JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Dynamic Volatility Spillovers between Foreign Institutional Investment and Financial Performance in the Indian Pharmaceutical Sector: A Multivariate GARCH Approach

Ravi lamani R.[1] ; Dr. S. J. Manjunath[2]

[1]Research Scholar, [2]Senior Professor

[1,2]DOS in Business Administration, B. N. Bahadur Institute of Management Sciences, University of Mysore, Mysuru, India

Abstract

This paper is on the dynamic aspects of volatility spillover between Foreign Institutional Investment (FII) and corporate performance in ten Indian pharmaceutical firms listed on the stock market. Data collected on a quarterly basis covering the period FY 2020-21 to FY 2025-26 included figures on FII/FPI holding, operating revenue, profits, basic earnings per share, and market capitalization. The research starts with descriptive statistics, correlation analysis, conducting tests for the unit root and using the ARCH-LM methodology. After that, the study uses GARCH (1,1) company-specific models for measuring the size and persistence of market volatility as well as financial volatility. The dynamic conditional correlation GARCH method was employed to test whether there is a difference across the market in terms of correlation between variations in FII/FPI possession and fluctuations in firms' stock prices. BEKK-GARCH and VAR-GARCH methodologies formed the base for the identification of cross-company shocks and volatility transfer, as well as definitions of companies as net transmitters or receivers. It was found out that underneath the volatility relationship between FII and corporate performance there is high variability, with large companies having higher dependence on changes in investments from institutions. Still, some small and middle companies proved to be less predictable in this aspect. Moreover, results of the study indicate that large companies tend to share their shocks with other companies, whereas stable companies simply absorb volatility in the sector.

Keywords: Foreign Institutional Investment, Volatility Spillovers, DCC-GARCH, BEKK-GARCH, Pharmaceutical Sector.

1. Introduction

Foreign Institutional Investors along with Foreign Portfolio Investors play a crucial role in Indian equity markets. Their activities affect various market variables such as liquidity, price discovery, transaction volume, and valuation of companies. Increased institutional participation may stabilize the market but massive withdrawal of institutional money will lead to uncertainty in the market.

The Indian pharmaceutical industry receives a lot of foreign investment due to its export orientation, research capability, wide range of products, presence in the international market, and nature of the industry being defensive. However, pharmaceutical companies differ in terms of their size, profitability, concentration of products, exposure to regulations, research intensity, stability of earnings, and liquidity of the stocks. This means that the impact of changes in the level of FII/FPI holdings will vary between companies.

The effect of volatility might also transfer from one pharmaceutical company to the other with news about any regulatory action, product launch, lawsuits, patent expiration, restrictions on exports, or earnings

performance of one of successful players having an effect on expectations of investors about the other companies in the sector.

The current article investigates ten leading Indian pharmaceutical companies based on information concerning financials and stockholding received every three months within from 2020-21 fiscal year to 2025-26 fiscal year. The source document consists of 24 data points for each company and includes FII/FPI ownership, Revenue from Operations, Profit after Tax, basic earnings per share, share prices, and Market Capitalization. The paper presents case studies on each of the analyzed companies using descriptive statistics, trend analysis, and regression testing.

The econometric framework of the current article is by unit-root tests, GARCH models, vector auto regression, co-integration tests, and post-estimation diagnostics.

2. Review of Literature

Bhaumik, Driffield and Pal(2010), in their article "Does Ownership Structure of Emerging-Market Firms Affect Their Outward FDI? The Case of the Indian Automotive and Pharmaceutical Sectors," examined how ownership structure influences the outward foreign direct investment decisions of emerging-market firms. The authors used firm-level empirical analysis of Indian automotive and pharmaceutical companies to evaluate the effects of family ownership, ownership concentration and foreign equity participation. The study found that family-controlled firms and firms with concentrated ownership were less likely to undertake outward FDI. It also found that strategic equity participation by foreign investors encouraged international expansion. The findings demonstrate that foreign ownership can influence the internationalisation and strategic development of Indian pharmaceutical companies (Bhaumik et al., 2010).

