

Foreign Portfolio Investments (FIP) and Indian Stock Markets: Exploring Dynamic Links through Sensex and Nifty50

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ABSTRACT

Ever since globalisation has swept the world, India has been poised towards prosperity. The principal contributors to this were foreign portfolio investors. Foreign portfolio investment (FPI) flow in India has unceasingly grown since 1991, which has made it an attractive hub for foreign investors and made them the dominant players. FPIs have a noteworthy impact on the Indian stock market. The interplay between FPI and stock market behaviour in India has drawn significant attention in light of growing integration between the emerging economies and global financial markets.

The study explores the evolving relationship between FPI inflows and the performance of the two prominent Indian stock indices, mainly the Sensex and NIFTY 50. The study was conducted with quarterly market data from the 1st quarter of 2010 through Q4, 2024. Applying a range of time series analytical methods, the research first scrutinises the stationary characteristics of the series, then investigates the potential causal links, and ultimately evaluates the existence of a long-term equilibrium relationship. The study employed the augmented Dickey-Fuller (ADF), the Granger causality test, VAR, and the Johansen Cointegration Test. It was found that FPI influences both Sensex and Nifty 50. FPI was found to be stationary, whereas Sensex and Nifty 50 were found to be stationary in the first lag. In the short term, FPI exerts a significant effect on 50; however, in the long run equilibrium bond between FPI and market indices remains Sensex and Nifty restricted

Keywords: Foreign Portfolio Investment, Indian stock Market, Sensex, Nifty, Globalisation.

INTRODUCTION

Long-term funds in the capital market, which deal with equity and debt, are mobilised through issuing and trading financial instruments like bonds and stocks (A. Kumar et al., 1997; Tarh, 2018). It plays a pivotal role in promoting investment (Hallaq et al., 2018), enhancing liquidity (Lipson & Mortal, 2009), and supporting economic development (Wurgler, 2000). In the age of globalization, the integration of economies has made it possible for capital and money to move more freely between countries. Macroeconomic conditions are largely determined by international capital flows. This emphasizes how crucial asset and capital growth are in developing and emerging markets. The stock market enhances the liquidity of the capital market and works as a catalyst for the long-term economic growth of economies (Eller et al., 2020; Igan et al., 2020). The scarcity of finance for industrialisation or development, if funded by foreign investors, leads to prosperity in developing countries like India. Among the various forms of international capital flows, Foreign Portfolio Investment (FPI) has emerged as a key driver

influencing the financial landscape of developing economies.

Errunza (2001) states that FPI includes investment in a foreign portfolio without gaining significant control over the management of the enterprises. These flows can enhance the depth and efficiency of domestic capital markets, provide critical development funding, and improve financial market integration (Singhania & Saini, 2017). However, integrating the global capital market creates volatility in the stock market—particularly in emerging markets like India—where sudden shifts in investor sentiment can lead to volatile capital movements, impacting market stability and asset prices (Bathia et al., 2020).

Following liberalisation, India gained significant exposure to foreign investment and foreign funds. The gradual opening of capital markets attracted increasing FPI inflows, making them a crucial element in the functioning of Indian financial markets (Singhania & Saini, 2017). While these capital inflows and outflows have supported market expansion and economic growth, they have also raised concerns over market volatility and

susceptibility to global shocks as they are influenced by global risk appetite, interest rate differentials, and domestic fundamentals (Davis & Van Wincoop, 2018).

Yadav et al. (2020) The Indian stock market, which is reflected by standard indices like the Sensex and Nifty 50, regularly reflects the effects of these international capital movements. Given the extent and significance of FPI, it is imperative to maintain the dynamic relationship between FPI inflows and stock market performance, especially with regard to short-term volatility and long-term equilibrium trends.

This study examines these relationships using quarterly data from Q1 2010 to Q4 2024, employing robust time series econometric tools to evaluate the direction, strength, and nature of linkages between FPI and the Sensex and Nifty 50 performance.

