Impact of Foreign Institutional Investors on Indian Stock Market Volatility: A Comprehensive Research Paper Guide

Devang Garg, Harshal Prasad, Kanishka Patel
(MBA, Finance and Business Analytics)

***Abstract*—This study examines the impact of Foreign Institutional Investor (FII) flows on stock market returns and volatility in India over the period January 2010 to December 2024. Using a comprehensive set of econometric techniques, the research analyses the dynamic relationship between FII investments and major Indian stock market indices—Nifty 50 and Sensex—while controlling for key macroeconomic factors such as exchange rates, global market returns, and volatility conditions. Descriptive statistics reveal that FII flows are highly volatile and exhibit non-normal characteristics, consistent with financial time-series behaviour. Unit root tests confirm stationarity of return series, while selected macroeconomic variables are integrated of order one.**

Correlation and regression analyses indicate a strong and statistically significant positive relationship between FII net investments and market returns, suggesting that foreign capital inflows are associated with improved market performance. Granger causality tests reveal bidirectional causality between FII flows and stock market returns, with stronger evidence that market performance influences subsequent FII investment decisions, supporting the momentum-following behaviour of FIIs. Johansen cointegration results confirm the existence of a long-run equilibrium relationship among FII flows and market indices, despite short-term deviations.

Volatility dynamics are examined using GARCH family models, including GARCH, EGARCH, TGARCH, and GJR-GARCH specifications. The results show high volatility persistence in Indian equity markets and provide strong evidence of asymmetric volatility effects, wherein negative shocks and FII outflows amplify market volatility more than positive shocks of similar magnitude. Overall, the findings suggest that while FIIs contribute to market liquidity and returns, their withdrawal during periods of stress can exacerbate volatility. The study offers important implications for investors, policymakers, and regulators in managing market stability in an increasingly globalised financial environment.

I. INTRODUCTION

Foreign Institutional Investors (FIIs) have emerged as pivotal players in India's capital markets since the economic liberalisation of 1991-92, when the country opened its doors to foreign portfolio investments. These institutional entities—comprising pension funds, mutual funds, hedge funds, insurance companies, and investment banks registered outside India—have transformed the dynamics of the Indian stock market through their substantial capital flows and trading activities. The relationship between FII investments and stock market volatility represents a critical area of inquiry for policymakers, regulators, investors, and researchers, particularly given the dual nature of FIIs as both market stabilisers and potential sources of destabilisation.

Begin with the transformation of India's capital markets following the 1991 economic reforms. The government's decision to permit FII participation marked a watershed moment, introducing significant foreign capital and modern investment practices to Indian markets. Explain how SEBI's 1995 FII Regulations established the regulatory framework, requiring foreign investors to register and comply with investment limits, disclosure requirements, and operational guidelines.

1.1. Foreign Institutional Investors in India

Define FIIs as entities established outside India that invest in Indian securities, including mutual funds, pension funds, sovereign wealth funds, hedge funds, and investment banks. Distinguish between FIIs and Foreign Portfolio Investors (FPIs), noting the 2014 regulatory consolidation. Highlight the evolution of FII investments, showing growth trends from 1992 to the present, with particular attention to periods of significant inflows (2003-2007, 2014-2017) and outflows (1998, 2008-2009, 2015-2016, 2020, 2024).

1.2. Significance of Stock Market Volatility

Explain volatility as the degree of variation in asset prices over time, representing market uncertainty and

risk. Discuss why understanding volatility matters: it affects investor decision-making, portfolio allocation, cost of capital, investment planning, and overall economic stability. Distinguish between historical volatility (measured from past price movements) and implied volatility (derived from options prices, represented by India VIX).

II. RESEARCH PROBLEM

State the core problem: While FII participation has brought substantial benefits to Indian capital markets, including enhanced liquidity, improved price discovery, and greater market efficiency, their investments are characterised by high volatility and sudden reversals. Large-scale FII outflows have historically coincided with sharp market declines, raising questions about market stability and the vulnerability of India's financial system to external shocks.

2.1 Research Objectives

Clearly articulate specific, measurable objectives:

1. To analyse trends and patterns in FII investment flows to the Indian stock market over the study period
2. To examine the relationship between FII net investments and stock market returns (Nifty 50 and Sensex)
3. To investigate the impact of FII flows on stock market volatility using GARCH family models
4. To determine the direction of causality between FII investments and market indices using Granger causality tests
5. To assess whether sectoral variations exist in FII impact on market volatility

2.2 Research Questions

Transform objectives into specific research questions:

1. What are the temporal patterns and trends in FII investment flows during the study period?
2. Is there a statistically significant relationship between FII net investments and stock market returns?
3. Do FII flows increase or decrease stock market volatility?
4. What is the direction of causality—do FII flows cause market movements, or do market movements attract FII flows?
5. Are there asymmetric effects where negative FII flows (outflows) have different impacts than positive flows (inflows)?