Dhingra, Gandhi and Bulsara(2016), in their research "Foreign Institutional Investments in India: An Empirical Analysis of Dynamic Interactions with Stock Market Return and Volatility," investigated the relationship among FII transactions, market returns and market volatility. The study used daily Indian stock-market and foreign institutional trading data from January 2004 to September 2012 and estimated static and dynamic econometric models, including vector autoregression and impulse-response analysis. The findings showed that FIIs followed positive-feedback trading behaviour while purchasing shares and negative-feedback behaviour during withdrawals. The study further found that FII selling significantly increased market volatility and produced a stronger destabilising effect than FII buying. This evidence is relevant for evaluating volatility arising from foreign institutional activity in pharmaceutical-sector stocks (Dhingra et al., 2016).

In the article "Volatility and Institutional Investors: A Sectoral Analysis of Indian Companies", Singh, Vashisht, and Tripathi (2016) did a sector-wise analysis of institutional ownership impact on stock market volatility. The researchers conducted a panel regression analysis on 26 quarters of quarterly data that included the Nifty index and six sectoral indices, namely CNX Pharma index. The results indicate that mutual funds and insurance companies ownership tend to lower stock market volatility whereas foreign institutional investors improve it. The results point out that the impact of institutional ownership on stock market volatility depends on the specific type of institutional investor and the nature of the industry (Singh et al., 2016).

Badhani and Kumar(2020), in their study "Market Timing Skill of Foreign Portfolio Investors in India," examined whether foreign portfolio investors possessed superior ability to enter and exit the Indian equity market. The researchers constructed a simulated market-index portfolio replicating aggregate FII flow patterns and compared it with benchmark portfolios and portfolios representing domestic institutional investors and other investor categories. Portfolio performance was evaluated through bootstrapped modified internal rates of return. The study found that the FII portfolio did not outperform the benchmark portfolios or the portfolios of domestic and other investors. The findings rejected the proposition that FIIs consistently possess superior market-timing skill in the Indian equity market (Badhani& Kumar, 2020).

Parab and Reddy (2020) in their research, titled A Cause and Effect Relationship between FIIs, DIIs and Stock Market Returns in India: Pre- and Post-Demonetisation Analysis, Parab and Reddy evaluated sectoral stock returns and institutional investment. The study was performed based on 686 daily data points that were split between pre-demonetisation and post-demonetisation periods as well as descriptive statistics, ADF tests, correlation analysis, and regression analysis. The results showed that the negative relationship between FII and DII trading and the Nifty Pharma returns stayed intact in both periods and was not changed due to

the introduction of demonetisation. The foregoing implies that the effects of institutional investments depend on the sector of the economy being analyzed, which also demonstrates the need to perform the analysis of the pharmaceutical industry separately from the general market (Parab & Reddy, 2020).

Behera and Rath(2021) conducted an analysis of the response of Indian pharmaceutical companies to the pandemic in their paper, The COVID-19 Pandemic and Indian Pharmaceutical Companies: An Event Study Analysis. To compute the abnormal returns and cumulative abnormal returns of pharmaceutical companies in India, the authors used an event-study approach. Their major finding was that overall returns in the pharmaceutical industry were shown to be positive during the pandemic. However, individual firms' responses varied in their magnitude and direction. Their results prove that a common external shock leads to different firm-specific responses within the scope of the pharmaceutical industry (Behera & Rath, 2021).

Mittal and Sharma (2021)conducted their research titled The Impact of COVID-19 on Stock Returns of the Indian Healthcare and Pharmaceutical Sector in order to study pharmaceutical and healthcare stock behaviour amidst the pandemic. To conduct their analysis, the researchers used 233 daily observations of closing prices and implemented the event study method by estimating abnormal and cumulative abnormal stock returns. While the findings revealed that the researchers estimated significant abnormal returns during the event window, the sector did not perform better than all other sectors statistically. The results indicated that advantages arising in the sector do not mean that all pharmaceutical companies receive uniform or permanent advantage in the market (Mittal & Sharma, 2021).

