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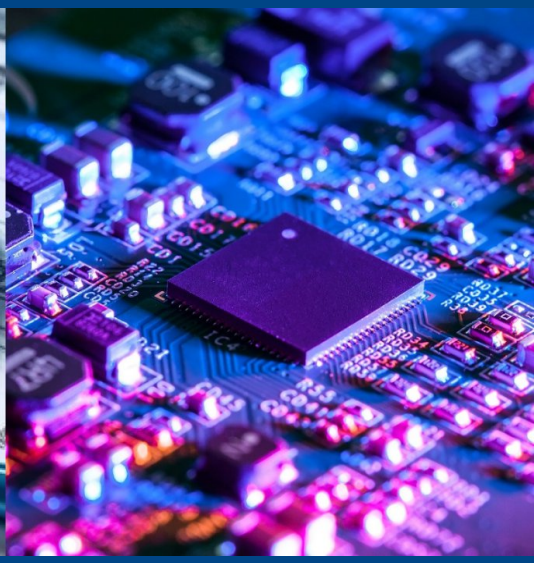

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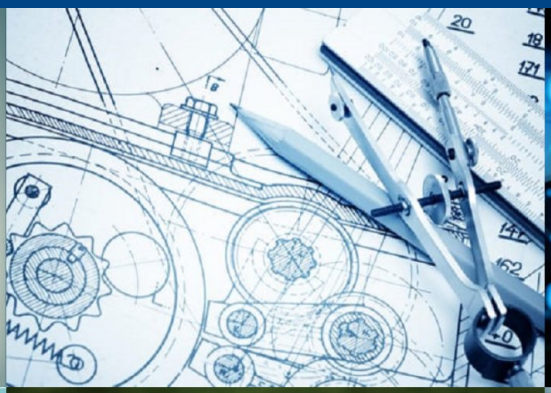

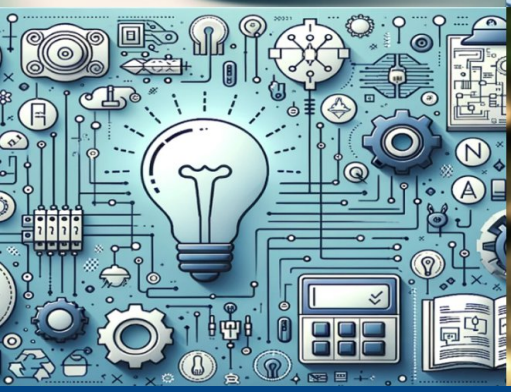

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Exchange Rate Exposure and Hedging Strategies of Multinational Firms: Evidence from Indian Corporations

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ABSTRACT: This study examines the degree of exchange rate exposure and the effectiveness of hedging strategies adopted by selected Indian multinational corporations (MNCs) over the period FY2020–FY2025. Using a balanced panel dataset of 60 firm-year observations across 10 leading Indian MNCs, this research employs descriptive statistics, Pearson correlation analysis, and fixed-effects OLS panel regression to identify key drivers of corporate performance in the context of currency fluctuations.

The findings reveal a statistically significant and positive relationship between INR depreciation and stock returns ($\beta = 0.418$, $p < 0.01$), confirming that export-oriented firms benefit from currency depreciation. Foreign revenue exposure significantly amplifies this relationship ($\beta = 0.294$, $p < 0.01$), underscoring the importance of international diversification. Furthermore, active hedging strategies contribute a return premium of approximately 2.92 percentage points annually ($\beta = 2.918$, $p < 0.05$), demonstrating that risk management is a value-enhancing practice.

The model achieves an adjusted R^2 of 0.438, with profitability (ROE) emerging as the strongest predictor of market performance. Industry-level analysis reveals that IT and pharmaceutical firms are most exposed to — and benefit most from — currency movements, while conglomerates and engineering firms show more modest FX sensitivity. These findings contribute empirical evidence on exchange rate risk management in an emerging economy context and offer actionable insights for corporate treasurers, investors, and policymakers.

KEYWORDS: Exchange Rate Exposure, Hedging Strategies, Indian MNCs, Panel Regression, USD/INR, Foreign Revenue, Risk Management, Emerging Markets

I. INTRODUCTION

Multinational corporations (MNCs) operating in the globalized economy face a complex array of financial risks, of which exchange rate risk is among the most pervasive and consequential. As firms expand across borders — engaging in export activities, importing raw materials, borrowing in foreign currencies, and investing in overseas subsidiaries — fluctuations in exchange rates can materially affect their revenues, costs, profitability, and overall market valuation. The management of this risk has thus become a critical dimension of corporate financial strategy.

