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RESEARCH ARTICLE

Foreign and Domestic Institutional Investors: A comprehensive analysis of their dynamic relationship in the Indian capital market

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Abstract

The 1991 liberalization policy, which introduced Foreign Institutional Investors (FIIs) to the market, to recent years, revealed a shift in the market dynamics. While FIIs have historically played a dominant role, recent years have seen increased contributions from domestic giants like mutual funds. The study employs a comprehensive methodology involving Granger causality tests and the Threshold Generalized Autoregressive Conditional Heteroskedasticity (TGARCH) model to analyze the causal relationship and impact on market volatility. The analysis covers the period from January 2017 to November 2023, utilizing data from authoritative sources like the National Stock Exchange (NSE) and the National Securities Depository Limited (NSDL). The findings reveal a bidirectional causality between Domestic Institutional Investors (DII) and FII gross sales and a unidirectional causality in gross and net purchases/sales. The results of the TGARCH model demonstrate significant impacts of negative news on volatility in various indices, with indications of a leverage effect in some cases. The study concludes that while both FIIs and DIIs influence market volatility, negative news has a larger impact on volatility than positive news of the same magnitude. The recent news impacts high on the market volatility than the historical news which is observed from the β variable values. The findings contribute to understanding the intricate dynamics of institutional investors in the Indian capital market, providing valuable insights for investors and policymakers.

Keywords: Domestic Institutional Investors (DIIs); Foreign Institutional Investors (FIIs); investment; TGARCH

Introduction

India's economic trajectory underwent a significant transformation with the introduction of the liberalization policy in 1991. This policy facilitated the entry of Foreign Institutional Investors (FIIs) into the Indian capital market, with the objective of reducing the country's dependency on external debt, improving the balance of payments and stimulating market development (1). The participation of these global investors, in conjunction with Domestic Institutional Investors (DIIs), redefined the investment landscape of India's financial sector (2).

Historically, FIIs have been dominant participants in the Indian stock market, with their net investments often influencing market sentiment and index performance. However, a notable structural shift has emerged in recent years, wherein domestic mutual funds and other DIIs have increasingly played a stabilizing and growth-oriented role in capital inflows (3).

This interplay between FIIs and DIIs has significantly impacted the dynamics of the Indian stock market. Their investment behaviors, often contrasting in nature, affect not only the direction of the market but also its volatility. Fig. 1 illustrates the co-movement of the Nifty 50 and Sensex indices with the net investment activities of FIIs and DIIs (Source: NSE India).

Foreign Institutional Investors (FIIs)

FIIs represent a category of investors from abroad who engage in the purchase of stocks, bonds and various financial assets within a host country, primarily for the purpose of generating returns on their investments. Unlike strategic investors, FIIs do not seek to acquire control over companies; instead, their focus is on enhancing the value of their financial portfolios. FIIs can be likened to influential entities such as hedge funds, insurance companies and mutual funds.

While the influx of FII capital can significantly contribute to the economic growth of the host country, nations like India exercise caution in regulating the extent of FII investments, particularly in individual firms. Historical data indicates that between 2018 and 2019, FIIs injected substantial capital into the