This study sought to achieve the objectives listed below:

1. To examine the stationarity properties of FPI, Sensex, and Nifty50.
2. To analyze the causal relationships between FPI and stock market indices.
3. To evaluate the dynamic interactions among FPI and stock market indices.
4. To test for the presence of a long-run equilibrium relationship among the variables

LITERATURE REVIEW

Choudhary et al., (2019) scrutinized “the relationship of FII investments with the stock market return, volatility, and trading volume and found a positive relationship between lagged market return and herding among FIIs, whereas information asymmetry did not affect herding. A bidirectional relationship exists between herding and returns of the stock market, where market return was the prime reason for FII herding. **Gupta & Jain (2017)** highlighted the fact that Globalization has embraced the world, and India is poignant towards prosperity. The principal contributors to this scenario were FIIs. FII investment (purchase and sales) and its effect on stock indices, i.e., SENSEX and NIFTY. **Rath (2017)** studied the investment trends of FIIs and their relationship with the stock market volatility. FIIs showed more attention in the Indian market due to great investment prospects. FII’s significantly influenced the volatility of Nifty and SENSEX. Along with economies like Korea, China, and Brazil, India has also witnessed a continuous flow of foreign investment because of rapid economic growth and influential macroeconomic factors **Dhingra et al.,(2016)**. FII in India was termed as “Return Chaser” or “Feedback Traders”. They displayed positive feedback trading behaviour while investing in the Indian Market, whereas their selling activities portrayed them as negative feedback traders. FIIs worked as an information disseminator. **Singh & Kaur (2016)** stated that Foreign Institutional Investment (FII) flow in India had unceasingly grown since 1991, which made it an attractive hub for foreign investors. It led to an increase in the globalization and growth of IT. **Srinivas (2016)** explored the significance of FIIs in India. FIIs had a noteworthy impact on the Indian stock market. The higher the FII

flow, the higher the value of the index. FIIs were the dominant players in the Indian market. **Chakraborty & De (2015)** referred to portfolio flow as “hot money” because of its high volatile nature than other sources of capital. Sensing the faintest smell of trouble in the host country, a foreign investor would make a withdrawal of their investment, resulting in a sharp decline in the stock price along with disastrous consequences to the host nation. The Indian economy has more prospects to grow and fascinates numerous foreign investors **Chaudhry (2015)**. Domestic capital is not enough for the economy to boost. Hence, foreign capital is brought in by FIIs. **Mohan & Prasad (2015)** emphasised the contribution made by FIIs in SENSEX and NIFTY, finding that FII’s movement impacted the volatility of the SENSEX and NIFTY, and other factors also contributed to it. **Kajipet & Ryakala (2015)** witnessed that a unidirectional causality runs from FII investment in the long run as well as the short run. **Sekhri (2015)** mentioned FII as a result of International economic Integration that acted as a major catalyst for the growth of nations. A moderate correlation was seen amid FII and SENSEX and NIFTY. The trend of the Indian stock market was determined by both FDI & FII. **Kumar & Gautam (2014)** found that FII, NASDAQ (New York stock exchange), FTSE (London stock exchange), and NIKKEI (Tokyo stock exchange), had a major impact on BSE SENSEX. An inverse relation between FII and NIKKEI, while NASDAQ and FTSE had a direct positive relation with SENSEX, was observed. **Murthy & Singh (2013)** stated “FIIs, Mutual Funds, and DIIs were key players of the Indian stock market” and discovered that FIIs and DIIs influenced the market. Mutual funds were found to be passive players. FIIs were noted as opportunistic agents who gain opportunistically from the market but does not cause any fundamental change to it. **Shrivastav (2013)** expressed the Indian stock market to be vast and a hotspot for attracting investment from both DIIs and FIIs. They invested largely in the banking and construction sectors. FII’s consider economic growth (IIP and GDP), interest rate, and inflation as the crucial factors before investing in any country. **Chandra (2012)** scrutinized the degree of causality between FII and the return of the Indian stock market and observed that the trading behaviour of FII gave rise to heavy trade volume, which induced short-term variance in the return of the stock market. Fluctuations in the trading behaviour of FIIs were caused due to the market return. **Paliwal & Vashishtha (2012)** conducted an empirical investigation by analyzing the causal relationship between FII flows and BSE averages in the Indian share market, confirming a positive correlation between BSE averages and FII flows, and also the existence of Granger causality between them. **Sultana & Pardhasaradhi (2012)** elucidated FDI and FII as instruments of global monetary integration. **Gupta A. (2011)** examined the cause and effect of FIIs on the Indian capital market, discovering that FIIs influenced the market, and they did transactions by observing the stock market movement, which makes them termed as “feedback traders.” FIIs' purchase or sale leads to either the stock market falling or rising. **Mukherjee & Roy (2011)** aimed at finding the components that influenced the investment pattern of FIIs and Domestic mutual funds in the stock market of India, discovering that mutual funds

