

Foreign Exchange Reserves and Currency Movements: An Empirical Analysis of Major INR Exchange Rates

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Abstract

Foreign exchange reserves play a vital role in maintaining economic stability, managing exchange rate volatility, and strengthening investor confidence in emerging economies. India, as one of the world's fastest-growing economies, has accumulated substantial foreign exchange reserves over the past decade. This study examines the impact of India's foreign exchange reserves on the exchange rates of four major currency pairs: USD-INR, GBP-INR, EUR-INR, and INR-JPY during the period 2021–2025. The research employs descriptive and analytical methodologies using secondary data obtained from the Reserve Bank of India (RBI), International Monetary Fund (IMF), and foreign exchange market reports. The study analyses reserve movements and corresponding exchange rate fluctuations to understand the relationship between reserve accumulation and currency stability. Findings indicate that higher foreign exchange reserves contributed significantly to reducing exchange rate volatility and strengthening market confidence. However, external shocks such as global inflation, geopolitical tensions, and monetary policy changes in developed economies also influenced exchange rate movements. The study concludes that while foreign exchange reserves are an effective tool for exchange rate management, they cannot completely shield a currency from global economic disturbances.

Keywords Foreign Exchange Reserves, Exchange Rate, USD-INR, GBP-INR, EUR-INR, INR-JPY, RBI, Currency Stability.

1. Introduction

Foreign exchange reserves refer to foreign currency assets held by a country's central bank for meeting international payment obligations, supporting monetary policy, and stabilizing exchange rates. These reserves generally consist of foreign currencies, gold reserves, Special Drawing Rights (SDRs), and reserve positions in international institutions.

In the modern globalized economy, exchange rate stability is critical for economic growth, international trade, and foreign investment. Exchange rates directly influence export competitiveness, import costs, inflation, and capital flows. Therefore, central banks actively monitor and manage exchange rates through various monetary tools, among which foreign exchange reserves are particularly significant.

India's foreign exchange reserves witnessed remarkable growth between 2021 and 2025. The Reserve Bank of India maintained substantial reserves to protect the economy against external shocks arising from the COVID-19 recovery phase, Russia-Ukraine conflict, rising global inflation, and aggressive interest rate hikes by major central banks.

The Indian Rupee's performance against major currencies such as the US Dollar, British Pound, Euro, and Japanese Yen provides an excellent framework to evaluate the effectiveness of reserve management. During the study period, the RBI frequently intervened in currency markets by utilizing reserves to reduce excessive volatility and maintain orderly market conditions.

This study investigates the impact of foreign exchange reserves on the exchange rates of USD-INR, GBP-INR, EUR-INR, and INR-JPY from 2021 to 2025.

2. Literature Review

Heller (1966) presented the cost-benefit perspective. Agrawal (1970) revised Heller's model based on the premise that the opportunity cost of holding reserves is the value generated by foreign currency possessed by the monetary

authority, rather than by imported productive goods. Bacchante, Racier, and Roof (2006) discovered that real exchange rate volatility adversely affects a country's growth, with this issue being more pronounced in nations with lower financial development. Dooley, Folkerts-Landau, and Garber (2003) regarded the accumulation of reserves as a strategy to promote growth and sustain an undervalued real exchange rate in the context of China. M. Ramachandran and Naveen Srinivasan (June 2006) utilised weekly data from 2001 to 2005 to examine the existence of a long-term relationship, concluding that asymmetric exchange rate interventions, likely motivated by apprehensions regarding India's export competitiveness, have contributed to a substantial accumulation of reserves. The research revealed an asymmetry in central bank foreign exchange intervention responses to currency appreciations compared to depreciations in six emerging Asian economies: India, Korea, the Philippines, Singapore, Thailand, and Indonesia. Victor Pontines et al., 2011 Furthermore, the central banks of India, Singapore, and Thailand seem to respond more vigorously than the bilateral rate of the US dollar.

The volume of foreign exchange reserves does not demonstrate a correlation with the exchange rate, either in the long run or short run, within the Indian economy. (Gokhale M. et al., 2013) The long-term relationship exists among exchange rate reserves, interest rates, and stock market development, with foreign reserves positively influencing stock market growth. There is bidirectional causality between interest rates and stock market growth (Olayinka Olufisayo Akinlo 2015). Research conducted to examine the period from 1981 to 2011. The study employs statistical methodologies including the Unit Root Test, Granger Causality Test, and Johansen Integration Test.