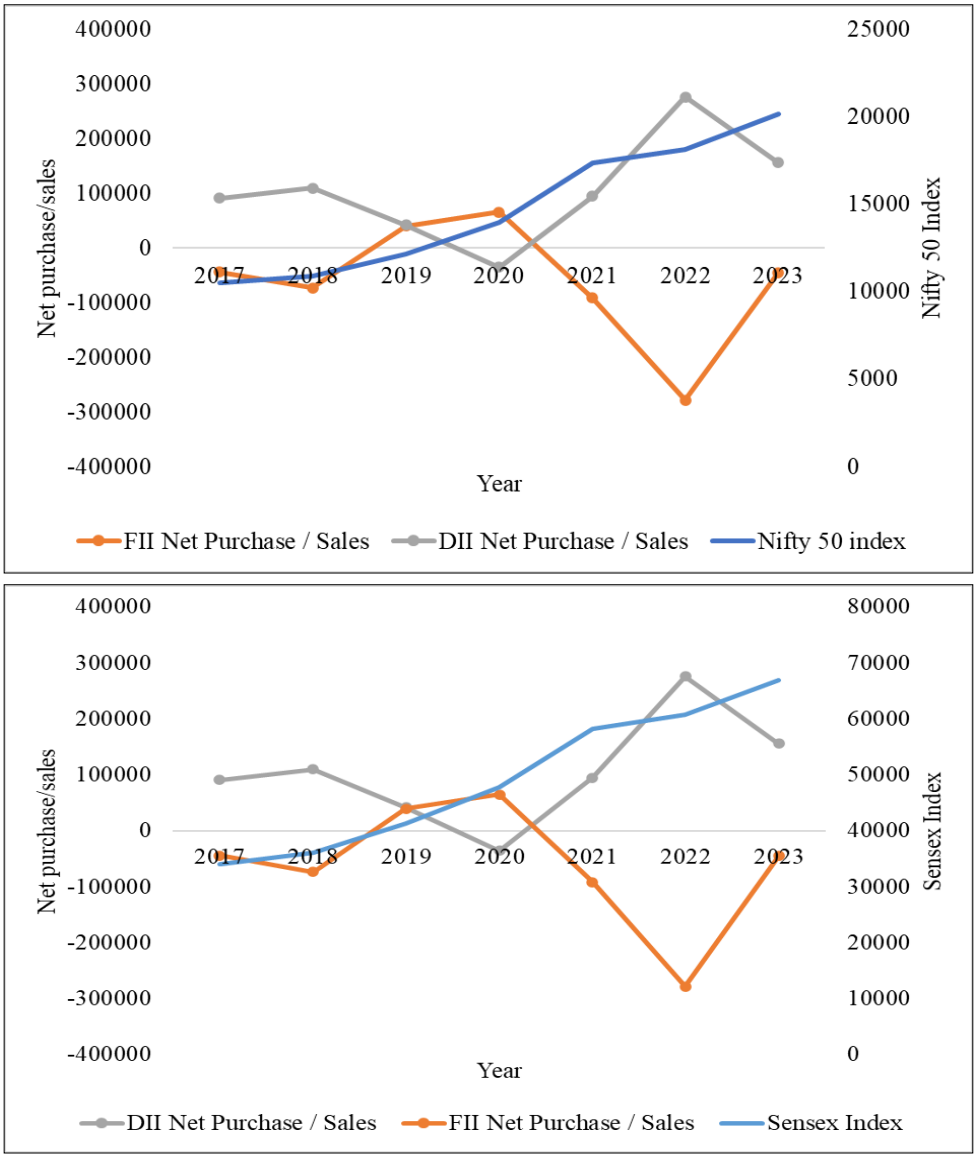

Fig. 1. Nifty 50 and Sensex relationship with the net investments of FIIs and DIIs.

Indian market, exceeding ₹50000 crore annually. However, the onset of the COVID-19 pandemic in 2020 marked a pivotal shift, as global uncertainties prompted FIIs to transition to a net selling position, resulting in outflows surpassing ₹85000 crore.

This trend of net selling persisted through 2022, albeit with intermittent periods of net inflows that ultimately culminated in an overall negative investment sentiment. Nevertheless, the year 2023 has witnessed a noteworthy resurgence in FII activity, with these investors returning as net buyers, contributing over ₹30000 crore to the Indian stock markets in the first half of the year alone. Fig. 2 illustrates the net purchases and sales of FIIs on Indian stock exchanges (Source: NSDL FPI Monitor).

Domestic Institutional Investors (DIIs)

DIIs are entities such as mutual funds, insurance companies and banks based within the country, whose investment decisions are influenced by domestic economic and political conditions. These investors play a crucial role in stabilizing the market, particularly during periods of heightened volatility caused by foreign investment fluctuations.

Between 2020 and 2022, DIIs consistently emerged as net buyers, collectively contributing over ₹1 lakh crore annually to Indian markets. Their increased activity during the FII withdrawal periods helped sustain market resilience. In 2023, DIIs continued this trend, maintaining net positive inflows and contributing significantly to the prevailing market rally (Fig. 3) (Source: NSE India).

The relationship between FIIs and DIIs in India's capital market is dynamic and complex (4). FIIs and DIIs have opposite trading patterns, with DIIs acting as negative feedback traders and FIIs as positive feedback traders. The trading behaviour of FIIs and DIIs can impact the volatility of the Indian stock market (5). Despite the impact of FIIs and DIIs, the Indian stock market has remained stable due to the consistent participation and steady investment approach of DIIs. To find FII and DII investment in stocks, one can analyse FII and DII data trading activity on the NSE and BSE.

The following are the objectives of the study:

1. To investigate the causal relationship between FIIs and DIIs within the stock market.
2. To analyze the influence of FIIs and DIIs on the volatility of the stock market.

