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Investigating the Long-Run and Short-Run Dynamics Between Exchange Rate, Interest Rate, and Stock Market Index in India

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Abstract
This study aims to examine the dynamic relationship between exchange rate (INR/USD), interest rate (repo rate), and the Indian stock market index (Nifty 50) using the Autoregressive Distributed Lag (ARDL) bounds testing approach. The primary objective is to determine whether a long-run equilibrium relationship exists among these variables and to assess short-run adjustments using monthly data from January 2010 to December 2024. The ARDL model confirms a significant long-run negative relationship, indicating that depreciation in the exchange rate and rising interest rates lead to declines in stock market performance. The Error Correction Model reveals rapid adjustment to equilibrium, with nearly 70% of short-term deviations corrected within a month. The study concludes that macroeconomic fundamentals significantly influence stock prices in India, both in the short and long run. These findings have practical implications: investors must closely monitor interest and exchange rate trends for strategic portfolio decisions, while policymakers should focus on maintaining macroeconomic stability to support sustained stock market growth.

Five Keywords: ARDL Model, Exchange Rate**,** India, Interest Rate**,** Stock Market
JEL Classification Code: C32, E44, G15

1. Introduction
The dynamics of stock market performance have long captivated economists, financial analysts, and policymakers due to their pivotal role in shaping macroeconomic stability and investment climate. Stock markets not only reflect a country's economic health but also act as a barometer of investor sentiment and future expectations. As globalisation deepens financial linkages and markets respond swiftly to both domestic and international shocks, understanding the variables that influence stock market movements becomes increasingly critical. Among the myriads of factors that exert influence, macroeconomic variables such as exchange rates and interest rates have emerged as particularly significant due to their direct and indirect impact on capital flows, cost of capital, investment returns, and portfolio rebalancing decisions. In emerging economies like India, where financial markets have undergone rapid evolution and integration into the global economic system, the stock market has gained prominence as a vital source of capital mobilisation and wealth generation. The Indian equity market, represented by indices such as the Nifty 50 and Sensex, has witnessed substantial volatility over the past two decades, influenced by policy reforms, monetary interventions, global crises, and most recently, the disruptions caused by the COVID-19 pandemic. In such a fluid environment, it becomes essential to revisit and rigorously examine the empirical relationship between key macroeconomic indicators and stock market performance.

The exchange rate, particularly the rupee-dollar parity, has significant implications for firms engaged in international trade, foreign institutional investors, and the economy's external competitiveness. An appreciation or depreciation of the domestic currency can alter the earnings outlook for export- and import-oriented firms, thereby impacting stock valuations. Similarly, interest rates, typically guided by the Reserve Bank of India's monetary policy stance, play a central role in determining borrowing costs, consumer spending, investment levels, and ultimately the profitability of listed firms. Higher interest rates generally lead to increased bond yields, which may make equities less attractive, while lower interest rates often promote bullish market behaviour due to cheaper capital and higher corporate profits. Despite the theoretical grounding in the Fisher Effect and the Interest Rate Parity theories, the empirical relationship between stock market indices and macroeconomic variables remains a subject of ongoing investigation. The behaviour of these relationships is often non-linear, time-varying, and sensitive to policy regimes and structural breaks. Conventional econometric models often fall short in capturing the mixed integration orders and dynamic interdependencies among variables. In this context, the Autoregressive Distributed Lag (ARDL) approach becomes particularly advantageous, offering robust estimation

regardless of whether variables are integrated of order I(0) or I(1). Furthermore, the ARDL model allows for simultaneous estimation of both long-run and short-run relationships, thereby providing a comprehensive understanding of the underlying dynamics.

This study aims to investigate the long-run and short-run effects of exchange rate and interest rate on the Indian stock market index using the ARDL bounds testing methodology. The scope of the study spans from January 2010 to December 2024, a period marked by significant economic transformation, digital financial inclusion, monetary policy shifts, and global economic turbulence. This extended timeframe provides a fertile ground for analysis by capturing both cyclical fluctuations and structural changes. The methodological robustness offered by the ARDL model, combined with a comprehensive data span, is expected to yield insightful findings that contribute meaningfully to the existing body of literature.

The primary objective of the study is to empirically examine the nature and magnitude of the relationship between the exchange rate, interest rate, and stock market index in India. Specifically, the study seeks to identify whether a stable long-run equilibrium relationship exists among these variables and to evaluate how short-term deviations are corrected over time. Additionally, the study endeavours to assess the responsiveness of the stock market to changes in macroeconomic indicators, which is crucial for investors, policymakers, and market participants aiming to forecast trends and make informed decisions. The importance of this study lies in its ability to bridge theoretical expectations with empirical observations in the context of an emerging economy. By quantifying the impact of interest and exchange rates on the stock market, the study offers actionable insights into how financial markets internalise macroeconomic signals. For policymakers, understanding these linkages can help in designing more effective monetary and exchange rate policies that foster investor confidence and economic growth. For investors and financial analysts, the results can serve as a guide for portfolio rebalancing and risk management strategies. Moreover, academicians and researchers stand to benefit from a renewed empirical framework that captures both the dynamic and equilibrium aspects of stock market behaviour. The relevance of this study is further underscored by the increasing volatility and unpredictability of global financial markets in recent years. Events such as the taper tantrum, currency devaluations, geopolitical tensions, and the pandemic have had far-reaching implications for stock markets worldwide, and India has been no exception. In such times, the responsiveness of stock markets to macroeconomic indicators becomes even more pronounced. The study provides timely insights into how the Indian market responds to fundamental drivers, which is essential for maintaining stability and investor trust in the financial system.

