A Study On Stock Volatility And Returns With Special Reference To Selected Stocks In Nse

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ABSTRACT:

The Stock Market has emerged as a crucial component of the global financial system, facilitating investment and economic growth. In India, the National Stock Exchange (NSE) plays a pivotal role in ensuring market efficiency, transparency, and liquidity. As financial markets continue to evolve, understanding these developments is essential for investors to navigate volatility effectively and maximize returns. The paper examines the nature of stock volatility and clustering, volatility patterns in financial time series data and leverage or asymmetric effect exists in selected stocks. The study indicates that volatility in selected stocks, demonstrates characteristics such as volatility clustering, the asymmetry effect, and the persistence of volatility in daily returns. It highlights that both recent and past news influence market volatility. Additionally, the study identifies the presence of a leverage effect, suggesting that negative shocks or unfavorable news have a greater impact on volatility compared to positive shocks or favorable news.

Keywords: Stock volatility, Volatility Patterns, Stock Return, Leverage Effect

INTRODUCTION

The global financial system is a complex network that enables capital flow through money and capital markets. While money markets focus on short-term borrowing and lending, capital markets, including stock exchanges, facilitate long-term investments in debt and equity. In India, the stock market is a key financial pillar, with the National Stock Exchange (NSE) ensuring transparency, liquidity, and efficiency in stock trading. Investors are primarily drawn to stock exchanges by returns on investment (ROI), which come from dividends or capital gains but are influenced by economic conditions, corporate performance, and market trends.

The Indian stock market, anchored by the NSE and BSE, has experienced remarkable growth driven by increased investor participation, rising disposable incomes, and economic reforms. Despite its impressive expansion, challenges such as global economic trends, market volatility, and regulatory concerns persist. However, with a strong economy, a tech-savvy young population, and growing financial literacy, the market holds significant potential for future growth and global integration.

Stock market volatility is influenced by factors such as interest rate changes, political instability, economic developments, and corporate performance. The Indian stock market, particularly the NSE, has experienced significant volatility in recent years due to events like the U.S.-China trade tensions, the COVID-19 pandemic, and geopolitical conflicts. Understanding these trends is crucial for investors managing risk and making informed decisions.

Recent NSE volatility is driven by the 2024 general elections, global inflation, oil price fluctuations, and interest rate decisions. The VIX spiked over 70% in May due to policy uncertainty, while strong corporate earnings and domestic capital inflows offer a positive outlook amid ongoing geopolitical risks.

REVIEW OF LITERATURE

Intaz Ali (2016), in "Stock Market Volatility and Returns: A Study of NSE & BSE in India," explored the dynamics of stock returns and market volatility in India's NSE and BSE. The study used GARCH-M and EGARCH models to analyze volatility clustering and the leverage effect, where negative news impacts volatility more significantly than positive news. The results show that volatility clustering is present, meaning volatility tends to persist over time. Although the relationship between returns and volatility is found to be statistically insignificant, the study highlights the persistent nature of volatility in the Indian stock market. These findings are crucial for investors and policymakers aiming to manage risk more effectively by understanding market behavior.

Muthukamu (2018), in "Volatility and Return: A Study with Special Reference to the Selected Banking Sectoral Stocks of NSE," investigated the relationship between stock volatility and returns in India's banking sector. The study found that private sector banks like Axis Bank and HDFC Bank exhibit higher volatility and returns compared to public sector banks due to economic reforms. The GARCH (1,1) model reveals a positive relationship between volatility and returns, meaning that higher risks are associated with higher rewards in banking sector stocks. This pattern suggests that investors might achieve higher returns by investing in more volatile private sector banks. The study offers valuable insights for investors looking to understand risk-reward dynamics in the banking sector.

PROBLEM STATEMENT:

Since the stock market is naturally turbulent, it is critical for investors, portfolio managers, and policymakers to comprehend the variables that contribute to this volatility. Though there is a lot of study on stock market volatility, the majority of studies tend to concentrate on either long-term or short-term viewpoints, which prevents them from offering a comprehensive understanding of how volatility operates throughout a range of timescales. Furthermore, there is a dearth of thorough research on the variations in stock returns and volatility among various industries and market capitalizations. Additionally, a large portion of the research that has already been done does not take into account recent, comprehensive data that reflects current market conditions, which leaves a gap in our knowledge of how short-term volatility relates to previous trends. In order to fill in these gaps, this study has looked at sectoral and market cap fluctuations using recent data, as well as long- and short-term volatility analysis and the influence of particular events. By taking this method, the research hopes to offer more useful information for risk management and return optimization in a changing market.

OBJECTIVES OF THE STUDY

1. To examine the nature of volatility clustering of the selected stocks in NSE
2. To examine the volatility patterns over the financial time series data
3. To examine whether the asymmetric effect or leverage effect exist in selected stocks in NSE

RESEARCH GAP:

In order to fill a void in the literature, which usually concentrates on only one of these timeframes, this study attempts to investigate stock volatility from both long-term and short-term viewpoints. The study will offer a more thorough knowledge of how volatility behaves across various time periods and how these behaviors could affect investment strategies by looking at both aspects. For investors who want to strike a balance between short-term returns and long-term stability, this dual strategy is essential.