The Indian capital market has undergone significant transformation since liberalization, with institutional investors both foreign and domestic playing a pivotal role in shaping market movements. Initial research established that the number

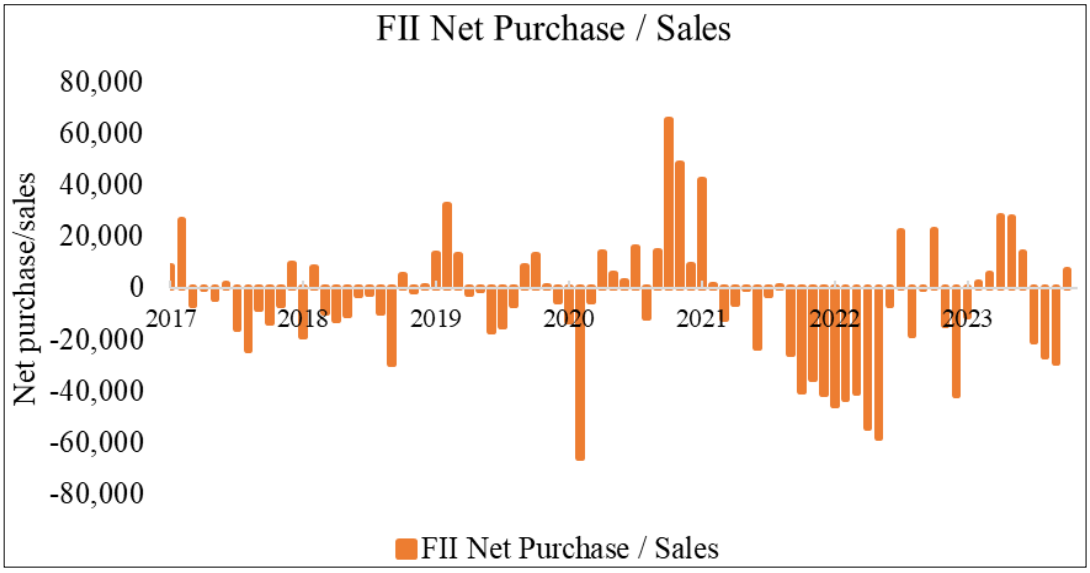

Fig. 2. FII net investments. Source: Compiled from data retrieved from NSE, NSDL and Money Control, 2023.

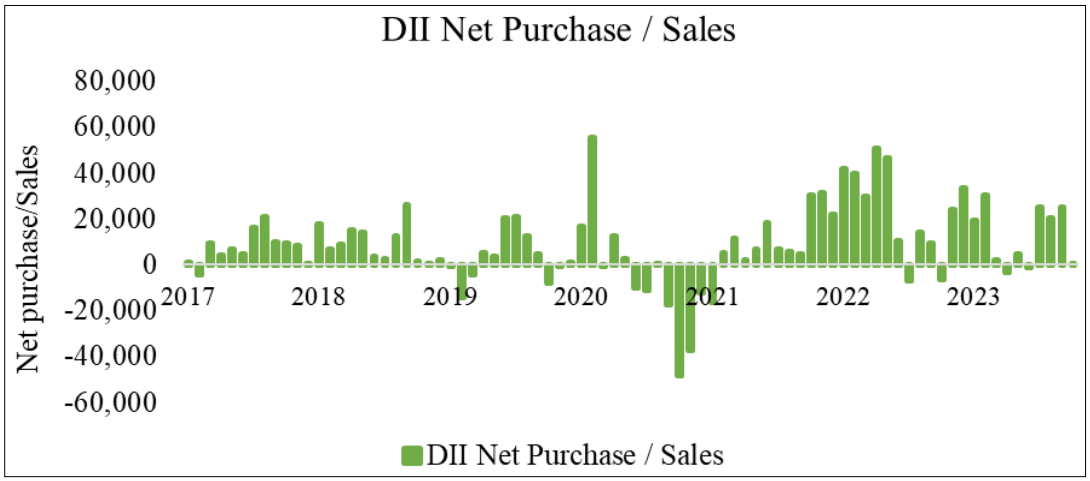

Fig. 3. DII net investments. Source: Compiled from data retrieved from NSE, NSDL and Money Control, 2023.

of active FIIs was relatively limited in the early stages. However, a strong association was found between India-specific funds from foreign sources and overall trading activity on Indian stock exchanges, especially on the Bombay Stock Exchange (BSE) (6).