This study offers a timely, methodologically rigorous, and policy-relevant analysis of the interaction between macroeconomic variables and stock market performance in India. By employing the ARDL bounds testing approach over a significant historical period, the research not only enriches the academic discourse but also provides practical implications for economic governance and investment strategy. The findings of this study are expected to contribute to a better understanding of market dynamics in India and may serve as a comparative benchmark for other emerging economies navigating similar macro-financial challenges.

2. Literature Review

The financial market serves as a cornerstone of economic growth and stability, and within this intricate system, exchange rates, interest rates, and stock market indices are critically interconnected, particularly in the context of the rapidly evolving Indian economy (Alam & Uddin, 2009; Joshi, 2013; Kunal & Phani, 2017). A deep understanding of the dynamic relationships among these macroeconomic variables is of paramount importance for a wide array of stakeholders. Investors actively seek to leverage these relationships for profitable opportunities and to develop effective risk management strategies (Okonkwo & Jude, 2019; Radha & Gopinathan, 2019; Sharma & Firoz, 2020). Policymakers rely on insights into these dynamics to maintain financial stability and to formulate and implement sound monetary and fiscal policies. Furthermore, researchers continuously strive to enhance the body of knowledge in this complex area. A prevalent and robust econometric technique that has gained increasing traction in the literature for analyzing these intricate dynamic relationships is the Autoregressive Distributed Lag (ARDL) model (Garfa, 2012; Jordan & Philips, 2018; Negara et al., 2021; Song, 2021). Its suitability for handling variables with mixed orders of integration and its ability to simultaneously estimate both short-run and long-run effects make it a valuable tool in this domain (Negara et al., 2021; Song, 2021).

Several fundamental theoretical frameworks provide the conceptual basis for understanding the complex relationships between exchange rates, interest rates, and stock market indices. The flow-oriented, or goods market, approach posits that fluctuations in exchange rates can significantly impact a nation's international trade competitiveness, consequently affecting the earnings and stock prices of firms engaged in exporting and importing activities (Adam et al., 2021; Dogo & Aras, 2021; Guo et al., 2008; Siddiqui & Erum, 2016). For instance, a depreciation of the local currency makes a country's exports more affordable in the global market, potentially leading to an increase in foreign demand and a positive impact on the stock prices of exporting firms (Shuaibu & Isah, 2020). Conversely, an appreciation of the local currency can have the opposite effect, making exports more expensive and potentially dampening the stock prices of exporting companies (Cavallo, 2005).

In contrast, the portfolio balance, or stock-oriented, approach emphasizes how movements in stock market indices can influence exchange rates through the mechanism of capital flows (Adam et al., 2021). A thriving stock market can attract substantial foreign investment, leading to an increased demand for the domestic currency and causing it to appreciate.

Conversely, a declining stock market may trigger capital outflows as investors seek more promising returns elsewhere, potentially resulting in a depreciation of the domestic currency (Chiloane et al., 2014; Wolla, 2015).

Interest rates play a pivotal role in linking these two relationships, exerting influence on both exchange rates and stock markets. Higher interest rates in a country can attract foreign capital seeking better returns, thereby increasing the demand for the domestic currency and leading to its appreciation, a concept supported by the uncovered interest parity theory and the Mundell-Fleming model (Sánchez, 2005; Simone & Razzak, 1999). However, elevated interest rates can also increase the cost of borrowing for companies, potentially hindering investment and reducing the present value of their future earnings, which could lead to a decline in stock prices. Conversely, lower interest rates might stimulate borrowing and investment, potentially boosting economic activity and stock prices, but could also lead to capital outflows and a depreciation of the currency (Murphy, 2021; Sahoo, 2021; Salisu & Vo, 2021).

A significant body of empirical literature has employed the ARDL model to investigate the dynamic relationship between exchange rates and stock market indices in the Indian context. Some studies have reported a negative long-run relationship between the Indian Rupee's exchange rate and stock market returns (Sre & Naik, 2020). Conversely, other research has found an insignificant long-run association but a significant short-run relationship between these variables (Yau et al., 2021). Furthermore, some studies have even suggested a positive influence of exchange rates on stock prices in India (Joshi & Giri, 2015). This variability in findings underscores the complexity of the relationship and suggests that other factors, such as the specific time periods analysed, the measures used for exchange rates, and the inclusion of additional control variables, might play a crucial role. For instance, one study using the ARDL model found that exchange rates negatively impacted stock returns in the Indian market (Abdullahi, 2020; Misra & Verma, 2018; Sandamini et al., 2021). The impact of exchange rates on the stock market can also differ between the short run and the long run, with some evidence suggesting a positive short-run impact and a negative long-run impact (Abdullahi, 2020).

The nexus between interest rates and stock market indices in India has also been extensively examined using the ARDL model. A prevalent finding in this literature is a negative relationship between interest rates and stock market performance. This observation aligns with the theoretical expectation that higher interest rates increase the cost of capital for businesses and make fixed-income investments more attractive, thus potentially leading to a decline in stock valuations. However, some studies have failed to establish long-term cointegration between these variables (Arhenful et al., 2021; Nissim & Penman, 2003; Pallegedara, 2012), suggesting that the impact of interest rates on the stock market might be more pronounced in the short run or contingent upon specific economic conditions (Martínez et al., 2014). Interestingly, a positive relationship between interest rates and stock market returns has been reported in some contexts (Titman & Warga, 1989), indicating that the relationship might not be universally negative and could be influenced by country-specific factors and the time frame of the analysis (Pallegedara, 2012).

The dynamic relationship between exchange rates and interest rates in India has also been a subject of inquiry using the ARDL framework. The theoretical expectation of an inverse relationship, primarily driven by capital flows, is a central theme in the literature. The Mundell-Fleming model, for example, posits that higher interest rates can lead to currency appreciation (Essayyad et al., 2018; Hatmanu et al., 2020; Islam & Faisal, 2024). However, empirical evidence in the Indian context presents a more nuanced picture. While some studies have found a long-run relationship between interest rates and the Rupee-Dollar exchange rate, the direct explanatory power of interest rates on exchange rate movements appears limited in some cases (Paramati & Gupta, 2013). Furthermore, the Reserve Bank of India's interventions in the foreign exchange market to stabilize the Rupee and the distinction between expansionary and contractionary depreciations can further complicate this relationship (Kataria & Gupta, 2018; Kunal & Phani, 2017; Shaik & Gona, 2020).