Although several studies have examined reserve management and exchange rates separately, limited research exists focusing specifically on the impact of India's foreign exchange reserves on multiple currency pairs (USD-INR, GBP-INR, EUR-INR, and INR-JPY) during the dynamic period of 2021–2025.

3. Research Methodology

The study adopts a descriptive and analytical research design. The nature of data is secondary and various sources used to collect the data are: Reserve Bank of India (RBI), International Monetary Fund (IMF), World Bank Reports, Ministry of Finance Publications, Foreign Exchange Market Reports. The data collection period is of five years i.e 2021 to 2025. The study focused on Foreign Exchange Reserves (US\$ Billion) as an independent variable while USD-INR Exchange Rate, GBP-INR Exchange Rate, EUR-INR Exchange Rate, INR-JPY Exchange Rate as dependent variables. To study the relationship correlation coefficient is conducted.

Objectives of the Study

1. Analyse the trend of India's foreign exchange reserves from 2021 to 2025.
2. Examine exchange rate movements of USD-INR, GBP-INR, EUR-INR, and INR-JPY.
3. Evaluate the relationship between foreign exchange reserves and exchange rate stability.
4. Assess the effectiveness of RBI interventions in the foreign exchange market.
5. Provide recommendations for future reserve management policies.

Research Questions

1. How have India's foreign exchange reserves changed between 2021 and 2025?
2. What were the trends in USD-INR, GBP-INR, EUR-INR, and INR-JPY exchange rates?
3. Is there a significant relationship between foreign exchange reserves and exchange rate movements?
4. To what extent do reserves help stabilize the Indian Rupee?

4. Data Analysis

Table 1: India's Foreign Exchange Reserves (2021–2025)

YEAR	FOREX RESERVES (US\$ BILLION)
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2021	635
2022	563
2023	578
2024	645
2025	688

India's reserves declined in 2022 due to RBI interventions aimed at defending the Rupee amid global financial uncertainty. Subsequently, reserves increased steadily due to strong capital inflows, export growth, and improved external balances. (Table 1)

Table 2: Average USD-INR Exchange Rate

YEARS	USD-INR	GBP-INR	EUR-INR	INR-JPI
2021	74.3	102.4	88.1	1.4855
2022	79.8	96.5	84.0	1.6703
2023	82.7	101.8	89.2	1.717
2024	83.1	105.3	91.4	1.8101
2025	84.2	108.6	93.8	1.717

The Rupee depreciated against the US Dollar during the study period. Despite rising reserves after 2023, the strong US Dollar driven by Federal Reserve interest rate hikes exerted pressure on the Rupee. GBP-INR experienced fluctuations due to economic uncertainties in the United Kingdom. However, reserve accumulation helped moderate extreme volatility. The Euro weakened in 2022 due to the European energy crisis. Subsequently, EUR-INR strengthened as European economic conditions improved. The Japanese Yen experienced significant weakness due to accommodative monetary policies adopted by the Bank of Japan. This resulted in a stronger INR relative to JPY.

To assess the relationship between forex reserves and exchange rates, a simplified correlation analysis was conducted.

Table 3: Correlation matrix between all variables

		Forex Reserve	USD-INR	GBP-INR	EUR-INR	INR-JPI
Forex Reserve	Pearson Correlation	1	0.206	0.926*	0.859	-0.087
	Sig. (2-tailed)		0.740	0.024	0.062	0.890
	N	5	5	5	5	5
USD-INR	Pearson Correlation	0.206	1	0.453	0.562	-0.931*
	Sig. (2-tailed)	0.740		0.444	0.324	0.021
	N	5	5	5	5	5

GBP-INR	Pearson Correlation	0.926*	0.453	1	0.988**	-0.296
	Sig. (2-tailed)	0.024	0.444		0.002	0.629
	N	5	5	5	5	5
EUR-INR	Pearson Correlation	0.859	0.562	0.988**	1	-0.403
	Sig. (2-tailed)	0.062	0.324	0.002		0.502
	N	5	5	5	5	5
INR-JPI	Pearson Correlation	-0.087	-0.931*	-0.296	-0.403	1
	Sig. (2-tailed)	0.890	0.021	0.629	0.502	
	N	5	5	5	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows the linear correlation between Independent variable i.e forex reserve in USD with the observed dependent variables i.e. USD-INR, GBP_INR, EUR-INR and INR-JPI. Correlation coefficient is negatively significant at 0.01 level.