Subsequent studies examined the impact of FIIs and DIIs on market indices, particularly the Nifty 50, over extended periods. These studies found that institutional investor activities were closely linked with market volatility and returns (7, 8). Further analysis covering the period from 2001 to 2015 demonstrated that net FII flows exerted a significant and positive influence on the performance of benchmark indices such as the CNX Nifty and BSE Sensex, highlighting the market's sensitivity to international capital movements (9).

The relationship between FIIs and DIIs has also been shown to exhibit dynamic patterns. While FIIs are often characterized as trend followers or momentum traders, DIIs tend to adopt contrarian strategies, acting as stabilizing forces during volatile market phases. This inverse investment behavior between the two investor categories was confirmed through Granger causality and VAR model analyses, which demonstrated both unidirectional and bidirectional causal effects depending on the time frame and indices considered (10, 11).

Volatility modeling using the Threshold Generalized Autoregressive Conditional Heteroskedasticity (TGARCH) model revealed that both FIIs and DIIs have a measurable impact on stock market fluctuations. The models identified that negative market news tends to have a stronger influence on volatility than positive news of the same magnitude, a phenomenon known as the leverage effect (2). Moreover, it was observed that recent events influence volatility more heavily than older, historical trends, further emphasizing the role of current investor sentiment and reactions to news in shaping market dynamics. Volatility and causality assessments, several regression-based studies have investigated the feedback relationship between foreign and domestic investor behavior. Evidence suggests that the trading decisions of DIIs, particularly mutual funds, can influence the subsequent actions of FIIs, indicating a strategic interaction in their investment flows (12). This finding challenges the traditional notion that FIIs act independently and suggests that domestic sentiment plays a more significant role than previously assumed. During periods of global crises such as the COVID-19 pandemic empirical findings showed that market volatility in India was less influenced by health data or infection rates and more significantly affected by the trading patterns of institutional investors. Notably, foreign portfolio investors' net selling of equities and debt during this period contributed more to market instability than the pandemic's direct economic impact (13). This further reinforces the centrality of investor behavior in determining market outcomes, even amid broader macroeconomic disruptions.

Materials and Methods

Data

This research utilizes secondary data collection to analyze various financial indicators and market variables, focusing on the dynamics of the Indian stock market. The study examines monthly data from key financial indices, including the Nifty 50 total return index, Nifty 50, Nifty Next 50 and the Indian market volatility index. Additionally, it incorporates data on net inflows and outflows from FII and DII within Indian stock exchanges. The data were systematically collected from authoritative sources such as the official websites of the National Stock Exchange (NSE), Money Control and the National Securities Depository Limited (NSDL). The sample period for this study spans from January 2017 to November 2023, providing a comprehensive dataset that reflects diverse market conditions and economic scenarios throughout this timeframe.

Methods

The study employs a combination of time series econometric techniques to test stationarity, causality and the impact of institutional investors on volatility. Each technique is summarized below.

Stationarity test

The ADF test is employed to identify whether a unit root exists in the series, assisting in determining the stationarity of the series (14).

Null hypothesis: The presence of a unit root.

Alternate hypothesis: The absence of a unit root.

Failure to reject the null hypothesis in this test could indicate evidence supporting the non-stationarity of the series. The ADF test enhances the Dickey-Fuller test equation by incorporating a higher-order regressive process into the model.

$$Y_t = C + \beta_t + \alpha Y_{t-1} + \varphi_1 \Delta Y_{t-1} + \varphi_2 \Delta Y_{t-2} + \ldots + \varphi_p \Delta Y_{t-p} + e_r$$

The ADF test assesses stationarity in time series.

KPSS serves as an additional test to assess the stationarity of a time series. The hypotheses for the KPSS test differ in direction compared to those of the ADF test (15).

Null hypothesis: The process exhibits trend stationarity.

Alternate hypothesis: The series possesses a unit root (indicating non-stationarity).

Granger causality test

The concept of Granger causality is widely employed to examine temporal cause-and-effect relationships between two time series variables. A variable Y is said to "Granger cause" another variable X if past values of Y contain information that helps predict X beyond the predictive power of X's own past values. In contrast, if past values of Y do not improve the prediction of X, then Y is considered strictly exogenous to X (16).