significantly influenced the investment decision of FIIs. Both mutual funds and FII's monitored Domestic and international rates. FII's and domestic mutual funds both tracked bond returns. Mutual funds followed the LIBOR rate, and FII followed the US Treasury Bill rate for deciding debt. **Inoue (2008)** applied "the Cross-Correlation function (CCF) approach" developed by Cheung and Ng, attempted to study the causalities between the returns of the Stock market and investment by FIIs in India, confirming the presence of both bi-directional and unidirectional association between the returns of the stock market and FIIs, in both sample periods. **Suresh Babu & Prabheesh (2008)** analysed the complex relationship between FII investment and stock market return of India and found "bi-directional causality between FII flows and stock market return". "Impulse response function indicated that FII inflows were more stock return driven". **Banerjee & Sarkar (2006)** mentioned the clustering of volatility in the Indian stock market, which verified the presence of the leverage effect. The variation in the trading volume directly influenced the volatility of asset returns. The presence of FIIs did not affect the overall market volatility. **Lin & Chen (2006)** observed the association between QFIIS and Taiwan's share market, revealing that the Investment performance of QFII's high-holding stock was comparatively better than low low-holding stock. The rate of return and portfolio performance were outstanding in QFII's high-holding stock. **Bose & Coondoo (2004)** observed the impact of various policy changes on the FIIs investment inflows to the Indian stock markets and found that a comprehensive set of laws governing FII investment flows, such as enlarged membership, improved both sectoral as well as individual caps, and hedging of FII risk, allowed them to enter the derivatives and forex markets. **Rajeshwar (2000)** assessed the role of FII in the Indian Stock market and reported that it had become an integral

ANALYSIS AND DISCUSSIONS

part of the market, as corporate India and the investor community at large were benefiting from the increased institutionalisation of the market in diverse ways.

DATA AND METHODOLOGY

Data Description

The Study is based on Secondary data. Quarterly data from 2010 Q1 to 2024 Q4 were collected from diverse verified websites. FPI Investments data was taken from CDSL (Central Depository Services Limited). To capture the stock market performance, the quarterly data of the Sensex and Nifty 50 were extracted from Yahoo Finance. The collected data was analysed using Python.

Methodology

The present study deals with time series data, so there is a chance of non-stationarity. So, to check the unit root in the variables (stationarity), the augmented Dickey-Fuller (ADF) test was used. The Granger causality test was used to check whether the variables under study influenced each other or not. The primary condition for employing the VAR model is to check the short-run dynamics between the variables. The Johansen Cointegration Test is used to check the long-run equilibrium between the variables.

The hypothesis framed under the study includes:

H₀₁: There is no stationarity between FPI, Sensex, and Nifty50.

H₀₂: There is no bidirectional causality between FPI and stock market indices.

H₀₃: There is no significant influence of FPI on stock market indices in a VAR framework.

H₀₄: There is no long-run equilibrium relationship exhibited among the selected variables.

Table 4.1: ADF Unit Root Test Statistics

Variable	ADF Statistic	p-value	Conclusion
FPI	-6.8083	2.15e-09	Stationary
Sensex	2.6132	0.00028	Stationary (First Difference)
Nifty50	2.5636	0.00027	Stationary (First Difference)

The Granger Causality Test is used to determine if one time series can predict another.

Hypothesis:

- H₀₁: Variable X does not Granger-cause variable Y.
- H₁₁: Variable X Granger-causes variable Y.