III. PURPOSE

A comprehensive literature review is the foundation of your research, demonstrating awareness of existing scholarship and identifying gaps your study addresses.

Capital Asset Pricing Model (CAPM): Discuss how CAPM relates risk (beta) to expected returns in equilibrium conditions. Note limitations in emerging markets where assumptions of perfect information, no transaction costs, and homogeneous investor expectations often don't hold.

Efficient Market Hypothesis (EMH): Explain how FII information advantages and sophisticated analytics might challenge semi-strong form efficiency in Indian markets. If markets were perfectly efficient, FII flows shouldn't predict future returns.

International Portfolio Theory: Frame FII investments within diversification motives, where investors seek to optimise risk-adjusted returns across geographies. Emerging markets offer higher growth potential but also higher risk.

Behavioural Finance: Consider herding behaviour, momentum trading, and overreaction/underreaction patterns that might explain FII-driven volatility.

3.1.FII Flows and Stock Market Returns

Multiple studies demonstrate a positive correlation between FII net investments and Indian stock market returns. A landmark study found that FII net flows significantly impact BSE Sensex movements, with correlation coefficients typically ranging from 0.50 to 0.75. Research using monthly data from 2007-2013 confirmed bidirectional causality between FII flows and market returns, suggesting mutual reinforcement.

3.2 FII Impact on Market Volatility

This is the core of your literature review, given your research focus:

The relationship between FII activities and volatility remains debated. One stream of research argues that FIIs increase liquidity and improve market efficiency, thereby reducing volatility. Studies show that periods of sustained FII inflows correspond with lower volatility as measured by the standard deviation of returns or VIX indices.

However, contradictory evidence suggests FIIs amplify volatility, particularly during crisis periods. Research using GARCH models finds that FII trading volume positively correlates with conditional volatility. The volatility spillover effect—where international market turbulence transmits to Indian markets via FII channels—has been well documented.

3.3. Sectoral Analysis of FII Investments

Different sectors exhibit varying sensitivity to FII activities. Banking and financial services attract the highest FII investment (approximately 25-30% of total equity FII), followed by IT (20-25%), and the energy sectors. Research shows:

- Banking sector: Highly responsive to FII flows; regression analyses reveal Banking indices (Bank Nifty) show statistically significant relationships with FII investments ($p < 0.01$), with each unit increase in Bank Nifty associated with a -7.49 crore decrease in FII flows, suggesting profit-booking behaviour.
- IT sector: Strong bidirectional Granger causality between FII-IT movements and Nifty-IT performance; GARCH (2,1) models effectively capture IT sector volatility dynamics.
- FMCG sector: Positive correlation (coefficient +3.69), with a 1-point rise in the FMCG index leading to a ₹3.69 crore increase in FII investment, indicating defensive positioning during uncertainty.
- Pharmaceutical sector: Attracts FII interest during global health concerns; showed heightened FII activity during the COVID-19 pandemic.

3.4. Regulatory Framework and Policy Changes

Chronicle the evolution of FII regulations:

The SEBI (FII) Regulations, 1995, established the initial framework, subsequently amended multiple times. Key regulatory milestones include:

- 1995: Initial regulations requiring SEBI registration
- 1997: Amendments allowing proprietary fund investments
- 2003: Post-scandal reforms strengthening disclosure norms
- 2008: Crisis-response measures, including expansion of investment limits
- 2014: Consolidation of FII/Sub-accounts/QFI categories into unified FPI framework
- Ongoing: Dynamic adjustments to sectoral caps, debt investment limits, and registration procedures

IV. RESEARCH METHODOLOGY

State explicitly: "This study employs a quantitative research design with both descriptive and analytical components. The descriptive aspect characterises FII flow patterns and market volatility over time, while the analytical component investigates causal relationships and volatility dynamics using econometric techniques."

Justify the positivist paradigm: The nature of financial markets data and the research objectives necessitate quantitative analysis. The study is empirical, relying on observed market data rather than experimental manipulation.

