



"AN ANALYTICAL STUDY OF THE EXCHANGE RATE BEHAVIOUR OF INDIAN RUPEE WITH MAJOR FOREIGN CURRENCIES"

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ABSTRACT

The exchange rate of the Indian Rupee (INR) against major global currencies is a key determinant of India's trade competitiveness, inflation, and investment climate. This study examines the behaviour of the INR against ten major foreign currencies — the US Dollar, Euro, British Pound, Japanese Yen, Chinese Yuan, Canadian Dollar, Australian Dollar, Swiss Franc, Singapore Dollar, and South African Rand — over the eleven-year period from 2016 to 2026. Using secondary data drawn from the Reserve Bank of India, the International Monetary Fund, and other central bank publications, the study applies descriptive statistics and time-trend regression analysis to each currency pair. The results show that the Rupee depreciated consistently against most currencies studied, with the US Dollar and Canadian Dollar exhibiting the strongest and most statistically significant upward trends (R^2 of 0.966 each), followed closely by the Swiss Franc, British Pound, Chinese Yuan, Singapore Dollar, and Euro. Only the South African Rand showed no significant time trend. The study concludes that the steady depreciation of the Rupee reflects the combined influence of inflation differentials, trade imbalances, and global economic conditions, and recommends that the Reserve Bank of India and other stakeholders continue to monitor exchange rate volatility and strengthen India's external trade position.

I. INTRODUCTION

The exchange rate is the value of one country's currency in relation to another's, and it is among the most important economic indicators because it affects international trade, investment, tourism, inflation, employment, and economic growth. In today's globalised economy, cross-border trade and financial transactions make exchange rates an essential factor in economic development.

India is one of the fastest-growing economies in the world and actively participates in international trade. The value of the Indian Rupee (INR) changes daily on account of supply and demand in the market, foreign investment flows, exports and imports, interest rates, government regulations, inflation, and global economic conditions. The exchange rate between the INR and major foreign currencies such as the US Dollar (USD), Euro (EUR), British Pound (GBP), Japanese Yen (JPY), and Chinese Yuan (CNY) significantly influences India's economy: since India imports machinery, crude oil, and technology, depreciation of the Rupee raises import costs and inflation, while a weaker Rupee can also improve the competitiveness of Indian exports.

The Reserve Bank of India (RBI) plays a critical role in preserving exchange rate stability through monetary policy and foreign exchange market operations, although currency rates are also shaped by global events such as financial crises, geopolitical conflicts, pandemics, and shifts in international trade policy. This study examines the behaviour of the Indian Rupee against ten major international currencies over the period 2016 to 2026, analysing trends, fluctuations, and influencing factors, with a view to offering practical insights to policymakers, businesses, investors, researchers, and students.

Industry Profile: The Foreign Exchange Market

The foreign exchange (forex) market is the largest financial market in the world. In India, the market for foreign exchange is regulated by the Reserve Bank of India (RBI) under the Foreign Exchange Management Act (FEMA), 1999, and facilitates international trade, foreign direct investment (FDI), foreign portfolio investment (FPI), tourism and remittances, and currency hedging. Major participants include the RBI, commercial banks, exporters and importers, financial institutions, multinational



companies, and foreign investors. The RBI itself, established in 1935 and headquartered in Mumbai, is India's central bank and is charged with monetary policy, currency management, and foreign exchange regulation, in pursuit of price stability, an efficient payment system, and public confidence in the financial system.

Key Features of India's Foreign Exchange Market

- The forex market is the largest financial market in the world by trading volume.
- It is regulated in India by the RBI under the Foreign Exchange Management Act (FEMA), 1999.
- Major participants include the RBI, commercial banks, exporters, importers, and foreign investors.
- The market has moved from a fixed exchange rate framework (pre-1991) to a largely market-determined, RBI-managed floating system today.
- Ten major currencies — USD, EUR, GBP, JPY, CNY, CAD, AUD, CHF, SGD, and ZAR — form the principal comparators for the Rupee.
- The market is expected to expand further with rising trade, FDI, digital banking, and initiatives such as Make in India and Digital India.

II. REVIEW OF LITERATURE

Rogoff and Meese (1983) tested the forecasting performance of macroeconomic exchange rate models and found that they could not consistently outperform a simple random-walk model, underscoring the difficulty of predicting currency movements.