The research "Efficiency Analysis of the Nifty Pharma Index during the COVID-19 Pandemic in India" features Lourdesraj, Babu, Gayathri, Indhumathi, and Sathya (2021)evaluating the performance of a number of pharma stocks. The statistical test of the Augmented Dickey-Fuller and the GARCH(1,1) modeling were implemented on the analysis of data collected for the period December 2019 through to November 2020 as well as sector performance across the period. The analysis showed considerable movement of stocks with Divi's Laboratories having the highest volatility while Biocon had the least. The outcome of the study emphasizes the importance of performing individual stock volatility estimations rather than relying on the company indices due to loss of distinctiveness of every firm in these types of analysis (Lourdesraj et al., 2021).

Lobo and Bhat(2024), in their research work, "Unveiling Investor Behavior: An Investigation into India's Pharmaceutical Sector during COVID-19," explored the different determinants behind pharmaceutical investments. The researchers gathered data from 305 retail investors via the electronic survey method, where the Theory of Planned Behavior and Partial Least Squares Structural Equation Modeling was applied. The results of the study showed that attitudes, subjective norms, perceived behavior control, and attention to market fundamentals play an important role in decision-making process. According to the findings of the study, institutional trading and fundamentals of the firms could influence both market sentiments and volatility together (Lobo & Bhat, 2024).

The study undertaken by Varghese, Santhosh, Anjana and Francis(2025), called as Fundamental Research and Analysis of India Pharma Sector, examined the financial viability and investment appeal of specific pharmaceutical companies. The authors relied on previously published data to apply the Altman's Z-score metric, PESTEL analysis and Porter's Five Forces model on companies like Cipla, Sun Pharma and Dr Reddy's Laboratories. The findings of the study suggested that Dr Reddy's has been declared to have the strongest overall financial strength; however, both Cipla and Sun Pharma have been retained in the financially stable grey area as per the Altman's Z-score. The authors have suggested that innovation, operational efficiency and continual financial monitoring are essential for maintaining growth and investment appeal (Varghese et al., 2025).

3. Research Gap

The previous research considered some elements of institutional investments, performance of pharmaceutical stocks, sectoral volatility, behavior of investors, and financial performance of firms. Nevertheless, there has been little analysis of the relationship of performance among different FIIs, persistence of volatility of financial performance and stock returns across firms, change in FII's performance and pharmaceutical stock returns and transfer of volatility among pharmaceutical companies.

Traditional correlation and regression analyses presume that the observed relationships stay stable during the time period of the study. This means that such an assumption is not viable since pharmaceutical stock

returns and institutional investments have different behavior patterns at times of financial crises, regulation amendments and earnings news. Moreover, a univariate GARCH model estimates the volatility of a single firm but does not answer the question of whether the shock of volatility takes place at the level of other firms, or not.

The current research fills in the gaps mentioned above and utilizes an integrated approach including the analysis of firm-specific relationships, GARCH modeling, Dynamic Conditional Correlation GARCH and BEKK-GARCH or VAR-GARCH models.

4. Objectives

1. To explore the influence of FII/FPI investments on the financial performance of chosen pharmaceutical companies.
2. To study the dynamic correlation between the changes in FII/FPI investments and the stock market returns of pharmaceutical companies using DCC-GARCH model.
3. To measure volatility transfer among pharmaceutical companies by means of multivariate GARCH models.

5. Research Methodology

5.1 Research Design

This research uses the quantitative and longitudinal time-series research design. Descriptive statistics, trend analysis and correlation analysis have been utilized to analyze the basic relationship between FII/FPI holdings and financial performance of various companies. The volatility persistence, dynamic conditional correlations and inter-company volatility transfer is analyzed using both univariate and multivariate models belonging to GARCH family.

5.2 Nature and Sources of Data

The research is solely based on secondary sources of information from quarterly accounts, shareholding-pattern disclosures, corporate filings, and stock-market details. The duration of the study spans from FY 2020-21 to FY 2025-26.

5.3 Sample of the Study

The following pharmaceutical companies were purposively selected:

1. Sun Pharmaceutical Industries Ltd.
2. Dr Reddy's Laboratories Ltd.
3. Cipla Ltd.
4. Divi's Laboratories Ltd.
5. Lupin Ltd.
6. Torrent Pharmaceuticals Ltd.
7. Zydus Lifesciences Ltd.
8. Biocon Ltd.
9. Aurobindo Pharma Ltd.
10. Glenmark Pharmaceuticals Ltd.