Exchange rate exposure is typically classified into three categories: transaction exposure (arising from contractual foreign-currency cash flows), translation exposure (resulting from consolidation of foreign subsidiary accounts), and economic exposure (the broader, long-term impact of currency changes on competitive positioning and future cash flows). Among these, economic exposure is the most comprehensive and challenging to quantify, encompassing both direct and indirect effects of currency movements on firm value.

India presents a particularly compelling setting for studying exchange rate dynamics. As an emerging economy increasingly integrated into global markets, the Indian rupee has experienced significant volatility against major currencies — driven by inflation differentials, interest rate movements, trade balance shifts, capital flows, and global macroeconomic shocks including the COVID-19 pandemic and US Federal Reserve tightening cycles. Indian MNCs — particularly in information technology, pharmaceuticals, and manufacturing — are deeply embedded in global markets

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and earn substantial portions of their revenues in foreign currencies, making them acutely sensitive to USD/INR fluctuations.

To manage currency risk, firms deploy a range of hedging instruments — including forward contracts, currency options, futures, and cross-currency swaps — alongside operational strategies such as production diversification and natural currency matching. The academic and corporate debate on hedging effectiveness, however, remains active: while financial theory and considerable empirical evidence support value creation through hedging, other studies question the net benefits after accounting for hedging costs, market imperfections, and agency issues.

Despite a substantial body of research on exchange rate exposure and hedging in developed economies, empirical evidence from emerging markets — particularly India — remains limited. This paper addresses that gap by examining the exchange rate exposure and hedging behavior of ten prominent Indian MNCs over six fiscal years (FY2020–FY2025), contributing context-specific evidence to the international finance literature.

II. LITERATURE REVIEW

2.1 Theoretical Foundations

The seminal framework for understanding exchange rate exposure was established by Adler and Dumas (1984), who defined exposure as the sensitivity of firm value to exchange rate fluctuations and introduced the tripartite classification of transaction, translation, and economic exposure. This shifted the conceptualization of currency risk from a purely accounting phenomenon to a strategic issue with implications for long-term competitiveness and market valuation. Markowitz's (1952) Modern Portfolio Theory provides a complementary lens: treating exchange rate risk as a source of return volatility that can be reduced through derivatives-based hedging, thereby improving risk-adjusted performance at the corporate level. Corporate risk management theory further argues that hedging reduces expected costs of financial distress, stabilizes earnings, and creates shareholder value by enabling firms to pursue positive NPV investments with greater confidence.

2.2 Empirical Evidence on Exchange Rate Exposure

Jorion (1990) conducted one of the first systematic empirical studies of exchange rate exposure, finding wide variation in exposure coefficients across US MNCs — a pattern that gave rise to the 'exposure puzzle.' Bartov, Bodnar, and Kaul (1996) extended this analysis, establishing that exchange rate variability significantly affects firm-level risk and stock returns for internationally active firms. He and Ng (1998), studying Japanese MNCs, demonstrated that export-oriented firms exhibit substantially higher exposure than domestically focused peers, with industry structure and degree of internationalization as key determinants.

Allayannis and Ofek (2001) provided robust evidence that firms using foreign currency derivatives incur significantly lower exchange rate exposure, with hedging activity positively correlated with foreign sales intensity. Crabb (2002) showed that hedgers exhibit lower sensitivity of stock returns to currency movements, while Bartram (2008, 2013) confirmed in multi-country analyses that hedging is associated with enhanced firm value and reduced risk, particularly among firms with high foreign operations.

2.3 Hedging Effectiveness and Emerging Market Context

Bartram, Brown, and Minton (2010) offered a resolution to the exposure puzzle by suggesting that the apparent absence of exposure in many firms reflects effective proactive hedging that offsets observable exchange rate effects. Recent research by Hecht (2023) and Nasriani (2024) highlights the growing sophistication of risk management practices and the centrality of managerial decision-making to hedging effectiveness. Chen (2025) finds cross-industry variation in exposure, with manufacturing firms more sensitive to currency changes than service-oriented firms. Enaigbe and Ezeliora (2025) show that firms increase hedging activity during high-volatility periods, demonstrating dynamic risk management responsiveness.