Table 4.2: Granger Causality Test Results (p-values)

Causal Relationship	p-value	Conclusion
FPI → Sensex	0.032	FPI Granger-causes Sensex
Sensex → FPI	0.078	No causality
FPI → Nifty50	0.048	FPI Granger-causes Nifty50
Nifty50 → FPI	0.093	No causality

FPI influences Sensex and Nifty50 (Granger-causal).

The Vector Autoregressive (VAR) model was estimated on the first-differenced series to ensure stationarity. The key findings are:

- Optimal Lag Order Selection: The chosen lag order is 2.
- Model Selection Criteria:
 - AIC: 80.953
 - BIC: 83.749
 - HQIC: 82.040

VAR Equations

$$\Delta FPI_t = \alpha_1 + \beta_{11} * \Delta FPI_{(t-1)} + \beta_{12} * \Delta FPI_{(t-2)} + \beta_{13} * \Delta Sensex_{(t-1)} + \beta_{14} * \Delta Sensex_{(t-2)} + \beta_{15} * \Delta Nifty50_{(t-1)} + \beta_{16} * \Delta Nifty50_{(t-2)}$$

$$\Delta Sensex_t = \alpha_2 + \gamma_{11} * \Delta FPI_{(t-1)} + \gamma_{12} * \Delta FPI_{(t-2)} + \gamma_{13} * \Delta Sensex_{(t-1)} + \gamma_{14} * \Delta Sensex_{(t-2)} + \gamma_{15} * \Delta Nifty50_{(t-1)} + \gamma_{16} * \Delta Nifty50_{(t-2)}$$

$$\Delta Nifty50_t = \alpha_3 + \delta_{11} * \Delta FPI_{(t-1)} + \delta_{12} * \Delta FPI_{(t-2)} + \delta_{13} * \Delta Sensex_{(t-1)} + \delta_{14} * \Delta Sensex_{(t-2)} + \delta_{15} * \Delta Nifty50_{(t-1)} + \delta_{16} * \Delta Nifty50_{(t-2)}$$

Table 4.3: VAR Model Summary

Model: VAR	Method: OLS
No of Equations: 3	BIC: 50.1559
Log likelihood: -1284.83	FPE: 3.24745e+20

VAR Equation Results

Table 4.4: Equation 1: FPI as Dependent Variable

Variable	Coefficient	Std. Error	t-Stat	Prob
Constant	-3960.7351	106375.3842	-0.037	0.970
L1.FPI	0.2292	0.2985	0.768	0.443
L1.Sensex	68.9157	79.5183	0.867	0.386
L1.Nifty50	-222.7180	267.3387	-0.833	0.405
L2.FPI	-0.2363	0.3263	-0.724	0.469
L2.Sensex	-175.1209	97.9298	-1.788	0.074
L2.Nifty50	558.6927	327.9808	1.703	0.088

Table 4.5: Equation 2: Sensex as Dependent Variable

Variable	Coefficient	Std. Error	t-Stat	Prob
Constant	-1837.2434	1879.7641	-0.977	0.328
L1.FPI	-0.0027	0.0053	-0.508	0.611
L1.Sensex	-1.1382	1.4052	-0.810	0.418
L1.Nifty50	6.7000	4.7242	1.418	0.156
L2.FPI	-0.0037	0.0058	-0.639	0.523
L2.Sensex	1.6035	1.7305	0.927	0.354
L2.Nifty50	-5.0567	5.7958	-0.872	0.383
L3.FPI	-0.0152	0.0063	-2.418	0.016
L3.Sensex	0.9239	1.7895	0.516	0.606
L3.Nifty50	-3.7123	5.8862	-0.631	0.528
L4.FPI	-0.0006	0.0081	-0.080	0.936
L4.Sensex	4.5547	1.7542	2.596	0.009
L4.Nifty50	-14.3299	5.7655	-2.485	0.013