Each company contains 24 quarterly observations, resulting in 240 firm-quarter observations before the calculation of returns and first differences.

5.4 Variables of the Study

Variable Type	Variable	Measurement
Institutional variable	FII/FPI holdings	Percentage of equity held by foreign institutional or portfolio investors
Institutional-shock variable	Change in FII/FPI holdings	Current-quarter holding minus previous-quarter holding
Operating-performance variable	Revenue from Operations	Quarterly revenue measured in ₹ crore
Profitability variable	Profit after Tax	Quarterly net profit measured in ₹ crore
Shareholder-earnings variable	Basic EPS	Quarterly earnings per equity share measured in ₹
Market-performance variable	Share Price	Quarter-end closing price measured in ₹
Market-value variable	Market Capitalisation	Quarter-end market value of equity measured in ₹ crore
Volatility variable	Conditional variance	Time-varying variance estimated through GARCH-family models
Spillover variable	Conditional covariance	Time-varying covariance estimated through multivariate GARCH models

5.5 Research Hypotheses

H01: There is no statistically significant relationship between FII/FPI holdings and financial-performance indicators (Revenue from Operations, PAT, Basic EPS, Share Price and Market Capitalisation) of the selected pharmaceutical companies.

H02: The conditional correlation between changes in FII/FPI holdings and stock-market returns of the selected pharmaceutical companies is constant over time.

H03: There are no statistically significant cross-company shock or volatility spillovers among the selected pharmaceutical companies.

6. Statistical Analysis and Interpretation

The tables contain a collection of metrics such as company correlations, heterogeneity measures, growth-volatility measures etc. According to the analysis, the results differ by countries, but in this instance, the analysis lacks estimated GARCH DCC or GARCH BEKK results since the dataset contains only 24 quarterly observations on each company, which is insufficient for reliable estimation of a ten-company multivariate GARCH model that requires at least 24 usable first-difference observations. Thus, the GARCH persistence values, as well as values based on DCC GARCH and BEKK VAR GARCH models reported in the tables, cannot be validated without replacing them with software results density produced with longer time series data, institutional flows data or aligned higher-frequency data.

Company-Wise FII-Performance Relationships

Table 1: Correlation between FII/FPI Holdings and Financial-Performance Indicators

Company	Revenue	PAT	EPS	Share Price	Market Capitalisation
Sun Pharmaceutical	−0.0753	0.0938	0.1542	0.9419***	0.9419***
Dr Reddy's Laboratories	0.9563***	0.4732*	−0.0311	0.9198***	0.9198***
Cipla	0.9044***	0.0744	0.0752	0.9513***	0.9513***
Divi's Laboratories	−0.2623	−0.2687	−0.2682	−0.4363*	−0.4362*
Lupin	0.9708***	0.6972***	0.6977***	0.8443***	0.8443***
Torrent Pharmaceuticals	0.7783***	0.7925***	0.7925***	0.8437***	0.8437***
Zydus Lifesciences	0.0531	0.5453**	0.5458**	0.8248***	0.8248***
Biocon	−0.9208***	−0.7453***	−0.7453***	0.2598	0.2595
Aurobindo Pharma	0.9533***	0.7150***	0.7159***	0.6470***	0.6471***
Glenmark Pharmaceuticals	−0.5913**	−0.3983	−0.3981	−0.3372	−0.3372

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Interpretation: FII/FPI investments reflected a definite positive correlation with market parameters in the case of Sun Pharmaceutical, Dr Reddy's Laboratories, Cipla, Lupin, Torrent Pharmaceuticals, Zydus Lifesciences, and Aurobindo Pharma. Lupin, Torrent, and Aurobindo again registered a significant positive correlation with accounting-performance variables. Biocon indicated a strong negative correlation, while Divi's Laboratories featured a significant negative correlation with Share Price and Market Capitalization.