Granger causality testing can be implemented within a Box-Jenkins ARIMA modeling framework or through conventional Ordinary Least Squares (OLS) regression. For instance, consider the following model:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ldots + \alpha_p Y_{t-p} + \beta_1 X_{t-1} + \ldots + \beta_q X_{t-q} + \varepsilon_t$$

Estimating this model and conducting a block F test for the joint significance of the Y's tests whether Y Granger causes X. It is crucial to note that Granger causality tests assess strong exogeneity, not weak exogeneity.

ARCH LM test

Engle's ARCH Test (17) helps us understand if a time series, even if not correlated, might still show a pattern of dependence over time due to changing variance. When a time series displays varying conditional variance or correlation in its squared values, it is said to have autoregressive conditional heteroscedastic (ARCH) effects. Engle's ARCH test is a way to check how significant these effects are.

The process by which the variances are generated is assumed to be as follows

$$\sigma_1^2 = \alpha_0 + \alpha_1 \mu^2_{t-1} + \ldots\ldots\ldots\ldots\ldots\ldots + \alpha_p \mu^2_{t-p}$$

This equation is known as p^{th} order ARCH process.

The null hypothesis is:

Null hypothesis: There is no ARCH effect.

Alternate hypothesis: There is an ARCH effect.

Threshold-GARCH

The Threshold-GARCH model, also known as the GJR model (18), is employed to address the leverage effect. In this study, the TGARCH model is specified as follows:

For the effect of FIIs.

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{NIFTRI} + \alpha_3 NI_{FII} + \alpha_4 VIX + \varepsilon_t$$

α_0 = intercept,

R_{t-1} = lagged returns of different indices,

R_{NIFTRI} = return of Nifty total returns,

NI_{FII} = net investment of FIIs,

VIX = volatility index,

ε_t = error term.

For the effect of DIIs.

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{NIFTRI} + \alpha_3 NI_{DII} + \alpha_4 VIX + \varepsilon_t$$

α_0 = intercept,

R_{t-1} = lagged returns of different indices,

R_{NIFTRI} = return of Nifty total returns,

NI_{DII} = net investment of DIIs,

VIX = volatility index,

ε_t = error term

(Note: For Sensex, Nifty Total Returns Index is excluded from the model).

Volatility model

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \delta \varepsilon^2_{t-1} d_{t-1} + \beta \alpha^2_{t-1}$$

Where dt = 1 if $\varepsilon_t < 1$ and $d_t = 0$ otherwise.

In this model, the conditional variance is influenced differently by positive news ($\varepsilon_t > 0$) and negative news ($\varepsilon_t < 1$). Positive news has an impact represented by α_1, whereas negative news has an impact represented by the sum of α and δ. If δ is greater than 0, it indicates the presence of a leverage effect, where negative news leads to an increase in volatility. On the other hand, if δ is equal to 0, the impact of news is symmetric, regardless of its positive or negative nature.

Results and Discussion

Descriptive statistics

Table 1 provides the mean and standard deviation for the change in various indices. The mean represents the average change in the index, while the standard deviation measures the amount of variation or dispersion in the data set relative to the mean. A smaller standard deviation indicates that the values are clustered closer to the mean, while a larger standard deviation indicates that the values are more spread out. The data for these statistics are taken in percentage change.

In Table 1, the Nifty Total Returns Index has the highest mean of 0.013 and the IND VIX has the highest standard deviation of 0.26. This implies that, on average, the Nifty Total Returns Index has the highest average change and the IND VIX has the highest variability or dispersion in its data points, indicating that the values are more spread out from the mean compared to the other indices (19).

Stationarity test

The application of the ADF and KPSS tests, a decomposition technique, likely using methods such as seasonal decomposition of time series (STL) or moving averages, was implemented to separate the time series data into its underlying components: trend, seasonality and residual. This decomposition aids in identifying patterns and characteristics within the data (20).

To visualize the results and evaluate the impact of applying the unit root tests and decomposition, Fig. 3 was generated. Fig. 4 likely displays the original time series data alongside the decomposed components, allowing for a clearer understanding of the trend and seasonality present in the data. ADF and KPSS reject the null hypothesis by employing the seasonal decomposition of time series and making the datasets stationary.

ARCH LM test

Table 2 provided the results of a Lagrange Multiplier test for various indices, with the null hypothesis being that there is no autocorrelation in the residuals. The Lagrange Multiplier, a measure of the likelihood ratio test for the null hypothesis in regression models, indicates values of 76.48 for Nifty 50, 74.64 for Nifty Next 50 and 76.58 for Sensex. The *p*-values associated with these indices are remarkably low, denoted as 1.75E-16, 4.33E-16 and 1.66E-16, respectively, suggesting strong evidence against the null hypothesis.