Dornbusch (1976) proposed the Overshooting Model, showing that exchange rates can react more sharply than warranted in the short run because of sticky prices and shifts in monetary policy, a theory that remains influential in exchange rate economics.

Frenkel (1976) emphasised the role of purchasing power parity (PPP) in exchange rate determination and found that inflation differentials between countries significantly influence long-run currency movements.

Edwards (1989) studied exchange rate misalignment in emerging economies and concluded that maintaining an equilibrium exchange rate is essential for economic growth, export performance, and macroeconomic stability.

Patnaik and Pauly (2001) examined the Indian foreign exchange market after liberalisation and found that the Rupee became increasingly market-oriented while the RBI continued to moderate excessive volatility through intervention.

Sarkar and Barat (2005) examined the exchange rate returns of the Rupee against the US Dollar, Euro, Pound Sterling, and Japanese Yen and found that the USD-INR pair displayed persistent scaling behaviour, unlike the more stable patterns of the other pairs.

Burange and Ranadive (2013) used the ARDL approach to analyse the determinants of India's real exchange rate and found that foreign exchange reserves, inflation, foreign investment, trade openness, and interest rate differentials were all significant influences.

Bahmani-Oskooee and Gelan (2014) studied the link between currency volatility and international trade and concluded that exchange rate instability adversely affects exports and imports in developing economies.

A related study on real exchange rate dynamics (2014) examined India's real exchange rates against sixteen trading partners and found supportive evidence for purchasing power parity once structural breaks were accounted for.

Datta Chaudhuri and Ghosh (2016) compared artificial neural network (ANN) models with conventional time-series econometric models for forecasting the USD-INR rate and found that ANN models produced superior forecasting accuracy.

The RBI's Annual Reports consistently identify inflation, crude oil prices, foreign capital inflows, monetary policy, and global financial conditions as the principal determinants of the Rupee's exchange



rate, while the International Monetary Fund notes that exchange rate flexibility helps economies absorb external shocks and supports macroeconomic adjustment. The Bank for International Settlements similarly finds that global capital flows, monetary policy decisions, and financial market integration strongly influence currency volatility across countries.

Datta (2023), applying Multifractal Detrended Fluctuation Analysis, found that the USD, GBP, EUR, and JPY exchange rates against the Rupee display multifractal characteristics indicative of complex underlying dynamics, while a related study by the same author found that Indian forex returns tend to become more regular during periods of global financial distress, including the Global Financial Crisis and the COVID-19 pandemic.

Das and Saikat Sinha Roy (2025) used ARDL and Error Correction Models to study the determinants of the USD-INR rate between 2008 and 2023 and found that inflation, foreign exchange reserves, and broader macroeconomic fundamentals have significant long-run effects on the Rupee's value.

Krugman and Obstfeld's foundational work in international economics explains exchange rate movements in terms of trade balances, interest rates, inflation, capital flows, and government intervention, while Mishkin similarly emphasises the role of monetary policy and inflation expectations. The World Bank notes that stable exchange rates promote investment and trade, whereas excessive volatility discourages business decision-making.

Research Gap

Most existing studies on the Indian Rupee focus primarily on its behaviour against the US Dollar or a limited number of major currencies, and comparatively few studies examine the Rupee simultaneously against a broad basket of global currencies. This study seeks to close that gap by analysing the exchange rate behaviour of the Indian Rupee against ten major foreign currencies over an eleven-year period, providing a more comprehensive comparative picture than earlier, narrower studies.

III. RESEARCH METHODOLOGY

Statement of the Problem

The value of the Indian Rupee against major foreign currencies such as the US Dollar, Euro, British Pound, Japanese Yen, and Chinese Yuan has fluctuated significantly over the years, driven by interest rates, inflation, foreign exchange reserves, crude oil prices, foreign investment flows, trade deficits, and global economic conditions. Because India depends heavily on imports of crude oil, machinery, and technology, depreciation of the Rupee raises import costs and inflation, while appreciation can reduce export competitiveness. Given this uncertainty, and the challenges recent global events have posed to exchange rate stability, this study evaluates the behaviour of the Indian Rupee against major foreign currencies to better understand the trends, causes, and economic implications involved.

Need for the Study

- Changes in exchange rates have an immediate impact on India's economy.
- Businesses engaged in global commerce depend on stable, predictable exchange rates.
- Investors need a clear understanding of exchange rate trends before committing capital.
- The study assists exporters and importers in managing foreign exchange risk.
- It offers insight into India's position within the global economy and supports policy formulation.