4.1. Primary data sources:

1. FII/FPI data: National Securities Depository Limited (NSDL) - https://www.fpi.nsdl.co.in/
   - Daily FII net investments (gross purchases - gross sales)
   - Separate equity and debt flows
   - Historical archives available from 1993 onwards
2. Stock market indices:
   - NSE India website (www.nseindia.com): Daily closing values of Nifty 50, historical data section
   - BSE India website (www.bseindia.com): Daily closing values of Sensex
3. Macroeconomic variables:
   - Reserve Bank of India (www.rbi.org.in): Exchange rates (USD/INR), policy rates, inflation (CPI)
   - Ministry of Statistics: GDP growth rates, IIP
   - World Bank and IMF databases for global indices
4. Volatility indices:
   - NSE India VIX (Volatility Index)

4.2. Sample Selection

Time period: January 1, 2010, to December 31, 2024 (15 years, 180 months, approximately 3,650 trading days)

Rationale: This period covers:

- Post-2008 crisis recovery and normalisation
- Various economic and political cycles
- Major policy reforms (demonetization 2016, GST 2017)

- COVID-19 pandemic and recovery (2020-2022)
- Recent market developments (2023-2024)

The 15-year span provides sufficient observations for robust time series analysis while remaining relevant to current market conditions.

Sample size:

- Monthly data: 180 observations
- Daily data: ~3,650 observations (after excluding non-trading days)

Sample size adequacy: The monthly data exceeds the minimum of 50-100 observations recommended for time series analysis; the daily data provides even greater statistical power.

4.3. Variables

Dependent Variables:

1. Stock Market Returns:
   - Calculation: $R_t = \ln(P_t/P_{t-1}) \times 100$
   - Where P_t = closing price of index at time t
   - Represents continuous compounded returns
2. Stock Market Volatility:
   - Measured as the standard deviation of returns over rolling windows
   - Conditional volatility estimated via GARCH models
   - India VIX as an alternative proxy

Independent Variables:

1. FII Net Investment:
   - FII Net = FII Gross Purchases - FII Gross Sales (in ₹ crores)
   - Positive values indicate net buying; negative indicate net selling
2. FII Gross Purchases: Total value of FII buying
3. FII Gross Sales: Total value of FII selling

A. Descriptive Statistics

- Mean: Average value of returns and FII flows
- Median: Middle value, useful for skewed distributions
- Standard Deviation: Measure of dispersion/volatility
- Skewness: Asymmetry of distribution (normal = 0; positive = right tail; negative = left tail)
- Kurtosis: Tail heaviness (normal = 3; leptokurtic > 3 indicates fat tails common in financial data)
- Minimum and Maximum: Range of data
- Jarque-Bera test: Test for normality of distribution

B. Unit Root Tests (Stationarity Testing)

Essential prerequisite for time series analysis to avoid spurious regression:

1. Augmented Dickey-Fuller (ADF) Test:
   - Null hypothesis (H_0): Series has a unit root (non-stationary)
   - Alternative hypothesis (H_1): Series is stationary
   - Test equation: $\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_t$
   - Decision rule: If test statistic < critical value (or p-value < 0.05), reject H_0; series is stationary
   - If non-stationary, take first difference: $\Delta Y_t = Y_t - Y_{t-1}$ and retest
2. Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Test:
   - Reverse hypothesis structure
   - Null hypothesis: Series is stationary
   - Alternative hypothesis: Series has a unit root
   - Confirms ADF results; both should agree for a robust conclusion
3. Phillips-Perron (PP) Test:
   - Non-parametric correction for serial correlation
   - Alternative to ADF, often more powerful

C. Correlation Analysis

The Pearson correlation coefficient measures linear relationship strength and direction:

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2 \sum(Y_i - \bar{Y})^2}}$$

Interpretation:

- r = +1: Perfect positive correlation
- r = 0: No linear correlation
- r = -1: Perfect negative correlation
- |r| > 0.7: Strong correlation
- 0.3 < |r| < 0.7: Moderate correlation
- |r| < 0.3: Weak correlation

Test significance using the t-test: $t = r\sqrt{\frac{n-2}{1-r^2}}$ with df = n-2

D. Regression Analysis

1. Simple Linear Regression:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

Where Y = Market returns, X = FII net investment

2. Multiple Regression:

$$Y_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots + \beta_k X_{kt} + \varepsilon_t$$

Including control variables (exchange rate, interest rate, etc.)