The F statistic, a measure of overall model fit in regression, is notably high for all three indices, with values of 758.30 for Nifty 50, 427.83 for Nifty Next 50 and 790.85 for Sensex. These high F-statistics further support the robustness of the regression models for these indices, indicating a significant relationship between the explanatory variables and the market performance.

Table 2. ARCH LM test results

Indices	Lagrange multiplier	*p*-Value	F stat
Nifty 50	76.48	1.75E-16	758.30
Nifty Next 50	74.64	4.33E-16	427.83
Sensex	76.58	1.66E-16	790.85

Granger causality test

The null hypothesis in this analysis asserts that there is no causal relationship between DII Gross sales and FII Gross sales. In Table 3 the test was conducted with 2 lags and the results show an F statistic of 8.9523 and a probability (*p*-value) of 0.0003. The decision based on this is to reject the null hypothesis. The values in Table 3 indicate that there is strong evidence to suggest that DII Gross sales cause FII Gross sales, as the F statistic is significant at the 0.05 level and the probability is very low, indicating that the relationship is statistically significant. Therefore, based on these results, it can be inferred that there is a significant causal relationship between DII Gross sales and FII Gross sales, with DII Gross sales causing FII Gross sales (21). It implies that Granger Causality above time series data is unidirectional in DII Gross sales and FII Gross sales, but it is bidirectional between DII Gross purchases with FII Gross purchases and DII Net purchases/sales with FII Net purchases/sales.

T-GARCH

Mean model

The results show that the values in parentheses indicate the *p*-values associated with each coefficient, providing a measure of their statistical significance. A lower p-value suggests higher significance. Looking at the Nifty, Nifty Next 50 and Sensex for both FII and DII, we observe variations in the coefficients and their p-values which are significantly very low. For instance, in the FII results, the α0 (intercept) for Nifty is significantly low, indicating a strong impact on the dependent variable. In contrast, the Nifty Next 50 α0 is relatively high but still statistically significant. The coefficient α1, representing the impact of the first independent variable, varies across indices and is statistically significant for Nifty and Nifty Next 50 in both FII and DII. The coefficient for the Nifty total returns is positive, indicating that an increase in the Nifty total returns leads to an increase in the current returns. The coefficient for the net investment of FIIs is also positive, indicating that an increase in the net investment of FIIs leads to an increase in the current returns.

In Table 4 Nifty and Nifty Next 50, the alpha coefficient for the effect of FIIs (NIFII) is significant ($p < 0.05$), indicating that the net investment of FIIs has a significant impact on these indices. However, for the Sensex, the alpha coefficient for the effect of FIIs (NIFII) is not significant ($p > 0.05$), suggesting that the net investment of FIIs does not have a significant impact on the Sensex. Similarly, Net investments of FII and DII have a significant impact on Nifty and Nifty Next 50 with low *p*-value and do not have a significant impact on the Sensex.

Table 1. Mean and standard deviation of indices

Indices	Mean	Std. Dev.	Min	Max
Nifty 50 Index	0.012165	0.049795	−0.2325	0.1468
Nifty Total Returns Index	0.013206	0.049669	−0.2303	0.1469
Nifty Next 50 Index	0.011235	0.05352	−0.2026	0.1414
SENSEX Index	0.012439	0.049701	−0.2305	0.1442
IND VIX	0.021876	0.260617	−0.4723	1.772

Table 3. Granger causality test results

Null hypothesis	Lags	F statistic	Probability	Decision
DII Gross sales cause FII Gross sales	2	8.9523	0.0003	Reject the null hypothesis