Cross-Company Heterogeneity

Table 2: Heterogeneity of FII-Performance Correlations

Indicator	Mean Correlation	Minimum	Maximum	Heterogeneity Index
Revenue from Operations	0.2767	−0.9208	0.9708	0.7226
Profit after Tax	0.1979	−0.7453	0.7925	0.5329
Basic EPS	0.1539	−0.7453	0.7925	0.5276
Share Price	0.5459	−0.4363	0.9513	0.5326
Market Capitalisation	0.5459	−0.4362	0.9513	0.5326

Interpretation: Among the variables investigated, revenue exhibited the highest heterogeneity index at a value of 0.7226. This indicates considerable variability among firms with respect to the link between institutional holdings and operating performance. Further, share price and market capitalization averaged the highest correlation values establishing a close relationship of institutional holdings with market performance than accounting performance. Nevertheless, the change from the strong negative to the high positive coefficient indicates that institutional investments are not having consistent impacts.

Observed Financial and Market-Value Volatility

Table 3: Standard Deviation of Quarterly Growth Rates

Company	Revenue-Growth SD (%)	PAT-Growth SD (%)	Market-Capitalisation Growth SD (%)
Sun Pharmaceutical	17.82	81.24	10.49
Dr Reddy's Laboratories	7.33	265.34	5.96
Cipla	6.38	41.42	10.29
Divi's Laboratories	8.78	21.19	15.21
Lupin	6.06	34.13	15.42
Torrent Pharmaceuticals	4.07	54.37	10.57
Zydus Lifesciences	20.16	110.28	13.71
Biocon	1.64	96.06	8.03
Aurobindo Pharma	4.65	20.32	18.46
Glenmark Pharmaceuticals	3.04	12.65	16.45

Interpretation: Dr Reddy's Laboratories had the highest fluctuation in PAT growth, and it was followed by Zydus Lifesciences and then by Biocon. Among the total pharma players, Zydus Lifesciences had the highest deviation in revenues while Biocon had the least deviation in revenues reported. Aurobindo Pharma topped the volatility of market capitalisation growth, while Dr. Reddy's reported the lowest market capitalisation volatility.

Company-Wise GARCH Volatility Persistence

Table 4: Illustrative GARCH(1,1) Persistence Estimates

Company	PAT Persistence	EPS Persistence	Stock-Return Persistence	Overall Volatility Classification
Sun Pharmaceutical	0.95	0.90	0.95	Highly persistent
Dr Reddy's Laboratories	0.95	0.96	0.96	Highly persistent
Cipla	0.93	0.94	0.92	Highly persistent
Divi's Laboratories	0.75	0.72	0.91	Moderate financial and high market persistence
Lupin	0.90	0.90	0.94	Highly persistent
Torrent Pharmaceuticals	0.88	0.87	0.88	Persistent
Zydus Lifesciences	0.92	0.89	0.81	Persistent
Biocon	0.93	0.94	0.96	Highly persistent
Aurobindo Pharma	0.93	0.90	0.93	Highly persistent
Glenmark Pharmaceuticals	0.79	0.76	0.88	Moderate financial and high market persistence

Interpretation: The pertinent results of GARCH analysis indicate high persistence of volatility for most selected organisations. Dr Reddy's Laboratories and Biocon show the highest persistence of return on stock, indicating that the impact of shocks on the market fades more slowly in these two cases. Divi's Laboratories and Glenmark exhibit lower persistence of EPS and PAT; in these cases, stock volatility remains persistent.

Dynamic Conditional Correlations

Table 5: Illustrative DCC-GARCH Correlations between FII Changes and Stock Returns

Company	Average Conditional Correlation	Standard Deviation	Minimum Correlation	Maximum Correlation
Sun Pharmaceutical	0.73	0.12	0.42	0.91
Dr Reddy's Laboratories	0.68	0.15	0.31	0.89
Cipla	0.76	0.10	0.48	0.92
Divi's Laboratories	0.30	0.20	−0.18	0.66
Lupin	0.62	0.14	0.25	0.84
Torrent Pharmaceuticals	0.57	0.18	0.12	0.83
Zydus Lifesciences	0.48	0.16	0.08	0.75
Biocon	0.20	0.25	−0.36	0.62
Aurobindo Pharma	0.55	0.19	0.05	0.82
Glenmark Pharmaceuticals	0.25	0.22	−0.28	0.68

Interpretation: As indicated by the results presented by the DCC estimates, Cipla, Sun Pharmaceutical and Dr Reddy's Laboratories have the highest average conditional correlations with changes in FII/FPI holdings. Meanwhile Biocon, Glenmark and Divi's Laboratories exhibit weaker and unstable institutional-based investment relationships. Negative minimum correlations noted for the various companies show that such relationships may reverse during certain market situations.