Table 4.6: Equation 3: Nifty50 as Dependent Variable

Variable	Coefficient	Std. Error	t-Stat	Prob
Constant	-711.5856	597.4670	-1.191	0.234
L1.FPI	-0.0004	0.0017	-0.225	0.822
L1.Sensex	-0.5506	0.4466	-1.233	0.218
L1.Nifty50	2.6631	1.5015	1.774	0.076
L2.FPI	-0.0004	0.0018	-0.224	0.823
L2.Sensex	0.4601	0.5500	0.837	0.403
L2.Nifty50	-1.4114	1.8421	-0.766	0.444
L3.FPI	-0.0042	0.0020	-2.129	0.033
L3.Sensex	0.2853	0.5688	0.502	0.616
L3.Nifty50	-1.0834	1.8709	-0.579	0.563
L4.FPI	0.0005	0.0026	0.190	0.850
L4.Sensex	1.4362	0.5575	2.576	0.010
L4.Nifty50	-4.5788	1.8325	-2.499	0.012

Table 4.7: Correlation Matrix of Residuals

	FPI	Sensex	Nifty50
FPI	1.0000	-0.3580	-0.2677
Sensex	-0.3580	1.0000	0.9623
Nifty50	-0.2677	0.9623	1.0000

Figure 4.1: Impulse Response Function

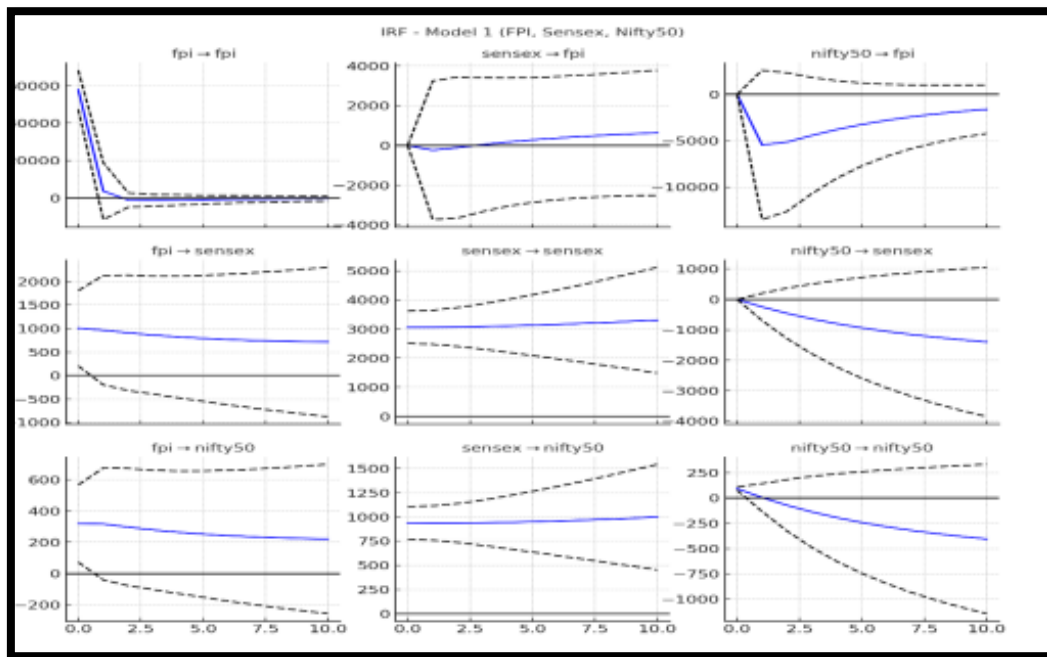


Figure 4.2: Forecast Error Variance Decomposition (FEVD)