The study also looks into how particular occurrences, such elections and policy declarations, affect stock volatility. The extant literature frequently fails to acknowledge the importance of these exogenous forces, resulting in a restricted comprehension of market dynamics. Through an analysis of these occurrences, this research seeks to further the subject of behavioral finance by offering insights into how abrupt shifts in the political and economic environment might affect investor sentiment and market behavior.

This study evaluates the returns and volatility of stocks for a range of shares from firms with varying market capitalizations and sectors. This method highlights how crucial portfolio management is to comprehending the connection between returns and volatility. The goal of the research is to find patterns and correlations

through the analysis of a wide range of companies, which can help portfolio managers and investors make better risk management decisions.

RESEARCH METHODOLOGY:

This study employs a descriptive research design to analyze the relationship between stock price volatility and returns on the National Stock Exchange (NSE). Using secondary data, including historical stock prices from the past ten years, it examines volatility patterns and stock behavior. The research follows a quantitative approach to provide a comprehensive understanding of stock dynamics.

The sampling design ensures a representative selection of stocks from the NSE, focusing on three key sectors—Banking, Automobile, and Pharmaceutical. This approach enables an analysis of overall volatility trends and returns across different company profiles, creating a diversified portfolio that reflects broader market behavior.

Among India's 23 stock exchanges, the NSE is chosen for analysis due to its higher market capitalization and trading volume compared to other exchanges, particularly the Bombay Stock Exchange (BSE). With a larger number of listed companies and higher trading activity, NSE attracts more institutional investors and offers greater liquidity, making it a more suitable choice for studying stock price volatility.

The study adopts a purposive sampling technique, a non-probability method where samples are selected based on specific characteristics, knowledge, or experience. Since the research focuses on particular stocks from Banking, Automobile, and Pharmaceutical sectors, this method is appropriate for ensuring that the selected companies reflect relevant market trends and volatility patterns.

The population of the study includes all 2,379 stocks listed on the NSE, covering a wide range of sectors. By analyzing this broad market, the study seeks to understand how stock price volatility behaves across different industries and company sizes, offering valuable insights into market dynamics.

The sample size consists of daily opening and closing stock prices from 15 selected companies over a ten-year period, from the financial year 2014-15 to 2023-24. Five companies from each of the three sectors are analyzed, resulting in a total of 37,245 data points. This extensive dataset ensures a robust examination of volatility trends, stock returns, and sector-specific market behavior.

TABLE 1: SELECTED COMPANIES FROM EACH SECTORS ON THE BASIS OF BETA VALUE

NAME OF THE COMPANY	SECTOR
Axis Bank	Banking
IndusInd Bank	Banking
State Bank of India	Banking
HDFC Bank	Banking
ICICI Bank	Banking
Tata Motors	Automobile
Maruti Suzuki	Automobile
Ashok Leyland	Automobile
Bajaj Auto	Automobile
Hero MotoCorp	Automobile
Dr. Reddy's Laboratories	Pharmaceutical
Cipla	Pharmaceutical
Sun Pharma	Pharmaceutical
Lupin	Pharmaceutical
Aurobindo Pharma	Pharmaceutical

Analytical Part of the Study:

The study calculates the arithmetic mean of daily stock returns to determine the average return of each stock. Descriptive statistical measures such as mean, standard deviation, skewness, and kurtosis are utilized to analyze the distribution characteristics of the selected stocks. This descriptive statistics been visualised in **Table 2.** Since financial time series data must be stationary for accurate analysis, the Augmented Dickey-Fuller (ADF) test is applied to assess the stationarity of the chosen data observed in **Table 3**. In **Table 4** ARCH tool been used to model and analyze time series data with time-varying volatility. ARCH models are particularly effective in capturing volatility clustering—periods of high volatility followed by high volatility, and low volatility followed by low volatility—a common characteristic in financial data such as stock returns. **Table 5** shows the GARCH model. The GARCH model was utilized to examine the volatility patterns over the financial time series data. In a stationary GARCH model, volatility gradually returns to its long-term average at a rate determined by the sum of the ARCH and GARCH coefficients, which is typically close to one in financial time series data. Finally EGARCH model been employed to find whether the leverage or asymmetric effect exists in the stock meaning it recognizes that negative news or price drops tend to increase volatility more than positive news or price rise. It been observed in **Table 6.**