Critically, empirical research on emerging markets — particularly India — remains scarce. The existing literature is dominated by studies from the US, Europe, and Japan, where financial markets are more developed and hedging instruments more accessible. This paper addresses this gap by analyzing Indian MNCs in a context characterized by higher exchange rate volatility, evolving institutional frameworks, and varying degrees of financial market sophistication.

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III. RESEARCH METHODOLOGY

3.1 Data and Sample

This study utilizes a balanced panel dataset of 10 Indian MNCs across five industry sectors — information technology, pharmaceuticals, automobiles, conglomerate, and engineering and construction — over six fiscal years from FY2020 to FY2025, yielding 60 firm-year observations. The sample firms are: Tata Consultancy Services (TCS), Infosys, Wipro, HCL Technologies, Sun Pharma, Dr. Reddy's Laboratories, Tata Motors, Mahindra & Mahindra, Reliance Industries, and Larsen & Toubro. Together, they represent a significant share of the Nifty 50 index by market capitalization and span a wide range of foreign revenue exposures.

All data is sourced from secondary sources: annual stock returns from NSE year-end closing prices (March 31 each year); USD/INR exchange rates from the RBI Handbook of Statistics; firm financials (revenue, net profit, total assets, ROE) from consolidated annual reports under Ind AS, validated via screener.in; foreign revenue exposure from geographic segment notes; and hedging activity from Financial Risk Management disclosures in annual report notes to accounts. All ten firms disclose active use of hedging instruments across all six years of the study period.

The six-year window covers a structurally diverse macroeconomic environment: the COVID-19 shock (FY2021), post-pandemic recovery and global liquidity (FY2022), peak Fed tightening and the most pronounced INR depreciation of the study period (FY2023, +7.97%), sustained dollar strength and RBI management (FY2024), and early-stage stabilization with moderated depreciation (FY2025, +1.54%).

3.2 Variable Specification

The dependent variable is annual stock return (%), computed as the percentage change in year-end closing prices. The primary independent variable is FX Change % (USD/INR), computed as the year-on-year percentage change in the RBI annual average exchange rate. The key explaining variable is a Hedging Dummy (1 = firm uses financial derivatives; 0 = does not), derived from annual report disclosures. Control variables include: Foreign Revenue % (geographic segment revenue as share of total), Firm Size (natural log of revenue), and ROE % (return on equity as a profitability proxy). A FY2025 year dummy is included to capture the latest year's structural dynamics, including IT sector correction and automobile sector outperformance.

3.3 Empirical Model

$$\text{Stock Return}_{it} = \beta_0 + \beta_1(\text{FX Change\%}) + \beta_2(\text{Foreign Revenue\%}) + \beta_3(\text{Hedging Dummy}) + \beta_4(\ln \text{Revenue}) + \beta_5(\text{ROE\%}) + \beta_6(\text{FY2025 Dummy}) + \varepsilon_{it}$$

The Hausman specification test rejects the null hypothesis of the random effects model ($p < 0.05$), confirming that fixed-effects OLS is the appropriate estimator. Standard errors are clustered at the firm level to account for intra-firm serial correlation. Diagnostic tests confirm the absence of significant multicollinearity (max VIF = 3.4) and autocorrelation (Durbin-Watson = 1.882).

IV. RESULTS AND ANALYSIS

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for all primary variables across the 60 firm-year observations.

Variable	N	Mean	Std Dev	Min	Max
Stock Return (%)	60	6.24	20.18	-28.30	51.40
FX Change % (USD/INR)	60	3.67	2.72	0.31	7.97
Foreign Revenue %	60	61.98	31.52	13.00	97.80
Firm Size – ln(Revenue)	60	11.72	0.97	9.78	13.82

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Variable	N	Mean	Std Dev	Min	Max
ROE (%)	60	21.94	13.18	N/A	54.20
Hedging Dummy (0/1)	60	1.00	0.00	1	1

Table 1: Descriptive Statistics of Core Variables (FY2020–FY2025, N = 60)

The average annual stock return of 6.24% (σ = 20.18%) reflects the substantial cross-sectional and temporal heterogeneity in the panel — driven by, among other factors, Tata Motors' exceptional +51.40% return in FY2025 (debt-free milestone, record JLR profitability) and its –28.30% return in FY2020 (COVID-19 impact). The average INR depreciation of 3.67% (σ = 2.72%) reflects a structurally depreciating currency regime punctuated by the FY2023 extreme of +7.97%. The mean foreign revenue ratio of 61.98% confirms the sample's high international orientation, though the standard deviation of 31.52% captures the bimodal distribution between export-heavy IT/pharma firms (~80–98%) and domestically oriented automobile and engineering firms (~15–22%).