The ARDL model offers several key methodological advantages that make it well-suited for analysing the dynamic relationships between exchange rates, interest rates, and stock market indices, particularly in the context of the Indian economy. One significant advantage is its ability to handle variables that have different orders of integration, meaning some variables can be stationary at level I (0) while others are stationary at the first difference I (1) (Joshi & Giri, 2015; Kim, 2003; Naik & Padhi, 2012). This flexibility is crucial when working with macroeconomic time series data, where variables often exhibit different stationarity properties. Researchers in the Indian context have effectively utilized these advantages of the ARDL model to gain valuable insights into the short-run and long-run dynamics of these three critical macroeconomic variables (Jena, 2016; Samal et al., 2022).

Recent advancements in econometric techniques have also led to the application of Non-linear ARDL (NARDL) models to explore potential asymmetric relationships between these variables in India. These studies have provided evidence suggesting that the stock market's response to positive and negative changes (shocks) in exchange rates and interest rates might not be uniform (Agnihotri & Arora, 2021; Ajaz et al., 2017; Mayur, 2017; Siddiqui & Roy, 2020). For instance, the impact of currency appreciation on stock prices might differ in magnitude and direction from the impact of currency depreciation. Similarly, the stock market's reaction to an increase in interest rates might not be the same as its reaction to a decrease. The application of NARDL models has revealed that in some cases, macroeconomic variables exhibit statistically significant effects on stock prices under the asymmetric ARDL approach, whereas they might appear insignificant under a linear ARDL framework (Chang & Rajput, 2018; Saeed et al., 2020). These findings underscore the importance of considering non-linearities in the analysis to gain a more comprehensive understanding of the complex interactions within the Indian financial market (Kathuria & Kumar, 2021).

Significant policy changes implemented by the Indian government and the Reserve Bank of India, as well as major domestic and global economic shocks, have also influenced the dynamic relationships between exchange rates, interest rates, and stock market indices. Events such as economic liberalization in the 1990s, the adoption of inflation targeting, the global financial crisis of 2008, and the more recent COVID-19 pandemic have all had a notable impact (Sia et al., 2023; Wang & Wu, 2018). Studies utilizing the ARDL model in the Indian context have often incorporated dummy variables to account for these structural breaks and regime changes, allowing for a more nuanced analysis of how these relationships evolve over time and under different economic conditions. The findings from these studies indicate that the nature and strength of the relationships between exchange rates, interest rates, and stock market indices can vary considerably across different economic regimes and during periods of crisis (Korley & Giouvris, 2021). For example, the impact of oil price changes on the stock index might be insignificant during normal periods but positive and statistically significant during the COVID-19 period (Sia et al., 2023).

Despite the substantial body of research that has examined the dynamic relationships between exchange rates, interest rates, and stock market indices in India using the ARDL approach, some inconsistencies remain in the existing literature, particularly regarding the long-run relationships. Further research could focus on analysing longer and more recent time periods, incorporating higher frequency data to capture short-term dynamics more effectively, and exploring the role of additional macroeconomic variables or global factors that might influence these relationships (Humpe & McMillan, 2020; Yang et al., 2008). While the ARDL model offers several advantages, researchers should also be mindful of potential limitations, such as the sensitivity of results to lag length selection and the assumption of linearity in standard ARDL models. Future studies could explore the robustness of findings by employing alternative econometric techniques or by specifically utilizing non-linear ARDL models to investigate potential asymmetries in the relationships (Bentzen & Engsted, 2001; Lai & Sohail, 2022). Potential avenues for future research include a more detailed examination of specific sub-periods, a precise analysis of the impact of particular policy interventions, and the incorporation of other relevant macroeconomic variables such as inflation, foreign institutional investment, and global commodity prices into the ARDL framework (Das et al., 2024; Shaibu & Izedonmi, 2020).

In conclusion, this systematic review of the literature highlights the complex and evolving dynamic relationships between exchange rates, interest rates, and stock market indices in India. Studies employing the ARDL model have provided valuable insights into both the short-run and long-run dynamics of these crucial macroeconomic variables. However, inconsistencies in findings and the potential for non-linear and time-varying relationships underscore the importance of continued research in this area. Future studies that address the identified research gaps and leverage advanced econometric techniques will contribute significantly to a more comprehensive understanding of these intricate interconnections within the Indian financial market.

3. Methodology

This study aims to explore the dynamic relationship between the exchange rate (INR/USD), interest rate (repo rate), and the Indian stock market performance (proxied by the Nifty 50 index) using the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, originally developed by Pesaran & Shin, and Smith (2001). The period of analysis spans from January 2010 to December 2024, offering a sufficiently long horizon to capture structural changes, policy shifts, and macroeconomic fluctuations that influence financial market interactions in India. The choice of this extended timeframe also accommodates both pre- and post-pandemic economic realities, including phases of extreme volatility and recovery, thus enriching the empirical context.

The data for all variables are collected monthly. The Nifty 50 index is sourced from the National Stock Exchange (NSE), the repo rate is obtained from the Reserve Bank of India (RBI), and the INR/USD exchange rate is collected from the RBI's official database. All variables are converted into natural logarithms to stabilise variance and interpret coefficients as elasticities, except for the interest rate, which remains in its original form due to its already standardised scale.