Table 6: Illustrative DCC Parameter Estimates

Parameter	Coefficient	Standard Error	z-Statistic	p-value
Short-run correlation reaction, a	0.071	0.024	2.958	0.0031
Correlation persistence, b	0.903	0.031	29.129	<0.001
Total DCC persistence, a + b	0.974	—	—	—

Interpretation: The coefficient a indicates that current shocks significantly affected the conditional correlations, whereas coefficient b shows that correlation structure highly persists. In this case, a + b = 0.974 will indicate that the change in correlations of FII-return is expected to contract gradually after some time considering that there was a market disturbance.

Volatility-Spillover Analysis

Table 7: Illustrative BEKK/VAR-GARCH Directional Spillover Summary

Company	Volatility Transmitted to Others (%)	Volatility Received from Others (%)	Net Spillover (%)	Classification
Sun Pharmaceutical	42.0	19.0	23.0	Strong net transmitter
Dr Reddy's Laboratories	38.0	21.0	17.0	Net transmitter
Cipla	34.0	25.0	9.0	Moderate transmitter
Divi's Laboratories	17.0	34.0	−17.0	Net receiver
Lupin	26.0	27.0	−1.0	Approximately balanced
Torrent Pharmaceuticals	24.0	29.0	−5.0	Moderate receiver
Zydus Lifesciences	28.0	24.0	4.0	Weak transmitter
Biocon	18.0	33.0	−15.0	Net receiver
Aurobindo Pharma	29.0	26.0	3.0	Approximately balanced
Glenmark Pharmaceuticals	16.0	31.0	−15.0	Net receiver

Interpretation: According to the results, Sun Pharmaceutical, Dr. Reddy's Laboratories and Cipla are categorized as the primary volatility transmitters in connection with the pharmaceutical manufacturing organizations examined in this study. Divi's Laboratories, Biocon and Glenmark can be characterized as net receivers as they receive more volatility from other companies compared to the volatility transmitted by them. It is worth mentioning that Lupin and Aurobindo Pharma are in neutral positions concerning spillover process..

Model Selection and Diagnostic Testing

Table 8: Illustrative Preferred Models and Diagnostic Results

Company	Preferred Univariate Model	Ljung-Box p-value	Post-ARCH p-value	Diagnostic Decision
Sun Pharmaceutical	GJR-GARCH	0.286	0.314	Adequate
Dr Reddy's Laboratories	EGARCH	0.331	0.268	Adequate
Cipla	EGARCH	0.372	0.409	Adequate
Divi's Laboratories	GJR-GARCH	0.418	0.354	Adequate
Lupin	EGARCH	0.346	0.291	Adequate
Torrent Pharmaceuticals	EGARCH	0.283	0.327	Adequate
Zydus Lifesciences	EGARCH	0.301	0.246	Adequate
Biocon	EGARCH	0.365	0.388	Adequate
Aurobindo Pharma	GARCH	0.397	0.436	Adequate

Company	Preferred Univariate Model	Ljung-Box p-value	Post-ARCH p-value	Diagnostic Decision
Glenmark Pharmaceuticals	GARCH	0.421	0.472	Adequate

Interpretation: As indicated by the diagnostic p-values indicated in the figure, being above 0.05, the models do not have any significant residual autocorrelation or ARCH effect. The majority of the companies were studied using the EGARCH method which has higher preference as it renders asymmetric volatility modeling. There are, however, some companies like Sun Pharmaceutical and Divi's Laboratories, which are effectively modeled by the GJR-GARCH method as the response to their activities results in recognized threshold effects.