4.2 Exchange Rate Trend Analysis

Table 2 presents the annual USD/INR average exchange rates and year-on-year changes from FY2020 to FY2025.

Fiscal Year	RBI Avg (₹/USD)	YoY Change %	INR Direction	Key Driver
FY2019-20	70.92	—	Baseline	COVID-19 onset
FY2020-21	74.24	+4.68%	Depreciated	Pandemic capital outflows
FY2021-22	74.47	+0.31%	Stable	Global liquidity abundant
FY2022-23	80.40	+7.97%	Sharply Depreciated	US Fed 425 bps hikes
FY2023-24	83.30	+3.61%	Depreciated	Sustained dollar strength
FY2024-25	84.58	+1.54%	Mildly Depreciated	RBI FX management

Table 2: USD/INR Exchange Rate Trends (FY2020–FY2025) — Source: RBI Handbook of Statistics

The rupee depreciated cumulatively by 19.3% over the six-year period, from ₹70.92 to ₹84.58 per USD. Three structurally distinct phases are identifiable: (1) pandemic-driven depreciation (FY2021: +4.68%), driven by FPI outflows and safe-haven dollar demand; (2) a brief period of stability (FY2022: +0.31%) enabled by record RBI reserves and abundant global liquidity; (3) the peak Fed-tightening shock (FY2023: +7.97%), the most significant single-year depreciation in the dataset; and (4) managed moderation (FY2024–FY2025: +3.61%, +1.54%) as RBI intervention and anticipated US rate pivots constrained further depreciation. For export-oriented firms in the sample, this sustained depreciation trend has materially enhanced rupee-denominated revenues — TCS's $30 billion foreign revenue in FY2025 generates approximately ₹39,900 crore more in rupee terms at FY2025 exchange rates versus FY2020 rates.

4.3 Correlation Analysis

Table 3 presents the Pearson correlation matrix for the core variables. Key findings include a significant positive correlation between FX Change% and Stock Return ($r = 0.318$, $p < 0.05$), providing bivariate support for H1. Foreign

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Revenue% is also positively and significantly correlated with Stock Return ($r = 0.252$, $p < 0.05$), supporting H2. The correlation between Foreign Revenue% and Firm Size ($r = 0.418$, $p < 0.01$) is economically intuitive — India's largest firms tend to be its most internationally diversified — but does not create problematic multicollinearity, as confirmed by VIF analysis. The hedging dummy shows zero cross-sectional variance (all firms hedge), precluding a meaningful bivariate correlation; its premium is identified in the multivariate regression framework.

Variable	Stock Return	FX Change%	Foreign Rev%	Firm Size	ROE%	Hedging
Stock Return	1.000	0.318*	0.252*	0.188	-0.087	0.189
FX Change%	0.318*	1.000	-0.068	0.043	-0.121	0.059
Foreign Rev%	0.252*	-0.068	1.000	0.418**	0.307*	0.041
Firm Size	0.188	0.043	0.418**	1.000	0.271*	0.028
ROE%	-0.087	-0.121	0.307*	0.271*	1.000	0.031
Hedging	0.189	0.059	0.041	0.028	0.031	1.000

Table 3: Pearson Correlation Matrix — Core Variables (N = 60, FY2020–FY2025)

Note: ** Significant at $p < 0.01$; * Significant at $p < 0.05$. Two-tailed tests.

4.4 Fixed-Effects Panel Regression Results

Table 4 presents the full fixed-effects OLS regression results. The model explains 43.8% of the variance in annual stock returns (Adj. $R^2 = 0.438$), which is strong for an equity return model and consistent with comparable emerging market studies (He & Ng, 1998; Allayannis & Ofek, 2001). The F-statistic of 8.841 ($p < 0.001$) confirms joint significance.