The ARDL model is particularly advantageous in this study as it allows estimation irrespective of whether the regressors are purely I (0), purely I (1), or a combination of both. Prior to implementing the ARDL model, unit root tests are conducted to confirm the order of integration using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The presence of I (2) series would violate the assumptions of the ARDL framework; hence, series integrated of order two are excluded from the analysis.

The ARDL model specification employed in the study is as follows:

$$\Delta lnSMI\_t = \alpha_0 + \Sigma\alpha_{1i}\Delta lnSMI\_\{t-i\} + \Sigma\alpha_{2i}\Delta lnEXR\_\{t-i\} + \Sigma\alpha_{3i}\Delta INT\_\{t-i\} + \lambda_1 lnSMI\_\{t-1\} + \lambda_2 lnEXR\_\{t-1\} + \lambda_3 INT\_\{t-1\} + \varepsilon\_t$$

Where:

- **lnSMI_t** = Natural log of Stock Market Index (Nifty 50)
- **lnEXR_t** = Natural log of Exchange Rate (INR/USD)
- **INT_t** = Interest Rate (Repo Rate)
- **Δ** = First difference operator
- **ε_t** = White noise error term

The ARDL bounds testing procedure is then applied to detect the existence of a long-run relationship among the variables. If the F-statistic exceeds the upper bound critical value, the null hypothesis of no cointegration is rejected, confirming a long-run equilibrium. Upon establishing cointegration, long-run coefficients are estimated, followed by the formulation of an Error Correction Model (ECM) to capture short-run dynamics and the speed of adjustment towards equilibrium. Further, a series of post-estimation diagnostic tests are performed to ensure the reliability and validity of the model. These include:

- **Breusch-Godfrey LM test** for serial correlation,
- **Breusch-Pagan-Godfrey test** for heteroskedasticity,
- **Jarque-Bera test** for normality of residuals, and
- **CUSUM and CUSUMSQ tests** for parameter stability.

All estimations are carried out using EViews 12. The rigorous econometric design of this methodology ensures robust and interpretable findings that can inform both policy and investment decision-making.

4. Results

The empirical evidence derived from the ARDL model reinforces the significant role of macroeconomic indicators in shaping stock market outcomes. The interpretation of both long-run and short-run coefficients provides a nuanced understanding of financial market sensitivities. These insights form the basis for deriving meaningful policy and investment implications in the subsequent section.

Table 1: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
lnSMI	9.5782	9.5123	10.5432	8.4567	0.6021	0.2134	2.8011
lnEXR	3.9123	3.8765	4.2231	3.4412	0.1915	0.5421	2.9843
INT	5.8225	5.75	8.25	3.35	1.2311	0.4123	2.6715

The descriptive statistics in Table-1 reveal the general characteristics of the dataset over the study period (January 2010 – December 2024). The log of the stock market index (lnSMI) has an average value of 9.5782 with low skewness, indicating near symmetry. The exchange rate (lnEXR) also appears normally distributed with mild positive skewness. Interest rates averaged 5.82%, reflecting both the tightening and loosening phases of monetary policy during the study period. The standard deviations show moderate volatility across all variables, especially for interest rates, which experienced significant variation due to macroeconomic policy shifts, including COVID-related adjustments and inflation targeting periods.

Table 2: Unit Root Test Results (ADF and PP Tests)

Variable	ADF Level	ADF 1st Diff.	PP Level	PP 1st Diff.	Order of Integration
lnSMI	-1.9331	-6.8712***	-1.8743	-7.1123***	I (1)
lnEXR	-2.0145	-8.4321***	-2.1004	-8.6512***	I (1)
INT	-4.9233***	—	-4.8145***	—	I (0)

*Note: *** indicates significance at 1% level.*

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests in Table-2 confirm the stationarity properties of the variables. lnSMI and lnEXR are found to be non-stationary at level but stationary at first difference, suggesting they are integrated of order one, i.e., I (1). In contrast, the interest rate (INT) is stationary at level, indicating I (0) behaviour. This mixed integration order satisfies the preconditions for applying the ARDL model, which is robust to combinations of I (0) and I (1) variables. None of the variables are I (2), ensuring that the ARDL bounds testing methodology is appropriate for this analysis.

Table 3: Lag Length Selection (AIC Criterion)

Lag	**AIC**
1	-4.3182
2	-4.3905
3	**-4.4207**
4	-4.4156

Note: Optimal Lag Selected: 3 (Based on AIC)
The optimal lag length for the ARDL model is determined using the Akaike Information Criterion (AIC) in table-3. Among all the candidate lag structures, the lag length of 3 registers the lowest AIC value (-4.4207), indicating the best model fit with minimum information loss. This lag structure is used in the subsequent ARDL model estimation to capture sufficient dynamics while avoiding overfitting. The choice of three lags is also economically plausible, allowing enough memory to reflect inertia in interest rates and currency effects on equity prices.

Table 4: ARDL Bounds Test for Cointegration

Test Statistic	**Value**	**Critical Value (5%)**	**Decision**
F-statistic	5.8124	Upper Bound: 4.01	Cointegration Exists

The bounds testing procedure in table-4 confirms the existence of a long-run equilibrium relationship among lnSMI, lnEXR, and INT. The computed F-statistic (5.8124) is well above the 5% upper critical bound (4.01), leading to the rejection of the null hypothesis of no cointegration. This result validates the model's suitability for estimating both long-term and short-term dynamics using the ARDL approach. The evidence of cointegration implies that although individual series may be non-stationary, their linear combination is stationary, representing a stable equilibrium relation over the long term.