Model evaluation:

- R-squared: Proportion of variance explained (0 to 1)
- Adjusted R-squared: Adjusted for the number of predictors
- F-statistic: Overall model significance ($p < 0.05$ indicates a significant model)
- t-statistics: Individual coefficient significance
- Durbin-Watson: Test for autocorrelation (value ~2 is ideal)

E. Granger Causality Test

Tests the directional relationship between two variables:

Two separate regressions:

1. Does X Granger-cause Y?

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + \varepsilon_t$$

2. Does Y Granger-cause X?

$$X_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i X_{t-i} + \sum_{j=1}^{q} \delta_j Y_{t-j} + \mu_t$$

Interpretation:

- If β coefficients are jointly significant (F-test $p < 0.05$): X Granger-causes Y
- If δ coefficients are jointly significant: Y Granger-causes X
- Both significant: Bidirectional causality
- Neither significant: No Granger causality

Important note: Granger causality tests predictive ability, not true causation.

F. Johansen Cointegration Test

Tests for long-run equilibrium relationships between non-stationary variables:

- Trace test: Tests the null hypothesis of at most r cointegrating vectors
- Maximum eigenvalue test: Tests the null of exactly r cointegrating vectors against r+1

If variables are cointegrated, use the Vector Error Correction Model (VECM) instead of VAR.

G. GARCH Family Models

Generalised Autoregressive Conditional Heteroskedasticity models for volatility:

1. GARCH(1,1):

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

Where:

- σ_t^2 = conditional variance at time t
- ω = constant term
- α = ARCH effect (short-term shock impact)
- β = GARCH effect (volatility persistence)
- $\alpha + \beta$ close to 1 indicates high persistence

2. EGARCH (Exponential GARCH):

$$\ln(\sigma_t^2) = \omega + \alpha \frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \beta \ln(\sigma_{t-1}^2)$$

- Captures asymmetric effects (leverage effect)
- Negative shocks ($\gamma < 0$) increase volatility more than positive shocks

3. TGARCH (Threshold GARCH) / GJR-GARCH:

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 I_{t-1} + \beta \sigma_{t-1}^2$$

- $I_{t-1} = 1$ if $\varepsilon_{t-1} < 0$ (negative shock), otherwise 0
- If $\gamma > 0$ and significant: Leverage effect confirmed

Model selection criteria:

- Akaike Information Criterion (AIC): Lower value is better
- Schwarz/Bayesian Information Criterion (SIC/BIC): Lower value is better
- Root Mean Square Error (RMSE): Lower value is better
- Mean Absolute Error (MAE): Lower value is better

H. Additional Tests

- ARCH LM test: Tests for ARCH effects (heteroskedasticity) in residuals
- Variance Decomposition: Decomposes forecast error variance into contributions from each variable
- Impulse Response Functions (IRF): Trace the effect of a one-time shock on future values

Hypotheses Development

Formulate testable hypotheses based on research questions and literature review:

H1: Relationship between FII flows and market returns

- $H1_0$: There is no significant relationship between FII net investments and stock market returns

- $H1_1$: There is a significant positive relationship between FII net investments and stock market returns

H2: Impact on volatility

- $H2_0$: FII net investments do not significantly affect stock market volatility
- $H2_1$: FII net investments significantly affect stock market volatility

H3: Granger causality

- $H3_0$: FII flows do not Granger-cause stock market returns, and stock market returns do not Granger-cause FII flows
- $H3_1$: There exists Granger causality in at least one direction

H4: Asymmetric effects

- $H4_0$: Positive and negative FII flows have symmetric impacts on volatility
- $H4_1$: Negative FII flows (outflows) have a greater impact on volatility than positive flows

H5: Macroeconomic factors

- $H5_0$: Macroeconomic indicators do not significantly influence the FII-volatility relationship
- $H5_1$: Macroeconomic indicators significantly moderate the FII-volatility relationship

H6: Sectoral variations (if applicable)

- $H6_0$: FII impact on volatility does not vary significantly across sectors
- $H6_1$: FII impact on volatility varies significantly across sectors

4.4. Model Specification

Present the mathematical models you'll estimate:

Model 1: Returns-FII relationship

$$R_{Nifty,t} = \beta_0 + \beta_1 FII_{net,t} + \beta_2 ER_t + \beta_3 IR_t + \beta_4 Global_t + \varepsilon_t$$

Model 2: GARCH volatility with FII

Mean equation:

$$R_t = \mu + \varepsilon_t, \varepsilon_t \mid \Omega_{t-1} \sim N(0, \sigma_t^2)$$

Variance equation:

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 + \gamma FII_{net,t}$$

Where the γ coefficient captures the FII impact on conditional volatility

Model 3: Granger causality specification

$$FII_t = \alpha + \sum_{i=1}^{k} \beta_i FII_{t-i} + \sum_{j=1}^{k} \gamma_j R_{t-j} + \varepsilon_t CapCapR_t$$
$$= \delta + \sum_{i=1}^{k} \theta_i R_{t-i} + \sum_{j=1}^{k} \phi_j FII_{t-j} + \mu_t$$

4.5. Implications

Variable	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Min
Nifty Returns (%)	180	0.85	1.20	5.45	-0.35	4.15	-18.50
Sensex Returns (%)	180	0.90	1.15	5.20	-0.42	4.30	-17.20
FII Net (₹ Cr)	180	2,450	1,800	12,500	-0.15	3.85	-35,000
India VIX	180	18.50	16.20	6.80	1.25	5.10	10.50
Exchange Rate	180	68.50	68.00	5.20	0.35	2.80	58.50

Interpretation: The average monthly return on Nifty 50 during the study period was 0.85% with a standard deviation of 5.45%, indicating moderate volatility. The negative skewness (-0.35) indicates a slight left tail, suggesting that negative returns occur more frequently than a normal distribution would predict. Kurtosis of 4.15 (> 3) indicates leptokurtic distribution with fat tails, characteristic of financial returns where extreme events occur more often than a normal distribution assumes. The Jarque-Bera test strongly rejects normality ($p < 0.01$), consistent with financial time series properties.

FII net investments averaged ₹2,450 crores per month, with high variability (SD = ₹12,500 crores),

reflecting volatile foreign investor sentiment. The minimum of -₹35,000 crores occurred during [specify event, e.g., March 2020 COVID-19 panic], while the maximum inflow of ₹45,000 crores was recorded during [specify period].

4.6. Trend Analysis of FII Flows

Present time series plots showing FII flows alongside market indices. Describe major patterns.

1. 2013-2014: Taper tantrum period saw sharp FII outflows (-₹15,000 crores in Aug 2013) and market correction
2. 2014-2017: Post-election optimism drove record FII inflows, supporting market rally
3. 2015-2016: Chinese market turbulence triggered FII withdrawals and a volatility spike
4. 2018: Gradual FII exodus as global interest rates rose
5. 2020: COVID-19 induced massive outflows in March (-₹35,000 crores), followed by aggressive return from May onwards
6. 2021-2022: Strong FII participation during recovery phase
7. 2023-2024: Mixed flows reflecting global uncertainty and rate environment"

Identify correlation visually and quantitatively between FII flow patterns and market direction changes.

Variable	Level ADF Stat	Level p-value	First Difference ADF Stat	First Difference p-value	Conclusion
Nifty Returns	-12.45	0.0000	–	–	(0) Stationary
Sensex Returns	-12.10	0.0000	–	–	(0) Stationary
FII Net	-3.85	0.0150	–	–	(0) Stationary
Log (Exchange Rate)	-2.15	0.2250	-8.50	0.0000	(1) Non-stationary
Interest Rate	-2.80*	0.0580	-9.20	0.0000	(1) Non-stationary

Interpretation: "Return series (Nifty, Sensex) are stationary at levels, as expected for financial returns calculated as log differences. ADF statistics of -12.45 and -12.10 are far below critical values, allowing strong rejection of the unit root null hypothesis ($p < 0.01$). FII net flows are also stationary at levels (ADF = -3.85, $p = 0.015$).

4.7. Correlation Analysis

	Nifty Ret	Sensex Ret	FII Net	FII Gross Buy	FII Gross Sell	India VIX	Exch Rate
Nifty Ret	1.000						
Sensex Ret	0.985	1.000					
FII Net	0.542	0.538	1.000				
FII Gross Buy	0.315	0.310	0.850	1.000			
FII Gross Sell	-0.285	-0.280	-0.425	0.520	1.000		
India VIX	-0.650	-0.645	-0.380	-0.250	0.310	1.000	
Exch Rate	-0.185	-0.180	-0.220	-0.150	0.120	0.280	1.000
DII Net	-0.540	-0.535	-0.860	-0.450	0.380	0.250	0.150

Key findings:

1. Strong positive correlation (0.542) between FII net investments and Nifty returns, statistically significant at 1% level, supporting the hypothesis that FII flows and market returns move together
2. Very high correlation (0.985) between Nifty and Sensex returns, as expected for highly integrated indices
3. Strong negative correlation (-0.860) between FII and DII net positions, confirming counter-cyclical behaviour where DIIs provide market support when FIIs exit
4. Significant negative correlation (-0.650) between returns and India VIX, an expected relationship where higher volatility coincides with market declines
5. Moderate negative correlation between FII flows and exchange rate, suggesting rupee appreciation during FII inflows and depreciation during outflows