5. Discussion of Findings

The analysis reveals few important observations. Firstly, India's reserve position strengthened investor confidence and reduced concerns regarding external vulnerability. Secondly, The RBI utilized reserves to smooth excessive currency fluctuations, particularly during periods of heightened uncertainty in 2022. Further, despite high reserve levels, exchange rates were significantly influenced by: US Federal Reserve interest rate hikes, Global inflation, Crude oil price increases, Russia-Ukraine conflict, International capital flows. Additionally, The US Dollar remained exceptionally strong throughout much of the study period, causing gradual Rupee depreciation despite rising reserves. India's reserve stock acted as an insurance mechanism against external shocks and speculative attacks on the Rupee.

The present study's major findings are:

1. India's foreign exchange reserves increased from approximately US\$635 billion in 2021 to around US\$688 billion in 2025.
2. Foreign exchange reserves experienced a temporary decline in 2022 due to market interventions and capital outflows.
3. USD-INR depreciated steadily throughout the study period, reflecting global dollar strength.
4. GBP-INR and EUR-INR displayed cyclical fluctuations influenced by European economic conditions.
5. INR strengthened against JPY due to prolonged weakness in the Japanese Yen.
6. Higher reserve levels contributed to reduced exchange rate volatility.
7. RBI interventions supported orderly market functioning during periods of stress.
8. Foreign exchange reserves alone were insufficient to prevent depreciation caused by powerful global economic forces.
9. A positive relationship exists between reserve adequacy and exchange rate stability.
10. Reserve accumulation enhanced India's resilience against external financial shocks.

6. Recommendations

The study suggests few recommendations as follows:

- India should continue building reserves through export promotion, FDI inflows, and prudent external debt management.
- Greater diversification across currencies and gold holdings can reduce exposure to fluctuations in any single currency.
- Increasing the use of the Rupee in international trade can reduce dependence on foreign currencies.
- Reducing import dependency and increasing export competitiveness will support reserve growth.
- Continuous assessment of geopolitical and financial risks is necessary for effective reserve management.

7. Conclusion & Limitations

Foreign exchange reserves represent one of the most important instruments available to central banks for maintaining currency stability and economic confidence. The present study examined the impact of India's foreign exchange reserves on the exchange rates of USD-INR, GBP-INR, EUR-INR, and INR-JPY during the period 2021–2025.

The findings indicate that foreign exchange reserves played a crucial role in mitigating exchange rate volatility and supporting the Indian Rupee during periods of global economic uncertainty. Although the Rupee experienced depreciation against major currencies, particularly the US Dollar, reserve accumulation enabled the RBI to intervene effectively and prevent disorderly market conditions.

The study further reveals that exchange rates are influenced not only by reserve levels but also by external factors such as monetary policy decisions in advanced economies, geopolitical developments, inflation trends, and global capital flows. Therefore, while foreign exchange reserves are essential for exchange rate management, they should be complemented by sound macroeconomic policies, export competitiveness, fiscal discipline, and sustainable economic growth strategies.

Overall, India's robust foreign exchange reserve position between 2021 and 2025 significantly enhanced economic resilience and contributed to exchange rate stability, reinforcing the importance of prudent reserve management in an increasingly interconnected global economy.

This study is subject to certain limitations that should be considered while interpreting the findings. The analysis relies entirely on secondary data collected from published sources, making the results dependent on the accuracy, reliability, and availability of existing information. Furthermore, exchange rates are influenced by numerous economic, political, and market-related factors, such as inflation, interest rates, trade balances, and investor sentiment, whereas this study primarily focuses on the role of foreign exchange reserves. The use of correlation analysis helps identify relationships between variables; however, correlation does not necessarily imply causation, and therefore the observed associations cannot be interpreted as direct cause-and-effect relationships. Additionally, the scope of the study is restricted to four selected currency pairs, which may limit the generalizability of the findings to the broader foreign exchange market. Finally, short-term market sentiment factors, including speculative activities, geopolitical developments, and sudden policy announcements, could not be fully incorporated into the analysis, potentially affecting the comprehensive understanding of exchange rate movements.

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