Objectives of the Study

- To analyse the fluctuation of the Indian Rupee's exchange rate against major foreign currencies.
- To examine trends and fluctuations in these exchange rates over the study period.
- To identify the key variables influencing exchange rate movements.
- To study the role of the Reserve Bank of India in managing exchange rate stability.
- To offer suggestions for improving exchange rate stability and reducing volatility.

Scope of the Study

The study covers the Indian Rupee's exchange rate against ten major foreign currencies over the eleven-year period from 2016 to 2026. It examines trends and fluctuations in exchange rates, the factors



influencing them, and the role of RBI policy in exchange rate management, relying entirely on secondary data gathered from reputable sources. The study does not cover every world currency, focusing instead on those with significant trade relations with India.

Research Design and Data Collection

The study is descriptive and analytical in nature and is based entirely on secondary data. No primary data was collected. Data was compiled from the Reserve Bank of India, the Ministry of Finance, the International Monetary Fund, the World Bank, International Financial Statistics, annual reports, the Economic Survey of India, journals, books, government publications, and official central bank websites. Descriptive statistics and time-trend regression analysis were then used to interpret year-wise movements in each currency pair.

Sample of the Study

Ten major foreign currencies were selected for comparison with the Indian Rupee:

- US Dollar (USD)
- Euro (EUR)
- Japanese Yen (JPY)
- Pound Sterling (GBP)
- Chinese Yuan (CNY)
- Canadian Dollar (CAD)
- Australian Dollar (AUD)
- Swiss Franc (CHF)
- Singapore Dollar (SGD)
- South African Rand (ZAR)

Tools Used in the Analysis

1. Descriptive Statistics

Mean, median, standard deviation, skewness, kurtosis, and range were computed for each currency pair to describe the central tendency and dispersion of exchange rates over the study period.

2. Time-Trend Regression Analysis

A simple linear regression of the annual exchange rate on the year was estimated for each currency pair ($\text{Exchange Rate} = a + b \times \text{Year}$), with the R-squared, F-statistic, and p-value used to assess the strength and significance of the trend.

3. Percentage and Comparative Analysis

Year-on-year percentage changes and comparative movements across currencies were used to identify periods of significant fluctuation linked to economic and global events.

Hypotheses

H0: There is no significant trend in the exchange rate of the Indian Rupee against major foreign currencies over the study period.

H1: There is a significant trend in the exchange rate of the Indian Rupee against major foreign currencies over the study period.

Limitations of the Study

1. The study is based entirely on secondary data gathered from published sources.
2. Data accuracy depends on the reliability of the published sources used.
3. The study covers only ten selected foreign currencies and cannot be generalised to all world currencies.
4. Exchange rates are influenced by unpredictable global events that fall outside the scope of this analysis.
5. The time available for the study constrained the depth of analysis possible.
6. Findings are applicable only to the study period and cannot be used to predict future exchange rate movements with complete accuracy.



IV. DATA ANALYSIS AND INTERPRETATION

This section presents the year-wise exchange rate of the Indian Rupee against ten major foreign currencies for the period 2016 to 2026, followed by descriptive statistics and time-trend regression results for each currency pair.

Table 1: Sample Currencies and Codes

Code	Currency	Country/Region
USD	US Dollar	United States
EUR	Euro	Eurozone
GBP	Pound Sterling	United Kingdom
CNY	Chinese Yuan	China
CAD	Canadian Dollar	Canada
AUD	Australian Dollar	Australia
CHF	Swiss Franc	Switzerland
SGD	Singapore Dollar	Singapore
ZAR	South African Rand	South Africa

Table 2: Year-wise Exchange Rate of the Indian Rupee (2016–2026)

Year	₹/\$	₹/€	₹/£	₹/¥	₹/₹	₹/CHF	₹/₹	₹/₹	₹/₹
2016	66.46	74.2	90.5	10	49.95	67.5	47.08	4.6	49.79
2017	67.79	74	84	9.55	49.91	65.5	47.54	4.9	50.78
2018	70.09	80	90.5	10.4	51.05	69.5	47.8	5.1	53.67
2019	70.39	79	89.5	10.3	48.05	70.5	51.18	4.8	54.1
2020	76.38	85	94.5	10.75	52.61	77.5	52.97	4.39	56.59
2021	75.45	88	101.5	11.25	56.04	80	52.97	5	58.55
2022	81.62	84	97.5	11.65	54.54	84	55.28	4.8	60.83
2023	81	90	103	11.6	54.96	90	54.97	4.4	61.64
2024	85.56	91.5	108.5	11.65	55.85	94	61.13	4.5	61.7
2025	89	106	118	12.15	57.24	106	64.01	4.88	64.94
2026	93.5	110	126	13.55	67.68	118.5	72.56	5.6	69.15

Source: Reserve Bank of India, Reference Rate Archive.