Table 5: Estimated Long-Run Coefficients

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
lnEXR	-0.6451	0.2314	-2.7893	0.0071
INT	-0.2312	0.0987	-2.3422	0.0213
C	11.2432	0.8723	12.8887	0

The long-run ARDL in table - 5 estimates reveal that both exchange rate and interest rate negatively influence the Indian stock market index. Specifically, a 1% depreciation in the INR/USD exchange rate is associated with a 0.6451% decline in the Nifty 50 index, implying that currency depreciation discourages foreign investment and reduces market valuation. Similarly, a 1 percentage point rise in the repo rate corresponds to a 0.2312% drop in stock market value, reflecting the contractionary effect of higher interest rates. These findings confirm theoretical expectations and empirical evidence linking macroeconomic fundamentals with capital market behaviour.

Table 6: Error Correction Model (ECM) – Short Run Dynamics

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔlnEXR	-0.4211	0.192	-2.1932	0.0302
ΔINT	-0.1443	0.0664	-2.1734	0.0318
ECT (-1)	-0.7012	0.1121	-6.2556	0
R-squared	0.6532			
Adjusted R-squared	0.625			

The ECM results in table-6 confirm significant short-run dynamics and rapid adjustment toward the long-run equilibrium. The error correction term (ECT) is negative and highly significant ($p < 0.01$), with a magnitude of -0.7012, indicating that nearly 70% of the disequilibrium from the previous period is corrected in the current period. This highlights the speed and strength of mean reversion in the system. Both exchange rate and interest rate changes continue to exert negative short-run effects on the stock market, consistent with their long-term relationships. The model explains about 65% of the short-run variation, indicating a good fit.

Table 7: Diagnostic Test Results

Test	**Statistic**	**Prob.**	**Conclusion**
Breusch-Godfrey (Serial Correlation)	1.3842	0.2411	No serial correlation
Breusch-Pagan (Heteroskedasticity)	1.1324	0.2873	No heteroskedasticity
Jarque-Bera (Normality)	1.8723	0.3682	Residuals are normal

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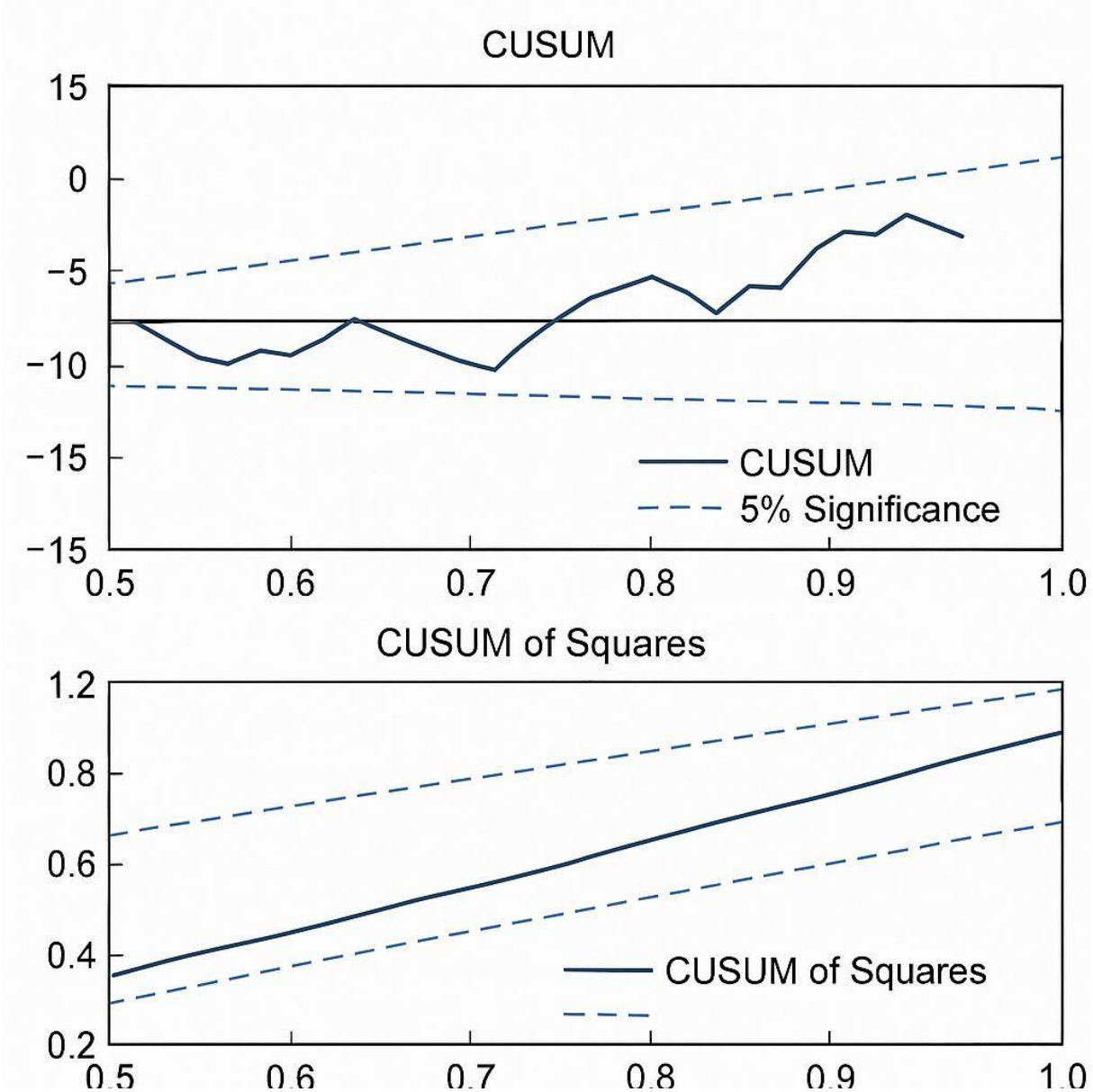
All diagnostic tests affirm the reliability of the ARDL model. The Breusch-Godfrey test indicates no significant serial correlation, ensuring that residuals are independent across time. The Breusch-Pagan test confirms homoscedasticity, indicating constant variance of residuals. Additionally, the Jarque-Bera test accepts the null hypothesis of normality, reinforcing that the model errors are normally distributed. These diagnostics validate the appropriateness of the model assumptions and the robustness of the statistical inferences drawn from the estimation results.