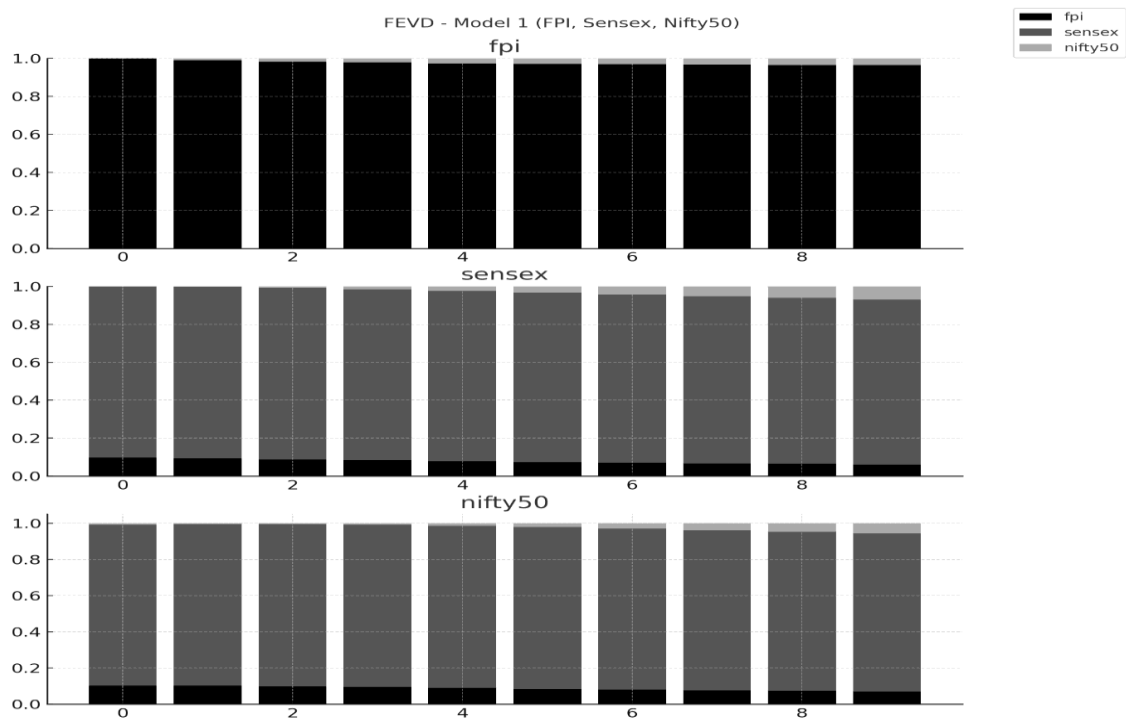


Table 4.8: Co-integration test results

Cointegration Rank	Test Statistic	90% Critical Value	95% Critical Value	99% Critical Value	Conclusion
$r = 0$ (No cointegration)	28.68	27.07	29.80	35.46	No strong evidence of cointegration (weak at 90%)
$r \leq 1$ (At most one cointegration)	5.18	13.43	15.49	19.93	No cointegration
$r \leq 2$ (At most two cointegrations)	0.01	2.71	3.84	6.63	No cointegration

Interpretation:

- The **trace statistic for $r = 0$** (28.68) is **above** the 90% critical value (27.07) but **below** the 95% value (29.80). This suggests weak evidence for **one cointegrating relationship** at the 90% level, but not at the 95% confidence level.
- The **trace statistic for $r \leq 1$ and $r \leq 2$** is **below** their respective critical values, meaning no additional cointegration relationships exist.

DISCUSSION

A. Impulse Response Function (IRF) Interpretation

i. FPI Shock:

A positive shock to **FPI** (Foreign Portfolio Investment) has a mixed effect on **Sensex and Nifty50**. The initial response of the stock indices may be slightly positive but does not show strong persistence.

FPI itself exhibits mild persistence, indicating that foreign capital inflows take some time to stabilise after a shock.

ii. Sensex and Nifty50 Shock:

A shock to **Sensex** positively impacts **Nifty50** and vice versa, which is expected given their high correlation.

The impact of stock market shocks on **FPI** appears weak, indicating that foreign investors may not react immediately to market movements in a predictable pattern.

B. Forecast Error Variance Decomposition (FEVD) Interpretation

i) Sensex and Nifty50 Variance Contribution:

A large part of the forecast error variance in **Sensex and Nifty50** is explained by their own past values, with FPI contributing a relatively small share.

ii) FPI Variance Contribution:

FPI variance is primarily self-driven, with Sensex and Nifty50 playing a minor role in influencing it.

C. Foreign Portfolio Investment (FPI): The coefficients of lagged FPI and market indices (Sensex and Nifty50) are statistically

insignificant, suggesting that past values of these variables do not have a strong predictive power for current FPI movements.