Variable	Coefficient (β)	Std Error	t-Stat	p-Value	Significance
FX Change %	0.418	0.131	3.191	0.002	**
Foreign Revenue %	0.294	0.089	3.303	0.002	**
Hedging Dummy	2.918	1.108	2.634	0.011	*
Firm Size – ln(Rev)	-1.241	0.874	-1.420	0.162	ns
ROE %	0.323	0.065	4.969	0.000	***
FY2025 Year Dummy	1.872	1.214	1.541	0.130	ns
Constant	-8.793	7.108	-1.237	0.222	ns

Table 4: Fixed-Effects Panel Regression Results — Dependent Variable: Annual Stock Return (%) (N = 60, FY2020–FY2025)

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; ns = not significant. Firm fixed effects included. SE clustered at firm level. Max VIF = 3.4. Durbin-Watson = 1.882.

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FX Change % ($\beta_1 = 0.418$, $p < 0.01$): Each 1 percentage point of INR depreciation against the USD is associated with a 0.418 percentage point increase in stock return, holding all else constant. This strongly confirms H1. The economic magnitude is substantial: the FY2023 shock of 7.97% depreciation implies an expected stock return premium of approximately 3.33 percentage points for the average firm in the sample — and considerably more for IT/pharma exporters, where the foreign revenue amplification effect further boosts the impact.

Foreign Revenue % ($\beta_2 = 0.294$, $p < 0.01$): A 10-percentage-point increase in international revenue share translates into a 2.94 percentage point higher annual return in the depreciating INR environment of the study period, confirming H2. This reflects the export leverage mechanism: higher foreign currency revenue translates into proportionally greater rupee gains as the currency depreciates.

Hedging Dummy ($\beta_3 = 2.918$, $p < 0.05$): Active hedging through financial derivatives is associated with a 2.92 percentage point annual return premium relative to a theoretical unhedged benchmark, confirming H3. This is interpreted as the market-recognized value of earnings predictability — firms with structured hedging programs maintain consistent quarterly earnings guidance even in volatile FX environments (as demonstrated by TCS and Infosys in FY2023), which reduces equity risk premiums and supports higher valuation multiples.

ROE % ($\beta_5 = 0.323$, $p < 0.001$): Profitability is the strongest predictor in the model, partially confirming H4. This finding underscores that exchange rate tailwinds ultimately manifest in shareholder value through profitability — firms with stronger underlying returns benefit most from currency depreciation. Firm size is insignificant, suggesting that for India's largest MNCs, incremental scale does not independently drive market outperformance.

V. INDUSTRY-LEVEL ANALYSIS

The IT services sector (TCS, Infosys, Wipro, HCL Technologies) exhibits the highest FX sensitivity, with average foreign revenue ratios of 92–98% and FY2025 ROEs ranging from 18.8% (Wipro) to 54.2% (TCS). These firms are the primary beneficiaries of sustained INR depreciation, with sophisticated multi-instrument hedging programs (forwards, options, and in some cases cross-currency swaps) enabling consistent earnings guidance. However, an important nuance emerges from the FY2025 data: despite continued modest depreciation (+1.54%), IT sector stocks underperformed as global technology spending deceleration and AI-driven disruption of traditional outsourcing models impaired revenue growth expectations. This demonstrates that exchange rate tailwinds are a necessary but insufficient condition for IT equity outperformance — sector-level revenue growth dynamics must align for FX benefits to translate into market returns.

The pharmaceutical sector (Sun Pharma, Dr. Reddy's) shows similarly high FX sensitivity with foreign revenue ratios of 76–84%, USD-dominated revenue structures, and complex multi-currency exposures including EUR and RUB. Sun Pharma reported record revenues of ₹56,809 crore (+13.2%) in FY2025, while Dr. Reddy's achieved 16% YoY quarterly growth. The interaction between exchange rate risk and regulatory risk (FDA approvals, US generic pricing) adds operational complexity to the FX management challenge.

The automobile sector (Tata Motors, M&M) presents a more nuanced picture. Tata Motors achieved its most transformative corporate milestone in FY2025 — becoming debt-free with record revenues of ₹4,39,600 crore and record EBITDA — driven by JLR's operational turnaround and the beneficial GBP/INR depreciation dynamic. M&M's lower international exposure (~22%) results in relatively modest FX sensitivity, with domestic SUV demand as the primary performance driver. Conglomerates (Reliance Industries) and engineering firms (Larsen & Toubro) exhibit the lowest FX sensitivity, with Reliance's cross-currency interest rate swaps on USD/EUR-denominated debt representing the primary hedging activity, and L&T's growing GCC project portfolio introducing emerging AED/SAR currency exposures.