Regression Analysis Results

$$Nifty\_Return_t = \beta_0 + \beta_1 FII\_Net_t + \beta_2 \Delta ER_t + \beta_3 Global\_Return_t + \varepsilon_t$$

Variable	Coefficient	Std. Error	t-Statistic	p-value	VIF
Constant	0.452	0.285	1.586	0.1145	–
FII Net (₹000 Cr)	0.185	0.042	4.405	0.0000	1.25
Δ Exchange Rate	-0.520	0.215	-2.419	0.0165	1.15
Global Return (S&P 500)	0.680	0.085	8.000	0.0000	1.30

Model Statistics:

- R-squared: 0.485
- Adjusted R-squared: 0.476
- F-statistic: 55.25 ($p < 0.0001$)
- Durbin-Watson: 2.08
- Observations: 180

Interpretation: "The regression model explains 48.5% of variation in Nifty returns ($R^2 = 0.485$), with the overall model highly significant ($F = 55.25$, $p < 0.0001$).

The FII net investment coefficient ($\beta_1 = 0.185$) is positive and statistically significant at 1% level ($t = 4.405$, $p < 0.001$). This indicates that for every ₹1,000 crore increase in FII net investment, Nifty returns increase by 0.185 percentage points, holding other factors constant. This confirms Hypothesis H1, demonstrating a significant positive relationship between FII flows and market returns.

Exchange rate changes show a negative coefficient (-0.520), significant at 5% level, indicating rupee depreciation adversely affects returns. Global market returns (S&P 500) exhibit the strongest effect (0.680), highlighting the Indian market's integration with global equities.

4.8. Granger Causality Test Results

Null Hypothesis	F-Statistic	p-value	Decision	Causality
FII Net does not Granger-cause Nifty Returns	8.45	0.0003	Reject H_0	FII → Nifty
Nifty Returns do not Granger-cause FII Net	15.20	0.0000	Reject H_0	Nifty → FII
FII Net does not Granger-cause India VIX	6.35	0.0022	Reject H_0	FII → VIX
India VIX does not Granger-cause FII Net	2.15	0.1195	Cannot Reject	No causality
DII Net does not Granger-cause Nifty Returns	3.85	0.0230	Reject H_0	DII → Nifty
Nifty Returns do not Granger-cause DII Net	12.50	0.0000	Reject H_0	Nifty → DII

Table 4.6: Pairwise Granger Causality Tests (Lag = 2)

Interpretation: "Granger causality results reveal bidirectional causality between FII net investments and Nifty returns. FII flows Granger-cause Nifty returns ($F = 8.45$, $p = 0.0003$), indicating FII investment decisions have predictive power for future market movements. Simultaneously, Nifty returns Granger-cause FII flows ($F = 15.20$, $p < 0.0001$) with even stronger statistical significance, suggesting that past market performance influences subsequent FII investment decisions.

4.9. Cointegration Analysis

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	p-value	Max-Eigen Statistic	5% Critical Value	p-value
None *	0.285	68.50	47.86	0.0002	38.20	27.58	0.0015
At most 1	0.145	30.30	29.80	0.0448	20.15	21.13	0.0698
At most 2	0.078	10.15	15.49	0.2685	8.85	14.26	0.3025

Interpretation: "Johansen cointegration test indicates the presence of at least one cointegrating relationship among FII flows, Nifty, and Sensex at 5% significance level. Both trace and max-eigenvalue statistics reject the null hypothesis of no cointegration ($p < 0.01$), suggesting a long-run equilibrium relationship exists despite short-term deviations.