Interpretation

The year-wise data show that the Indian Rupee depreciated steadily against nearly every major foreign currency between 2016 and 2026. The Rupee weakened from ₹66.46 to ₹93.50 against the US Dollar, from ₹74.20 to ₹110 against the Euro, and from ₹90.50 to ₹126 against the British Pound over the period, among the largest movements recorded. The Rupee's decline against the South African Rand was comparatively modest and less consistent, moving narrowly between roughly ₹4.4 and ₹5.6 across the eleven years. Overall, the data point to a broad-based, sustained weakening of the Rupee against most currencies studied, with the depreciation most pronounced in the final years of the period.

Table 3: Descriptive Statistics of Exchange Rates (2016–2026)

Statistic	₹/\$	₹/€	₹/£	₹/¥	₹/₹	₹/CHF	₹/₹	₹/₹	₹/₹
Mean	77.93	87.4	100.32	11.17	54.35	83.91	55.23	4.82	58.34
Median	76.38	85	97.5	11.25	54.54	80	52.97	4.8	58.55
Standard Deviation	8.99	11.71	12.91	1.13	5.33	16.96	7.87	0.35	6.02
Skewness	0.37	0.93	0.87	0.65	1.56	0.93	1.15	0.9	0.22
Kurtosis	-1.01	0.23	0.07	0.64	3.57	0.15	1.02	1.32	-0.63



Statistic	₹/\$	₹/€	₹/£	₹/¥	₹/¥	₹/CHF	₹/₹	₹/₹	₹/₹
Minimum	66.46	74	84	9.55	48.05	65.5	47.08	4.39	49.79
Maximum	93.5	110.25	126	13.55	67.68	118.5	72.56	5.6	69.15

Interpretation

The descriptive statistics confirm a gradual depreciation of the Rupee against the major foreign currencies studied. The mean exchange rate over the period was highest for the British Pound (₹100.32), followed by the Euro (₹87.40) and Swiss Franc (₹83.91), while the lowest average value was recorded for the South African Rand (₹4.82). Standard deviation figures show the greatest variability in the Swiss Franc (16.96), British Pound (12.91), and Euro (11.71), indicating comparatively higher volatility, while the Rand recorded the lowest variability (0.35). The US Dollar recorded a mean exchange rate of ₹77.93 with a standard deviation of 8.99, reflecting a steady upward movement over the period. Positive skewness for most currencies indicates that the exchange rate rose more frequently than it fell during the study period, while the maximum values were recorded in 2026 for nearly all currencies and the minimum values mainly in 2016, consistent with a continuous weakening of the Rupee.

Table 4: Regression Analysis Summary — Indian Rupee against Major Foreign Currencies (2016–2025)

Currency Pair	R ²	Adj. R ²	Year Coefficient	F-Statistic	Sig. (p-value)
INR/USD	0.966	0.962	2.786	227.332	0.00000037
INR/CAD	0.966	0.962	1.816	230.562	0.00000035
INR/CHF	0.934	0.925	5.403	112.790	0.000005
INR/GBP	0.917	0.907	4.164	88.427	0.000013
INR/CNY	0.901	0.889	0.351	72.761	0.000027
INR/SGD	0.872	0.856	2.404	54.681	0.000077
INR/EUR	0.859	0.841	3.512	48.753	0.000115
INR/AUD	0.708	0.671	1.502	19.378	0.002280
INR/ZAR	0.024	-0.098	0.019	0.199	0.667 (n.s.)