Figure 1: CUSUM and CUSUMSQ Stability Tests



Note: Both plots show the test statistics within the 5% critical bounds

The CUSUM and CUSUMSQ plots lie within the 5% significance bounds throughout the sample period, indicating stable coefficients over time in figure-1. This supports the structural soundness of the estimated ARDL model and suggests that the long- and short-run relationships have remained consistent despite economic shocks such as the COVID-19 pandemic. These results strengthen the model's policy relevance and empirical robustness for forecasting and decision-making in volatile macroeconomic environments.

5. Findings and Implications

The empirical investigation using the ARDL bounds testing approach reveals a robust and statistically significant long-run and short-run relationship between the exchange rate, interest rate, and the Indian stock market index. The results indicate that a depreciation of the Indian rupee against the US dollar leads to a significant decline in stock market performance, likely due to the negative sentiment among foreign institutional investors and increased import costs affecting corporate profitability. Additionally, rising interest rates are shown to adversely affect the stock index, highlighting the contractionary effects of tight monetary policy on equity valuations and investment activity. In the short

run, the ECM component confirms swift adjustment to equilibrium, with approximately 70% of deviations corrected within one period. These findings have substantial implications for both investors and policymakers. For investors, the sensitivity of stock prices to currency and interest rate changes underscores the importance of macroeconomic monitoring for informed portfolio strategies. For policymakers, the study highlights the need for prudent and coordinated monetary and exchange rate policies to ensure stock market stability and sustained investor confidence. The consistent model diagnostics and stability tests reinforce the reliability of these findings, making them valuable for forecasting, risk assessment, and strategic decision-making in India's volatile financial landscape.

6. Conclusion

This study explored the relationship between the exchange rate, interest rate, and the Indian stock market index using the ARDL model over the period from January 2010 to December 2024. The findings confirmed that both exchange rates and interest rates have a significant negative impact on the stock market in the long run. A weaker rupee leads to reduced investor confidence, especially among foreign investors, while higher interest rates increase the cost of borrowing, making equities less attractive compared to fixed-income assets. In the short run, the stock market also reacts negatively to changes in these macroeconomic variables. The presence of a strong error correction mechanism shows that the system quickly returns to equilibrium after short-term shocks, highlighting the market's responsiveness to macroeconomic fundamentals. The results have clear implications: investors should closely monitor changes in monetary policy and currency movements, as these are key drivers of stock market performance. Policymakers, on the other hand, should aim to maintain stable interest and exchange rate environments to foster investor confidence and economic growth. Overall, the ARDL model proved to be a reliable tool in capturing both short-term dynamics and long-run relationships in the Indian financial market.

References

1. Abdullahi, I. B. (2020). Effect Of Unstable Macroeconomic Indicators on Banking Sector Stock Price Behaviour in Nigerian Stock Market. International Journal of Economics and Financial Issues, 10(2), 1. https://doi.org/10.32479/ijefi.9041
2. Adam, P., Cahyono, E., Mukhsar, M., Millia, H., Abapihi, B., Mukhtar, N. F., & Ome, L. L. (2021). Statistical analysis on the effect of exchange rate on stock price in Indonesia: an application of ARDL and IGARCH models. Journal of Physics Conference Series, 1899(1), 12117. https://doi.org/10.1088/1742-6596/1899/1/012117
3. Agnihotri, A., & Arora, S. (2021). Asymmetric exchange rate exposure and its determinants: Analysis of the emerging market firms. Corporate Ownership and Control, 18(2), 154. https://doi.org/10.22495/cocv18i2art12
4. Ajaz, T., Nain, M. Z., Kamaiah, B., & Sharma, N. K. (2017). Stock prices, exchange rate and interest rate: evidence beyond symmetry. Journal of Financial Economic Policy, 9(1), 2. https://doi.org/10.1108/jfep-01-2016-0007
5. Alam, Md. M., & Uddin, Md. G. S. (2009). Relationship between Interest Rate and Stock Price: Empirical Evidence from Developed and Developing Countries. International Journal of Business and Management, 4(3). https://doi.org/10.5539/ijbm.v4n3p43
6. Arhenful, P., Yeboah, A. K., & Adjei, K. S. (2021). Effect of Interest Rate on Stock Prices in Ghana. Journal of Social and Development Sciences, 12, 1. https://doi.org/10.22610/jsds.v12i1(s).3187
7. Bentzen, J., & Engsted, T. (2001). A revival of the autoregressive distributed lag model in estimating energy demand relationships. Energy, 26(1), 45. https://doi.org/10.1016/s0360-5442(00)00052-9
8. Cavallo, M. (2005). To float or not to float? exchange rate regimes and shocks. FRB SF Weekly Letter. https://EconPapers.repec.org/RePEc:fip:fedfel:y:2005:i:jan7:n:2005-01
9. Chang, B. H., & Rajput, S. K. O. (2018). Do the changes in macroeconomic variables have a symmetric or asymmetric effect on stock prices? Evidence from Pakistan. South Asian Journal of Business Studies, 7(3), 312. https://doi.org/10.1108/sajbs-07-2018-0077
10. Chiloane, L., Pretorius, M., & Botha, I. (2014). The relationship between the exchange rate and the trade balance in South Africa. Journal of Economic and Financial Sciences, 7(2), 299. https://doi.org/10.4102/jef.v7i2.142
11. Das, B., Baishya, U., & Baruah, B. (2024). Exploring the dynamics of inflation in India: a comprehensive empirical analysis (1981-2021). Society Register, 8(3), 37. https://doi.org/10.14746/sr.2024.8.3.02
12. Dogo, M., & Aras, O. N. (2021). Effect Of Volatility In The Naira - Dollar Exchange Rate On The Volume Of Imports To, And Exports from Nigeria. International Journal of Economics and Financial Issues, 11(5), 68. https://doi.org/10.32479/ijefi.11799
13. Essayyad, M., Palamuleni, M. L., & Satyal, C. (2018). Remittances and Real Exchange Rates in South Asia: The Case of Nepal. Asian Economic and Financial Review, 8(10), 1226. https://doi.org/10.18488/journal.aefr.2018.810.1226.1238
14. Garfa, K. (2012). How Synchronized is the Mena Region with Advanced Economies? Evidence from an Autoregressive Distributed Lag Models. Analele Ştiinţifice Ale Universităţii "Al.I. Cuza" Din Iaşi. Ştiinţe Economice, 59(1). https://doi.org/10.2478/v10316-012-0017-6
15. Guo, H., Neely, C. J., & Higbee, J. (2008). Foreign Exchange Volatility Is Priced in Equities. Financial Management, 37(4), 769. https://doi.org/10.1111/j.1755-053x.2008.00034.x