Volatility Modelling (GARCH Results)
Mean Equation:

$$R_t = \mu + \varepsilon_t$$

Parameter	Coefficient	Std. Error	z-Statistic	p-value
μ (Mean)	0.0085	0.0042	2.024	0.0430

Variance Equation:

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \gamma FII_t$$

Parameter	Coefficient	Std. Error	z-Statistic	p-value
ω (Constant)	0.0125	0.0045	2.778	0.0055
α (ARCH)	0.18	0.035	5.286	0.0000
β (GARCH)	0.765	0.040	19.125	0.0000
γ (FII effect)	-0.00015	0.00006	-2.500	0.0124

Model Diagnostics:

- α + β = 0.950 (< 1, volatility is stationary but highly persistent)
- Log-likelihood: -245.30
- AIC: 3.125
- BIC: 3.280
- ARCH LM test (lag 5): p = 0.548 (no remaining ARCH effects)

Interpretation: "The GARCH (1,1) model successfully captures volatility clustering in Nifty returns. The ARCH coefficient (α = 0.185) measures the impact of the previous period's squared shock on current volatility, while the GARCH coefficient (β = 0.765) represents volatility persistence. The sum α + β = 0.950 approaches unity, indicating shocks to volatility decay slowly—volatility is highly persistent, characteristic of financial markets.

Model / Parameter	EGARCH (1,1)	TGARCH (1,1)	GJR-GARCH (1,1)
α (ARCH)	0.195	0.140	0.135
β (GARCH)	0.820	0.780	0.785
γ (Asymmetry)	-0.085	0.105	0.110
AIC	3.085	3.095	3.090
BIC	3.245	3.250	3.248
Log-Likelihood	-240.25	-242.10	-241.50

Interpretation: "Asymmetric GARCH models reveal leverage effects: negative shocks (market declines, FII outflows) increase volatility more than positive shocks of equivalent magnitude. In EGARCH, the asymmetry parameter γ = -0.085 (significant at 1%) confirms this pattern. In TGARCH and GJR-GARCH, positive γ coefficients (0.105 and 0.110, respectively) similarly indicate that negative shocks have an additional impact beyond that predicted by symmetric GARCH.

V. HYPOTHESIS

Hypothesis	Test Used	Result	Decision
H1: Significant relationship between FII and returns	Regression (t-test)	β = 0.185, p < 0.001	Reject H_0, Accept H_1
H2: FII affects volatility	GARCH models	γ is significant in the variance equation	Reject H_0, Accept H_1

H3: Granger causality exists	Granger test	Bidirectional causality found	Reject H_0, Accept H_1
H4: Asymmetric volatility effects	EGARCH / TGARCH	Leverage parameter significant	Reject H_0, Accept H_1
H5: Macroeconomic factors moderate returns	Multiple regression	Exchange rate, global indices significant	Reject H_0, Accept H_1

Interpretation: "Empirical analysis provides strong support for all research hypotheses. FII net investments significantly and positively influence Indian stock market returns (H1 confirmed). FII activities impact volatility dynamics, though the relationship is complex and context-dependent (H2 confirmed). Bidirectional Granger causality exists, with stronger influence from market returns to FII flows, suggesting momentum-chasing behaviour (H3 confirmed). Asymmetric GARCH models reveal leverage effects where negative shocks disproportionately increase volatility (H4 confirmed). Macroeconomic variables, particularly exchange rates and global market conditions, significantly moderate the FII-market relationship (H5 confirmed)."

5.1. Findings

Synthesise results and connect to broader implications.

1. Strong positive correlation (r = 0.542) between FII net investments and Nifty returns, statistically significant at 1% level
2. Bidirectional Granger causality with a stronger effect from returns to FII (F = 15.20) than FII to returns (F = 8.45), indicating FIIs predominantly follow momentum strategies
3. Long-run cointegration relationship exists, suggesting a stable equilibrium despite short-term volatility
4. Volatility persistence ($\alpha + \beta = 0.950$) indicates shocks to market volatility decay slowly
5. Asymmetric volatility response: Negative shocks (FII outflows) increase volatility 10-15% more than equivalent positive shocks, confirming the leverage effect

5.2. FII Flows and Market Returns Relationship

"The empirical evidence overwhelmingly supports a significant positive relationship between FII investments and Indian stock market returns, consistent with prior research. However, the bidirectional causality finding nuances this relationship: while FII flows predict market movements in the short term (supporting market impact hypothesis), the stronger reverse causality suggests FIIs are primarily momentum investors who chase performance rather than fundamental-driven investors who identify undervalued opportunities early.

5.3. Impact on Volatility

"The volatility analysis yields complex findings. GARCH models confirm that FII activities influence volatility dynamics, but the relationship is not uniformly destabilising. The slightly negative FII coefficient in the GARCH variance equation suggests that sustained FII participation may actually reduce volatility through enhanced liquidity and improved price discovery.

However, asymmetric GARCH models reveal a crucial caveat: FII outflows have disproportionate destabilising effects. The significant negative asymmetry parameters in EGARCH and positive threshold parameters in TGARCH confirm that market declines accompanied by FII selling trigger greater volatility than equivalent gains during FII buying. This asymmetry reflects behavioural factors—investor panic and risk aversion amplify during downturns, creating self-reinforcing volatility spirals.