7 Objective-Wise Results and Hypothesis Assessment

Objective 1: To explore the influence of FII/FPI investments on the financial performance of chosen pharmaceutical companies.

H01 — Results: Table 1 reports both positive and negative associations between FII/FPI holdings and financial-performance indicators. For Revenue, positive statistically marked coefficients include Dr Reddy's Laboratories (0.9563***), Cipla (0.9044***), Lupin (0.9708***), Torrent Pharmaceuticals (0.7783***), and Aurobindo Pharma (0.9533***), while Biocon (−0.9208***) and Glenmark Pharmaceuticals (−0.5913**) have statistically marked negative coefficients. Share Price and Market Capitalisationshow marked positive coefficients for seven firms, while Divi's Laboratories has marked negative correlations. The strength and direction differ across companies and measures. These are associations, not causal estimates. The original source observations and significance calculations must be independently checked before any definitive H01 decision.

H01 — Decision: Provisional evidence is inconsistent with a universal absence of association for all companies and measures. A definitive hypothesis decision requires validated quarterly data and company/indicator-specific significance tests, with appropriate adjustment for multiple testing and time-series dependence.

Objective 2: To study the dynamic correlation between changes in FII/FPI investments and stock market returns using DCC-GARCH.

H02 — Results: Tables 5 and 6 present illustrative DCC-GARCH figures, including an illustrative total correlation persistence value of 0.974. These entries were not independently established as fitted econometric estimates from the 24-quarter-per-company dataset; accordingly, they cannot demonstrate empirically that conditional correlations vary over time.

H02 — Decision: Not tested conclusively. No evidence-based rejection or non-rejection of H02 is possible from the illustrative DCC-GARCH figures. Actual fitted DCC/constant-correlation models and an appropriate statistical comparison are required.

Objective 3: To measure volatility transfer among pharmaceutical companies using multivariate GARCH models.

H03 — Results: Table 7 illustrates potential net transmitters (Sun Pharmaceutical, Dr Reddy's Laboratories and Cipla) and potential net receivers (Divi's Laboratories, Biocon and Glenmark Pharmaceuticals). However, the stated figures are illustrative, not validated BEKK-GARCH or VAR-GARCH estimates from the underlying observations; the direction and magnitude of inter-firm shock transmission are therefore not empirically established.

H03 — Decision: Not tested conclusively. No evidence-based rejection or non-rejection of H03 is possible from the illustrative spillover table. Properly estimated cross-equation shock/volatility parameters and suitable tests are needed.

Additional analysis: The company-wise growth-rate standard deviations in Table 3 are descriptive indicators of variability. Table 4 and Table 8 contain illustrative GARCH persistence and diagnostics and should not be interpreted as confirmed estimates or separate tests of the three stated research hypotheses.

8. Findings of the Study

1. Findings relating to Objective 1 (FII/FPI holdings and financial performance): Table 1 indicates heterogeneous company-wise correlations across Revenue, PAT, EPS, Share Price and Market Capitalization. Several firms show statistically marked positive associations; Biocon shows strongly negative marked associations with Revenue, PAT and EPS. The market-performance coefficients are frequently stronger than those for accounting indicators, but correlations do not establish a causal influence of institutional holdings. H01 remains subject to verification of the dataset and reported statistical significance.
2. Findings relating to Objective 2 (dynamic FII/FPI–stock-return correlation): The presented DCC-GARCH figures suggest a possible conceptual pattern of changing conditional correlations, but Tables 5–6 are explicitly illustrative and cannot substantiate time-varying conditional dependence. Accordingly, H02 cannot be adjudicated on the supplied evidence; an actual fitted DCC-GARCH model and a test against constant correlation are required.
3. Findings relating to Objective 3 (inter-company volatility transfer): Table 7 proposes illustrative transmitter/receiver classifications, but these should be regarded as scenarios rather than observed volatility-spillover findings. H03 cannot be adjudicated without validated multivariate GARCH estimation and tests of cross-company shock and volatility transmission.
4. Overall limitation and reporting caution: The study uses 24 quarterly observations per firm. This is insufficient for reliable estimation of the proposed high-dimensional GARCH framework. The descriptive relationships can be discussed subject to data validation, whereas the model-dependent findings, parameter estimates, and directional rankings must be re-estimated before publication. The Abstract and Conclusion have been preserved verbatim as requested; their stronger empirical claims should be revisited separately before submission.

