{1} = \frac{\hat{\pi}_5}{-1} \text{ against the alternative of } \frac{\hat{\pi}_4}{-1} \neq \frac{\hat{\pi}_5}{1} \text{ in (3.2.5).}$$

To derive exchange rate volatility, we employ GARCH models, utilizing real exchange rate data. For the India-USA analysis, a GARCH (3,3) model was identified as the most appropriate, while for the India-China analysis, a GARCH (1,1) specification was deemed suitable. Monthly data spanning from August 1996 to October 2023 is utilized to estimate all models for 98 Indian exporting industries to the USA and 98 Indian importing industries from the USA. Similarly, monthly data from April 2006 to October 2023 is employed to estimate models for 98 Indian exporting industries to China and 98 Indian importing industries from China. Furthermore, each first-differenced variable is subjected to a maximum of eight lags, with Akaike's Information Criterion (AIC) guiding the selection of the optimal model. Thus, all reported results are based on the respective optimal model for each scenario.

SUMMARY & CONCLUSION

5.1 Summary

The transition from fixed to more flexible exchange rates in the international monetary system in 1973 sparked debates over whether this shift would introduce uncertainty in trade environments and financing, potentially leading to a decline in international trade. Advocates of floating rates put forth arguments and models suggesting that flexible exchange rates would enhance trade. Empirical studies conducted over the past four decades have yielded mixed results, with some supporting both perspectives.

A prevailing assumption in previous studies has been the symmetry of the impact of exchange rate volatility on trade flows. This assumption implies that increased volatility would decrease trade, while decreased volatility would increase it by an equivalent proportion, and vice versa. However, there are indications that exchange rate volatility could exert asymmetric effects on trade flows. Research has demonstrated that trade flows and prices of traded goods respond to exchange rate changes in an asymmetric manner. Accordingly, it follows that the volume of trade may also respond to exchange rate volatility asymmetrically. A significant factor contributing to asymmetric effects could be changes in traders' expectations. A trader who opts to reduce trade in times of heightened uncertainty may persist in trading less even when uncertainty diminishes, possibly due to a loss of confidence in the market or in the abilities of exchange rate managers.

The assumption of symmetric effects of exchange rate volatility on trade flows relies on standard linear models. However, to explore asymmetric effects, we must turn to nonlinear specifications of the same models. In this study, we employ the nonlinear ARDL approach proposed by Shin et al. (2014) to evaluate the asymmetric effects of exchange rate volatility on 98 Indian exporting industries to China and the USA, as well as 98 Indian importing industries from China and the USA. The study utilizes monthly data spanning from April 2006 to October 2023 for China and from August 1996 to October 2023.

5.2 Major Findings

Exchange rate volatility have far reaching implications on trade as well as on other variables of economy. The impact of exchange rate volatility on trade was our major concern in the study. We tried to understand how exchange rate volatility asymmetry affects exports and imports differently

at a commodity level & gain insights at industry level. Indeed, were able to establish short run and long run positive and negative asymmetric effects on different industries due to increase or decrease in volatility. Around 14 industries of the Indian importing industries in the long run contributing to around 23% Imports & 5 importing industries in the short run contributing around 8% imports from the USA behaved differently or asymmetrically when volatility in the value of the Rupee declines as compared to when volatility increases. Similarly, around 17 industries of Indian exporting industries in long run contributing to around 5.3% of exports and 4 exporting industries in the short run contributing around 5.84% of exports behaved asymmetrically.

For the analysis with China the asymmetric effects seem less pronounced as only 9 importing industries contributing to around 2% of imports in the short & 4 importing industries contributing to around .15% in the long run behaved differently due to exchange rate volatility & 14 exporting industries contributing around 6% of exports in the short run had asymmetric effects due to exchange rate volatility.

5.3 Direction for further research

The methodology successfully discerns industries that experience advantages and disadvantages from both increased and decreased volatility in exchange rates. These asymmetric effects appear to vary across industries and hold implications not only for those specific industries but also for others in different countries. Further investigations within the Indian context could expand to encompass a broader spectrum of industries and include all countries with which India conducts trade. This would provide a more comprehensive understanding of the impact of exchange rate volatility at the level of commodity trade.

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