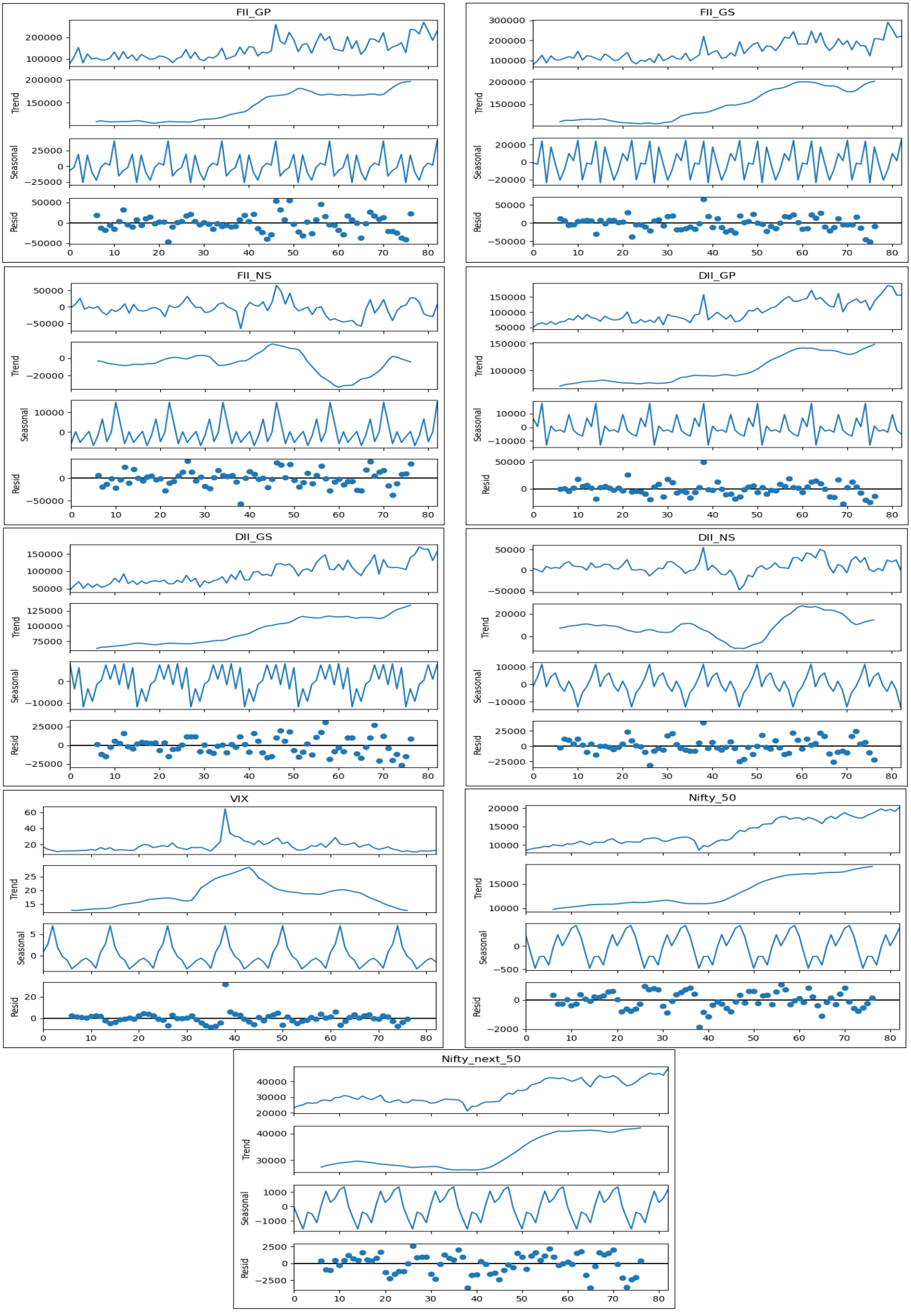

Fig. 4. Seasonal decomposition of time series data.

Table 4. Threshold GARCH - mean model results

FII

S.No	Indices	α	α	α	α	α
1	Nifty	1342.3570 (<0.0001)	0.0408 (<0.0001)	-3.9972 (0.0027)	0.6372 (<0.0001)	-2.48E-04 (0.411)
2	Nifty next 50	11162.000 (<0.0001)	11162.000 (<0.0001)	11162.000 (<0.0001)	11162.000 (<0.0001)	11162.000 (<0.0001)
3	Sensex	37730.000 (<0.0001)	37730.000 (<0.0001)	37730.000 (<0.0001)	37730.000 (<0.0001)	

Note: *p*-Values are given in parentheses. "<0.0001" indicates extremely small values rounded for clarity. Missing values (-) indicate data not reported or statistically insignificant.

DII

S.No	Indices	α	α	α	α	α
1	Nifty	1344.0500 (<0.0001)	1344.0500 (<0.0001)	1344.0500 (<0.0001)	1344.0500 (<0.0001)	1344.0500 (<0.0001)
2	Nifty next 50	10919.000 (<0.0001)	10919.000 (<0.0001)	10919.000 (<0.0001)	10919.000 (<0.0001)	10919.000 (<0.0001)
3	Sensex	38466.000 (<0.0001)	38466.000 (<0.0001)	38466.000 (<0.0001)	38466.000 (<0.0001)	

Note: *p*-Values are given in parentheses. "<0.0001" indicates extremely small values. Empty cells (-) denote missing or non-reported α_4 values.