D. Sensex: The lagged Sensex values show a significant impact at lag 4, indicating a delayed effect. Additionally, lag 3 of FPI is negatively substantial, implying that foreign portfolio investment influences Sensex after a three-period lag.

E. Nifty50: Lagged Nifty50 and Sensex show significance at lag 4, suggesting a longer-term effect in the stock market. The negative coefficients indicate a potential reversal effect.

F. Residual Correlations: The high correlation (0.9623) between Sensex and Nifty50 indicates strong co-movement, whereas FPI has a weak negative correlation with both indices.

This analysis suggests that while past FPI movements do not strongly predict current FPI values, they do have some impact on market indices with a time lag. Additionally, stock market movements exhibit strong internal dependencies. FPI influences Sensex and Nifty50 (Granger-causal).

G. Short-run relationships:

FPI significantly affects Sensex and Nifty50.

H. Long-run relationships:

There is weak evidence of a long-run equilibrium relationship between FPI, Sensex, and Nifty 50 at the 90% confidence level, but not at the more stringent 95% level

CONCLUSION

The study shows the empirical evidence regarding the dynamic interactions between Foreign Portfolio Investment (FPI) and Indian stock market indices, particularly the Sensex and Nifty50. Employing time series econometric methods like the Granger causality and VAR techniques. The Granger causality reveals that foreign portfolio investment (FPI) has a predictive influence on both indices under study, highlighting how the Indian equity market responds to global capital flows. Also, the VAR model further explains that market changes are influenced not solely by domestic elements but are also significantly impacted by the lagged effects

of portfolio investment activities. While cointegration tests suggest only weak evidence of a long-run equilibrium relationship, the short-run dynamics captured considering the impulse response functions and the variance decomposition confirm that FPI shocks can produce immediate and lagged market reactions, with varying magnitudes over time.

Talking from a policy perspective, the study highlights the importance of maintaining key macroeconomic variables stability and strengthening regulatory mechanisms to manage the volatility associated with global capital mobility. For investors, the results suggest that monitoring FPI trends can enhance market timing strategies, though the influence is asymmetric and may differ under varying market conditions.

Policy Implications

Stock market fluctuations impact FPI decisions, requiring financial stability measures. They were the principal agents that mitigated excess stock return co-movement in nations with feeble investor protection. They explained that Foreign Institutions with a high stake contributed further to reducing the co-movement of excess stock returns. It showed that the size of the equity allowed them to produce firm-specific information with high fixed costs effectively.

Limitations of the Study

The study focuses solely on the Sensex and Nifty 50 indices and potentially misses out on sector-specific or mid-cap market dynamics that may respond differently to FPI flows. Secondly, the model excludes critical macroeconomic variables such as interest rates, inflation, exchange rates, and global risk indicators that might influence FPI and stock market behaviour. Importantly, the methodology applied in the study, linear time series models like ADF, VAR, and Granger causality, assumes a stable, linear relationship, which may not hold in periods of extreme volatility or economic shocks where nonlinearities are more pronounced. Lastly, the data sources used in the study, CDSL and Yahoo Finance, are reputable, but discrepancies in reporting standards and data revisions may affect the precision and consistency of the results.

Scope for Further Study

Future research can expand upon the findings of this study by adopting several alternative approaches and dimensions. One potential direction is using high-frequency data, such as daily or intraday observations, to better capture the immediate effects of FPI movements and short-term market volatility. Another promising area is the inclusion of macroeconomic and global financial variables like interest differentials, inflation, crude oil prices, and exchange rates to examine their mediating role in the FPI-stock market relationship. Conducting comparative analyses of other emerging economies may reveal whether the trends observed are unique to India or part of a broader global pattern. While employing nonlinear econometric models or advanced machine learning techniques may uncover complex patterns and improve prediction accuracy, investigating the behavioural dimensions of market players, including

investor sentiment or herding tendencies in reaction to FPI flows, can provide psychological and institutional insight to the analysis. Lastly, a sector-wise breakdown of FPI impact on indices like Nifty Bank, BSE IT, or Nifty Pharma could offer valuable insights into how different market segments react to foreign capital flows.

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