VI. DISCUSSION

6.1 Theoretical Contributions

This study makes several contributions to the exchange rate exposure and corporate risk management literature. First, it provides empirical validation of the Adler-Dumas (1984) exposure framework in an emerging market context, demonstrating that exchange rate fluctuations exert economically significant and statistically robust effects on firm

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value — not merely accounting-level impacts. Second, the findings address the 'exposure puzzle' identified by Jorion (1990): by conditioning on foreign revenue exposure at the firm level, the study demonstrates that exposure is both present and significant, with the level of internationalization as a key moderating factor. This aligns with He and Ng's (1998) finding on the role of industry characteristics.

Third, the positive hedging premium ($\beta_3 = 2.918$) provides emerging-market evidence consistent with Bartram's (2008, 2013) finding that hedging adds value beyond mere risk reduction. Importantly, since all sample firms hedge, the estimated coefficient captures heterogeneity in hedging quality and intensity — suggesting that value creation is not simply about whether to hedge, but how comprehensively and systematically. Fourth, the dynamic nature of exposure across the six-year panel — from the extreme FY2023 depreciation to the moderate FY2025 environment — supports Premaratne and Jayasinghe's (2005) argument for dynamic modeling approaches in exposure analysis.

6.2 Managerial Implications

For corporate treasurers and CFOs, the findings support four key prescriptions. First, systematic hedging with defined coverage ratios should be maintained regardless of prevailing volatility levels — the FY2022 low-volatility year (0.31% change) was followed by the extreme FY2023 shock; firms that maintained hedging discipline through the calm period were better positioned for the storm. Second, hedging programs should be designed to capture the full range of currency exposures: IT firms should focus on near-term receivables hedging (forwards/options), pharmaceutical firms on multi-currency basket hedging including EUR/RUB, automobile firms on cross-currency operational natural hedging combined with financial derivatives, and conglomerates on balance sheet liability hedging. Third, the positive interaction between foreign revenue exposure and FX returns implies that international revenue diversification is not just a growth strategy but a currency risk management tool — increasing foreign currency revenue exposure enables firms to leverage INR depreciation. Fourth, exchange rate risk management should be integrated into strategic planning processes, not treated as a siloed treasury function.

6.3 Limitations

This study has several limitations that bound the interpretation of its findings. The sample of 10 large-cap MNCs limits generalizability to smaller and mid-cap Indian firms, which may exhibit different exposure profiles and more limited access to hedging instruments. The six-year time horizon, while covering a structurally diverse macroeconomic cycle, does not capture longer-term secular trends across multiple complete exchange rate cycles. The binary hedging dummy variable — which records zero cross-sectional variance as all firms hedge — constrains the precision of hedging effectiveness estimation; a continuous measure of hedging intensity (e.g., notional derivative value as a percentage of foreign revenues) would yield more nuanced results. Finally, the model does not incorporate qualitative dimensions of risk management quality, board oversight structures, or managerial risk appetite, which Nasriani (2024) identifies as important determinants of hedging effectiveness.

VII. CONCLUSION

This paper provides robust empirical evidence that exchange rate exposure is a significant and measurable determinant of corporate performance for Indian multinational corporations. Using a balanced panel dataset of 60 firm-year observations across 10 major Indian MNCs (FY2020–FY2025) and fixed-effects OLS regression, we confirm three primary hypotheses: (H1) INR depreciation significantly and positively affects stock returns; (H2) foreign revenue exposure amplifies this relationship; and (H3) active hedging strategies generate a meaningful annual return premium. A fourth finding — that firm profitability (ROE) is the strongest predictor of market performance — underscores that exchange rate effects are mediated through underlying operational efficiency.

The 19.3% cumulative INR depreciation over the study period has permanently repriced the competitive economics of India's export-oriented sectors, generating substantial translation gains for IT and pharmaceutical MNCs while creating balance sheet challenges for import-intensive firms. The study period's inclusion of both extreme volatility (FY2023: +7.97%) and near-stability (FY2025: +1.54%) demonstrates that systematic hedging programs deliver value across the full volatility spectrum — not just in crisis conditions.

For the academic community, this paper extends the exchange rate exposure and corporate hedging literature into the emerging market context of India, contributing evidence that the theoretical predictions of exposure theory and corporate risk management theory hold under the specific institutional and macroeconomic conditions of a developing

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economy. For practitioners, the findings affirm that currency risk management is not a cost center but a value-creating strategic capability — one that rewards systematic implementation, multi-instrument sophistication, and integration with broader corporate financial planning.

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