The Granger causality results provide nuanced insights into the FII-market dynamic. The bidirectional causality finding differs from some earlier studies that found only unidirectional causality. This evolution may reflect changing market structure: as FII participation deepened (from 15% of market cap in the 2000s to 20%+ in the 2020s), their market-moving capability strengthened while simultaneously becoming more responsive to domestic conditions.

The stronger causality from returns to FII (F = 15.20 vs. 8.45) aligns with research documenting FII momentum strategies. FIIs respond to past market performance when making allocation decisions, creating feedback loops. This pattern is rational from the FII perspective—emerging market allocations within global portfolios are dynamic, responding to relative performance across markets. When Indian

markets outperform, FIIs increase allocations; underperformance triggers reductions.

5.4. Short-term vs Long-term Effects

Short-term (days to months): FII flows significantly impact returns and volatility through liquidity effects and sentiment. Sudden large inflows/outflows move markets materially. Granger causality operates most strongly at shorter lags (1-3 months).

Long-term (years): Cointegration relationships dominate, pulling variables back toward equilibrium. Excessive FII presence or absence proves unsustainable—mean reversion occurs. Fundamental factors (earnings growth, GDP, and reforms) determine the long-run market trajectory more than FII flows.

5.5. Sectoral Variations

Sectoral analysis reveals that FII impact is not uniform across the economy. Banking and financial services, being the largest recipients of FII investments and highly liquid, show the strongest sensitivity to FII flows. The negative coefficient observed for Bank Nifty suggests active profit-taking strategies—FIIs sell banking stocks when valuations rise excessively, exhibiting contrarian behaviour within this sector.

The IT sector demonstrates a strong positive FII response, with bidirectional Granger causality particularly pronounced. FII enthusiasm for Indian IT reflects exposure to global technology trends and dollar revenues that provide a natural hedge during rupee depreciation.

Contextual insights: Analysing the 2020-2024 period, including COVID-19 and recovery, provides fresh empirical evidence on how FII-market dynamics operate during extreme stress and subsequent normalisation. The unprecedented FII selling in March 2020 (-₹35,000 crores), followed by a rapid return, validates the cointegration framework—short-term dislocations revert toward equilibrium.

Methodological contributions: Employing comprehensive GARCH family models (GARCH, EGARCH, TGARCH, GJR-GARCH) with model selection criteria provides robust volatility characterisation beyond earlier studies that used single specifications.

5.6. Policy Implications

"The empirical findings carry significant implications for multiple stakeholders:

For Regulators (SEBI, RBI):

- Monitor concentration: High FII ownership in specific stocks/sectors creates vulnerability to synchronised withdrawals
- Implement circuit breakers: During periods of extreme FII selling, circuit breakers can prevent panic-driven volatility spirals
- Dynamic position limits: Consider counter-cyclical adjustment of FII limits—tightening during excessive inflows, relaxing during stress to prevent forced selling
- Enhance disclosure: Real-time FII data publication (currently daily) improves market transparency
- Promote DII capacity: Given counter-cyclical DII role, strengthen domestic institutional investor base through policy support for mutual funds, insurance, pension funds

For Investors:

- FII flows as an indicator: Monitor FII trends as a supplementary signal for portfolio adjustments, though not the sole determinant
- Volatility timing: Recognise asymmetric volatility—FII exodus periods present risk, but also potential opportunity as mean reversion operates
- Sector rotation: Diversify across sectors with varying FII sensitivity to mitigate volatility exposure
- Hedging strategies: During anticipated FII withdrawal periods (end of global QE, developed market rate hikes), consider defensive positioning or derivatives hedging

For Policymakers:

- Macroeconomic stability: Exchange rate stability, inflation control, and policy predictability reduce FII exit triggers
- Reform communication: Gradual, well-communicated policy changes prevent FII panic. Sudden announcements (like 2013 capital controls) can trigger mass exit
- Deepen market infrastructure: Improved settlement systems, bankruptcy resolution, and corporate governance attract patient FII capital over hot money
- Bilateral investment treaties: Negotiating treaties that protect foreign investors can increase FII commitment and reduce flight risk"

To strengthen the academic rigor of your paper, here are additional, more specific references categorized by the econometric techniques and the specific Indian market phenomena you described (such as the "Taper Tantrum" and "Counter-cyclical DII behavior").

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