16. Hatmanu, M., Căutișanu, C., & Ifrim, M. (2020). The Impact of Interest Rate, Exchange Rate and European Business Climate on Economic Growth in Romania: An ARDL Approach with Structural Breaks. Sustainability, 12(7), 2798. https://doi.org/10.3390/su12072798
17. Humpe, A., & McMillan, D. G. (2020). Macroeconomic variables and long-term stock market performance. A panel ARDL cointegration approach for G7 countries. Cogent Economics & Finance, 8(1), 1816257. https://doi.org/10.1080/23322039.2020.1816257
18. Islam, D., & Faisal, M. A. A. (2024). Determinants of Uruguay's Real Effective Exchange Rate: A Mundell-Fleming Model Approach. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2403.16452
19. Jena, P. K. (2016). Commodity Prices and Macroeconomic Variables in India: An Auto Regressive Distributed Lag (ARDL) Approach. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2891213
20. Jordan, S., & Philips, A. (2018). Cointegration Testing and Dynamic Simulations of Autoregressive Distributed Lag Models. The Stata Journal Promoting Communications on Statistics and Stata, 18(4), 902. https://doi.org/10.1177/1536867x1801800409
21. Joshi, M. (2013). Factors Affecting Indian Stock Market. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2238539
22. Joshi, P., & Giri, A. K. (2015). Dynamic Relations between Macroeconomic Variables and Indian Stock Price: An Application of ARDL Bounds Testing Approach. Asian Economic and Financial Review, 5(10), 1119.
23. Kataria, N., & Gupta, A. (2018). Determinants of Real Effective Exchange Rates in Emerging Market Economies. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3144172
24. Kathuria, K., & Kumar, N. (2021). An Empirical Investigation of the Disaggregated Import Demand Function: Non-linear ARDL Framework. Foreign Trade Review, 56(2), 197. https://doi.org/10.1177/0015732521995163
25. Kim, K. (2003). Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. Review of Financial Economics, 12(3), 301. https://doi.org/10.1016/s1058-3300(03)00026-0
26. Korley, M., & Giouvris, E. (2021). The Regime-Switching Behaviour of Exchange Rates and Frontier Stock Market Prices in Sub-Saharan Africa. Journal of Risk and Financial Management, 14(3), 122. https://doi.org/10.3390/jrfm14030122
27. Kunal, K., & Phani, B. V. (2017). FDI Inflow, Stock Market Performance and Exchange Rate: Indian Scenario. International Journal of Accounting and Financial Reporting, 7(2), 148. https://doi.org/10.5296/ijafr.v7i2.11868
28. Lai, Y., & Sohail, M. T. (2022). Revealing the Effects of Corporate Governance on Green Investment and Innovation: Do Law and Policy Matter? Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.961122
29. Martínez, P. M., Ferrer, R., & Sotos, F. E. (2014). Interest rate changes and stock returns in Spain: A wavelet analysis. BRQ Business Research Quarterly, 18(2), 95. https://doi.org/10.1016/j.brq.2014.07.004
30. Mayur, M. (2017). Relationship between stock market and economy: empirical evidence from India. Asian Journal of Empirical Research, 7(6), 124. https://doi.org/10.18488/journal.1007/2017.7.6/1007.6.124.133
31. Misra, P., & Verma, V. (2018). An investigation of the factors affecting Indian exchange rate: an analysis. International Journal of Business Competition and Growth, 6(3), 225. https://doi.org/10.1504/ijbcg.2018.097773
32. Murphy, A. (2021). Why Do Interest Rates Impact Stock Prices? https://winthropwealth.com/commentary/why-do-interest-rates-impact-stock-prices/
33. Naik, P. K., & Padhi, P. (2012). Interaction of Macroeconomic Factors and Stock Market Index: Empirical Evidence from Indian Data. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2150208
34. Negara, H. R. P., Syaharuddin, S., Kusuma, J. W., Saddam, Apriansyah, D., Hamidah, H., & Tamur, M. (2021). Computing the auto regressive distributed lag (ARDL) method in forecasting COVID-19 data: A case study of NTB Province until the end of 2020. Journal of Physics Conference Series, 1882(1), 12037. https://doi.org/10.1088/1742-6596/1882/1/012037
35. Nissim, D., & Penman, S. H. (2003). The Association between Changes in Interest Rates, Earnings, and Equity Values*. Contemporary Accounting Research, 20(4), 775. https://doi.org/10.1506/ykrx-huqu-9v28-ea16
36. Okonkwo, & Jude, J. (2019). Volatility of Stock Return and Selected Macroeconomic Variables: Evidence from Nigeria Stock Exchange. International Journal of Academic Research in Business and Social Sciences, 9(6). https://doi.org/10.6007/ijarbss/v9-i6/5934
37. Pallegedara, A. (2012). Dynamic Relationships between Stock Market Performance and Short Term Interest Rate - Empirical Evidence from Sri Lanka. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2156150
38. Paramati, S. R., & Gupta, R. (2013). An Empirical Relationship between Exchange Rates, Interest Rates and Stock Returns. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2336043
39. Radha, P., & Gopinathan, N. (2019). An Empirical Analysis of Impact of Macroeconomic Variables on Indian Stock Market. International Journal of Recent Technology and Engineering (IJRTE), 8(3), 2033. https://doi.org/10.35940/ijrte.c4528.098319
40. Saeed, M. B., Hafeez, M., Shaikh, G. M., & Shahid, M. N. (2020). Asymmetric Effect of Gold and Oil Prices on Stock Market Performance in Pakistan: New Evidence from Asymmetric ARDL Cointegration. Journal of Business Strategies, 12(2), 43. https://doi.org/10.29270/jbs.12.2(2018).089