9. Conclusion

The study indicates that the influence foreign institutional investments have on the financial performance of Indian pharmaceutical companies vary in nature and depend on the company to be assessed as well as the particular performance measurement. Company-wise GARCH estimates confirm that in companiestaken into accountthe accounting and market volatility persist, but the speed of adjustment differs considerably across firms. The correlations between the changes in FII/FPI holdings and pharmaceutical stock return being present at a given time are of a varying nature according to DCC-GARCH analysis. The results of the multivariate spillover framework reveal that the companies that are capable of acting as potential net volatility transmitters are Sun Pharmaceutical, Dr Reddy's Laboratories and Cipla, while Divi's Laboratories, Biocon and Glenmark act as receivers of volatility. The outcomes demonstrate that averages in the industry do not take into account significant differences of companies with respect to institutional sensitivity, volatility persistence, and shock transmission. Hence, investors, executives and regulators should take into consideration company-wise as well as multivariate volatility models while assessing risk related to institutional investment in the aforementioned field.

10. Reference

1. Bhaumik, S. K., Driffield, N. L., & Pal, S. (2010). Does ownership structure of emerging-market firms affect their outward FDI? The case of the Indian automotive and pharmaceutical sectors. Journal of International Business Studies, 41(3), 437–450. https://doi.org/10.1057/jibs.2009.52
2. Dhingra, V. S., Gandhi, S., & Bulsara, H. P. (2016). Foreign institutional investments in India: An empirical analysis of dynamic interactions with stock market return and volatility. IIMB Management Review, 28(4), 212–224. https://doi.org/10.1016/j.iimb.2016.10.001
3. Singh, H., Vashisht, A., & Tripathi, T. (2016). Volatility and institutional investors: A sectoral analysis of Indian companies. IRA-International Journal of Management & Social Sciences, 5(1), 37–46. https://doi.org/10.21013/jmss.v5.n1.p5
4. Badhani, K. N., & Kumar, A. (2020). Market timing skill of foreign portfolio investors in India. IIMB Management Review, 32(1), 24–38. https://doi.org/10.1016/j.iimb.2019.07.012
5. Parab, N., & Reddy, Y. V. (2020). A cause and effect relationship between FIIs, DIIs and stock market returns in India: Pre- and post-demonetization analysis. Future Business Journal, 6, Article 25. https://doi.org/10.1186/s43093-020-00029-6
6. Behera, C., & Rath, B. N. (2021). The COVID-19 pandemic and Indian pharmaceutical companies: An event study analysis. Bulletin of Monetary Economics and Banking, 24(Special Issue), 1–14. https://doi.org/10.21098/bemp.v24i0.1483
7. Mittal, S., & Sharma, D. (2021). The impact of COVID-19 on stock returns of the Indian healthcare and pharmaceutical sector. Australasian Accounting, Business and Finance Journal, 15(1), 5–21. https://doi.org/10.14453/aabfj.v15i1.2
8. Lourdesraj, A. A., Babu, M., Gayathri, J., Indhumathi, G., & Sathya, J. (2021). Efficiency of Nifty Pharma Index during the COVID-19 pandemic in India. Academy of Strategic Management Journal, 21(S1), 1–7. DOI not assigned by the publisher. https://www.abacademies.org/articles/efficiency-of-nifty-pharma-index-during-the-covid19-pandemic-in-india-13548.html
9. Lobo, S., & Bhat, S. (2024). Unveiling investor behavior: An investigation into India's pharmaceutical sector during COVID-19. Investment Management and Financial Innovations, 21(3), 399–411. https://doi.org/10.21511/imfi.21(3).2024.32
10. Varghese, A., Santhosh, A. K., Anjana, K. M., & Francis, R. (2025). Fundamental research and analysis of India pharmaceutical sector. Shanlax International Journal of Arts, Science and Humanities, 12(S1), 124–130. https://doi.org/10.34293/sijash.v12iS1-June.9127