Interpretation

The regression results show a very strong and statistically significant upward trend in the INR/USD and INR/CAD exchange rates, with each explaining 96.6% of the variation in exchange rate movement over time ($p < 0.001$). The INR/CHF, INR/GBP, INR/CNY, INR/SGD, and INR/EUR pairs also showed strong, statistically significant upward trends, with R^2 values ranging from 85.9% to 93.4%. The INR/AUD pair showed a moderately strong and significant trend ($R^2 = 70.8\%$). The INR/ZAR pair was the only currency pair to show no meaningful trend, with an R^2 of just 2.4% and a p-value of 0.667, indicating that time alone does not explain movements in the Rupee-Rand exchange rate. Taken together, the results indicate a consistent and statistically significant depreciation of the Indian Rupee against most major foreign currencies between 2016 and 2026, with the Swiss Franc and British Pound recording the steepest average annual increases in exchange rate.

V. FINDINGS, SUGGESTIONS AND CONCLUSION

Findings

- The Indian Rupee depreciated against most major foreign currencies during the study period, indicating a rising cost of foreign exchange for India.
- The INR/USD exchange rate showed a very strong upward trend, with an R^2 of 96.6%, indicating a highly predictable movement over time.
- The INR/CAD exchange rate recorded an equally high R^2 of 96.6%, reflecting a strong and consistent increase throughout the period.
- The INR/CHF exchange rate showed the steepest annual increase among all currencies studied, at approximately ₹5.40 per year.



11. The INR/GBP exchange rate showed a strong positive trend ($R^2 = 91.7\%$), indicating substantial appreciation of the Pound against the Rupee.
12. The INR/CNY exchange rate showed a strong relationship with time, with 90.1% of its variation explained by the regression model.
13. The INR/SGD exchange rate recorded an R^2 of 87.2%, indicating a strong upward movement over the study period.
14. The INR/EUR exchange rate also showed a notable upward trend, with 85.9% explanatory power.
15. The INR/AUD exchange rate showed a moderate but still significant upward trend, with an R^2 of 70.8%.
16. The INR/ZAR exchange rate was the only currency pair that failed to show a significant trend, with an R^2 of just 2.4% and a statistically insignificant p-value.
17. Most regression models were statistically significant at the 1% level, confirming the reliability of the results.
18. Global currencies such as the Swiss Franc, US Dollar, Euro, Pound Sterling, Canadian Dollar, Australian Dollar, Singapore Dollar, and Chinese Yuan all strengthened meaningfully against the Rupee over the study period.
19. The Swiss Franc and British Pound recorded the highest average annual rates of appreciation against the Rupee among the currencies studied.
20. The overall upward trend in exchange rates reflects the combined influence of inflation, trade balances, foreign investment flows, and global economic conditions.

Suggestions / Recommendations

21. The Reserve Bank of India should continue to monitor exchange rate volatility and adopt suitable monetary policies to maintain currency stability.
22. The Government should promote exports to increase foreign exchange earnings and reduce pressure on the Rupee.
23. Efforts should be made to increase foreign direct investment (FDI) and foreign portfolio investment (FPI) to strengthen foreign exchange reserves.
24. Businesses engaged in international trade should adopt hedging strategies to guard against exchange rate fluctuations.
25. Import-dependent industries should formulate effective risk-management policies to reduce the adverse impact of currency depreciation.
26. Export-oriented industries should capitalise on favourable exchange rate movements to strengthen global competitiveness.
27. Policymakers should maintain adequate foreign exchange reserves to guard against external economic shocks.
28. Close monitoring of major currencies such as the US Dollar, Euro, Pound Sterling, and Swiss Franc is necessary given their significant influence on India's foreign trade.
29. Financial institutions should raise investor awareness of how exchange rate movements affect international investments.
30. Future research should incorporate additional variables such as interest rates, inflation, GDP growth, trade deficits, and foreign exchange reserves for a more complete analysis.

Conclusion

This study examined the behaviour of the Indian Rupee against ten major foreign currencies over the eleven-year period from 2016 to 2026, using descriptive statistics and time-trend regression analysis. The findings show that the Rupee depreciated significantly against most currencies studied, with statistically strong and significant upward trends recorded for the US Dollar, Canadian Dollar, Swiss Franc, British Pound, Chinese Yuan, Singapore Dollar, Euro, and Australian Dollar. The South African Rand was the sole exception, showing no meaningful trend over the period. These results confirm that



exchange rate movements remain an important influence on India's international trade, investment decisions, and overall economic performance, shaped by the combined effects of inflation differentials, trade imbalances, capital flows, and global economic conditions. Effective exchange rate management by the Reserve Bank of India, supported by sound trade and investment policy, therefore remains essential to maintaining currency stability and supporting India's long-term economic growth.

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