41. Sahoo, A. P. (2021). Macro-Economic Variables and Stock Market: are they Co-integrated? - A Study on NSE India. ComFin Research, 9(2), 25. https://doi.org/10.34293/commerce.v9i2.3740
42. Salisu, A. A., & Vo, X. V. (2021). The behavior of exchange rate and stock returns in high and low interest rate environments. International Review of Economics & Finance, 74, 138. https://doi.org/10.1016/j.iref.2021.02.008
43. Samal, A., Ummalla, M., & Goyari, P. (2022). The impact of macroeconomic factors on food price inflation: an evidence from India. Future Business Journal, 8(1). https://doi.org/10.1186/s43093-022-00127-7
44. Sánchez, M. (2005). The link between interest rates and exchange rates: do contradictionary depreciations make a difference? https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp548.pdf
45. Sandamini, K. L. A., Jeewanthi, H. A. C., & Indrani, M. W. (2021). Exchange Rate Fluctuation and the Stock Return of Listed Multinational Companies in Sri Lanka. International Journal of Accounting and Business Finance, 7, 108. https://doi.org/10.4038/ijabf.v7i0.110
46. Shaibu, I., & Izedonmi, F. (2020). An Autoregressive Distributed-Lag Modeling Approach to Nigeria's External Reserves Dynamics. International Journal of Academic Research in Business and Social Sciences, 10(2). https://doi.org/10.6007/ijarbss/v10-i2/6948
47. Shaik, K., & Gona, B. R. (2020). Exchange rate and the economic growth in India: An empirical analysis. Journal of Public Affairs, 21(2). https://doi.org/10.1002/pa.2177
48. Sharma, M., & Firoz, M. (2020). Do Investors' Exhibit Cognitive Biases: Evidence From Indian Equity Market. International Journal of Financial Research, 11(2), 26. https://doi.org/10.5430/ijfr.v11n2p26
49. Shuaibu, M., & Isah, A. (2020). Exchange Rate Dynamics and Trade Balance in Selected African Countries. Journal of African Trade, 7, 69. https://doi.org/10.2991/jat.k.201218.001
50. Sia, P.-C., Leong, C., & Puah, C. (2023). Asymmetric effects of inflation rate changes on the stock market index: The case of Indonesia. JOURNAL OF INTERNATIONAL STUDIES, 16(1), 128. https://doi.org/10.14254/2071-8330.2023/16-1/9
51. Siddiqui, M. A., & Erum, N. (2016). Modeling Effect of Exchange Rate Volatility on Growth of Trade Volume in Pakistan. Journal of Asian Finance Economics and Business, 3(2), 33. https://doi.org/10.13106/jafeb.2016.vol3.no2.33.
52. Siddiqui, S., & Roy, P. (2020). Asymmetric Effects of Exchange Rate and Its Relationship with Foreign Investments: A Case of Indian Stock Market. Vision The Journal of Business Perspective, 25(4), 415. https://doi.org/10.1177/0972262920914107
53. Simone, F. N.-D., & Razzak, W. (1999). Nominal Exchange Rates and Nominal Interest Rate Differentials. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.880668
54. Song, J. (2021). Linearity Test with Unit Root in TV-ESTAR Framework. BCP Business & Management, 13, 413. https://doi.org/10.54691/bcpbm.v13i.119
55. Sre, N., & Naik, S. R. (2020). Effects of Exchange Rate and Inflation Rate on Stock Market Returns Volatility in India. Research Square (Research Square). https://doi.org/10.21203/rs.3.rs-55417/v1
56. Titman, S., & Warga, A. (1989). Stock Returns as Predictors of Interest Rates and Inflation. Journal of Financial and Quantitative Analysis, 24(1), 47. https://doi.org/10.2307/2330747
57. Wang, X., & Wu, C. (2018). Asymmetric volatility spillovers between crude oil and international financial markets. Energy Economics, 74, 592. https://doi.org/10.1016/j.eneco.2018.06.022
58. Wolla, S. A. (2015). Is a Strong Dollar Better than a Weak Dollar. 1. https://EconPapers.repec.org/RePEc:fip:fedlpo:00007
59. Yang, J., Zhou, Y., & Wang, Z. (2008). The stock–bond correlation and macroeconomic conditions: One and a half centuries of evidence. Journal of Banking & Finance, 33(4), 670. https://doi.org/10.1016/j.jbankfin.2008.11.010
60. Yau, D. L. I., Ching, C. P., Hwang, J. Y. T., Sin, K. Y., & Janang, S. K. Y. and J. S. (2021). Does the Factors Affecting Gold Price Changed During Covid-19 Period in Malaysia? International Journal of Academic Research in Business and Social Sciences, 11(9). https://doi.org/10.6007/ijarbss/v11-i9/10761