Table 5. Threshold GARCH - volatility model results

FII

S.No	Indices	α	α	δ	β
1	Nifty	604.2481 (0.3790)	1.0000 (0.0021)	<0.0001 (1.0000)	<0.0001 (1.0000)
2	Nifty next 50	638000 (0.3550)	0.7265 (0.0758)	0.0676 (0.802)	0 (1.000)
3	Sensex	12500000 (<0.0001)	0.9902 (<0.0001)	-0.6504 (<0.0001)	<0.0001 (1.000)

DII

S.No	Indices	α	α	δ	β
1	Nifty	623.176 (0.142)	1 (<0.0001)	-1.2512 (1.000)	0 (1.000)
2	Nifty next 50	6.850005 (0.312)	0.6527 (0.0457)	0.1178 (0.663)	0 (1.000)
3	Sensex	11800000 (<0.0001)	0.9906 (<0.0001)	-0.6814 (<0.0001)	<0.0001 (1.000)

Note: *p*-Values in parentheses. "<0.0001" denotes extremely small values. All values are rounded for clarity and consistency.

Both the FII and DII have a significant effect on the returns of the Nifty and Nifty Next 50 indices (22), while the effect on the Sensex index is not significant

Volatility model

Table 5 presents the volatility model for FIIs, in the Nifty index, positive news (α1) is statistically significant at the 0.05 level, indicating that it has a significant impact on volatility. The presence of a leverage effect is suggested by the positive and significant coefficient for δ, implying that negative news increases volatility. The results indicate that the leverage effect is present in the Nifty index and Nifty Next 50 index, with the coefficient of the lagged independent variable (β) being negative, implying that negative news has a larger impact on volatility than positive news of the same magnitude.

In contrast, the leverage effect is absent in the Sensex index, as the coefficient of the lagged independent variable (β) is positive. In the Nifty Next 50 index, both positive and negative news impact volatility significantly. However, in the Sensex, negative news significantly influences volatility. For DII, in the Nifty index and Nifty Next 50 index, both positive and negative news have a significant impact on volatility without the presence of a leverage effect. In the Sensex, negative news significantly influences volatility, while the leverage effect is absent. The recent news impacts high on the market volatility than the historical news which is observed from the β variable values.

Conclusion

This study highlights the intricate dynamics between FIIs and DIIs in influencing the volatility of the Indian stock market. The findings from the Granger causality tests indicate a robust causal relationship between the Gross sales and purchases of FIIs and DIIs, underscoring the interconnectedness of these market participants. The bidirectional causality observed further emphasizes the collaborative yet competitive nature of their trading activities. The application of the Threshold Generalized Autoregressive Conditional Heteroskedasticity (TGARCH) model reveals that while net investments by FIIs and DIIs have a significant impact on indices like Nifty and Nifty Next 50, their influence on the Sensex is less pronounced. The results demonstrate that both positive and negative news events considerably affect volatility in the Nifty and Nifty Next 50 indices, indicating that market sentiment plays a crucial role in shaping investor behavior. Notably, the absence of a leverage effect in these indices suggests that negative news does not disproportionately increase volatility compared to positive news.

In summary, the reaction to negative and positive news is balanced in terms of volatility, which is a noteworthy observation for market participants and analyst. Overall the study underscores the importance of timely information and market sentiment in understanding stock market volatility. Recent news tends to have a more substantial impact on market fluctuations than historical information, as indicated by the β variable values. These insights are vital for investors and policymakers alike, as they navigate the complexities of the Indian stock market and formulate strategies to mitigate risks associated with market volatility. Further research could explore the implications of these findings on investment strategies and market regulation in the context of evolving global financial landscapes.

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Authors' contributions

VP contributed to the conceptualisation, framing the methodology, obtaining resources, carrying out the investigation, analysis and writing the original draft. MK helped in the statistical analysis, conducting the investigation, formulating the methodology, employing software and writing the original draft. VP and NB has assisted with the analysis, investigation, methodological framework, software application and writing. SA participated in writing, review and editing the manuscript. VB and EP took part in framing the methodology, utilization of software, writing, review and editing. BR involved in writing, review and editing. VP, MR and HP contributed in editing the manuscript. All authors have read and agreed to the published version of the manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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