TABLE 2: DESCRIPTIVE STATISTICS FOR STOCK RETURNS

S.No	Name of the Stock	Mean	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum
1	Axis Bank	-0.0756	1.8559	-0.0403	9.2586	-19.9040	12.0416
2	IndusInd Bank	-0.0848	2.3217	0.9157	39.4753	-26.7409	37.7904
3	SBI	-0.0014	0.0194	0.9467	9.4808	-0.0844	0.2100
4	HDFC Bank	-0.0133	1.2469	0.3163	8.9701	-10.9746	11.2012
5	ICICI Bank	-0.0003	0.0168	0.4167	4.7273	-0.0977	0.1158
6	Tata Motors	-0.1729	2.2029	0.5793	3.3845	-10.3792	13.5286
7	Maruti Suzuki	-0.0209	1.6046	0.7666	6.2703	-8.9000	12.7720
8	Ashok Leyland	-0.1580	2.4133	0.7184	7.7998	-16.2892	20.8745
9	Bajaj Auto	-0.0465	1.5133	0.2798	3.9205	-9.2780	10.4140
10	Hero MotoCorp	-0.0954	1.6839	0.4109	3.8727	-8.6828	12.9349
11	Dr. Reddy's Laboratories	-0.0667	1.5873	-0.0027	6.5918	-14.7334	10.2523
12	Cipla	-0.1096	1.6459	0.3680	2.8780	-8.4188	9.6778
13	Sun Pharma	-0.0973	1.7788	0.4924	4.0422	-9.0577	12.6686
14	Lupin	-0.1349	1.7899	0.2085	6.9631	-17.0781	12.6019
15	Aurobindo Pharma	-0.1053	2.2960	0.6210	10.9928	-17.9645	22.0817

TABLE 3: AUGMENTED DICKEY-FULLER UNIT ROOT TEST

S.No	Name of the Stock	Coefficient	Std. Error	t-Statistic	Prob.
1	Axis Bank	-1.0753	0.0285	-37.7051	0.0000
2	IndusInd Bank	-0.9970	0.0200	-49.6625	0.0000
3	SBI	-1.0289	0.0200	-51.2566	0.0000
4	HDFC Bank	-1.1519	0.0520	-22.1379	0.0000
5	ICICI Bank	-1.0838	0.0286	-37.8390	0.0000
6	Tata Motors	-1.0243	0.0200	-51.0047	0.0000
7	Maruti Suzuki	-0.9755	0.0211	-46.1438	0.0000
8	Ashok Leyland	-1.0039	0.0200	-50.0529	0.0000
9	Bajaj Auto	-1.0093	0.0200	-50.2404	0.0000
10	Hero MotoCorp	-0.9564	0.0200	-47.6573	0.0000
11	Dr. Reddy's Laboratories	-0.9227	0.0200	-46.0855	0.0000
12	Cipla	-1.0014	0.0200	-49.8713	0.0000
13	Sun Pharma	-1.0123	0.0200	-50.4181	0.0000

| 14 | Lupin | -1.0095 | 0.0200 | -50.2698 | 0.0000 |
| 15 | Aurobindo Pharma | -0.9920 | 0.0200 | -49.4478 | 0.0000 |

TABLE 4: TESTING THE HETEROSKEDASTICITY EFFECT IN THE RETURN SERIES OF STOCKS (ARCH)

S.No	Name of the Stock	Prob. F	Prob. Chi-square	R-Squared	Durbin-Watson statistic
1	Axis Bank	0.0000	0.0000	0.0485	2.08
2	IndusInd Bank	0.0000	0.0000	0.0375	2.06
3	SBI	0.0000	0.0000	0.0139	2.01
4	HDFC Bank	0.0000	0.0000	0.0543	2.03
5	ICICI Bank	0.0000	0.0000	0.1510	2.05
6	Tata Motors	0.0000	0.0000	0.0480	2.12
7	Maruti Suzuki	0.0000	0.0000	0.0131	2.01
8	Ashok Leyland	0.0000	0.0000	0.0091	2.02
9	Bajaj Auto	0.0000	0.0000	0.0091	2.03
10	Hero MotoCorp	0.0000	0.0000	0.0230	2.00
11	Dr. Reddy's Laboratories	0.0002	0.0002	0.0055	2.00
12	Cipla	0.0000	0.0000	0.0387	2.04
13	Sun Pharma	0.0000	0.0000	0.0139	2.01
14	Lupin	0.0539	0.0539	0.0015	2.00
15	Aurobindo Pharma	0.0000	0.0000	0.0300	2.01

TABLE 5: RESULT OF GARCH MODEL

S.No	Name of the Stock	p-value	RESID(-1)^2	GARCH(-1)	[RESID(-1)^2] + [GARCH(-1)]
1	Axis Bank	0.0000	0.0726	0.8947	0.97
2	IndusInd Bank	0.0000	0.1110	0.8698	0.98
3	SBI	0.0000	0.1938	0.6973	0.89
4	HDFC Bank	0.0000	0.0650	0.8985	0.96
5	ICICI Bank	0.0000	0.0544	0.9383	0.99
6	Tata Motors	0.0000	0.0243	0.9727	1.00
7	Maruti Suzuki	0.0000	0.0760	0.8945	0.97
8	Ashok Leyland	0.0000	0.0332	0.9614	0.99
9	Bajaj Auto	0.0000	0.0441	0.9188	0.96
10	Hero MotoCorp	0.0000	0.0537	0.9277	0.98
11	Dr. Reddy's Laboratories	0.0000	0.0579	0.8535	0.91
12	Cipla	0.0000	0.0836	0.8320	0.92
13	Sun Pharma	0.0000	0.0829	0.8853	0.97
14	Lupin	0.0000	0.1012	0.7421	0.84
15	Aurobindo Pharma	0.0000	0.1256	0.7613	0.89

TABLE 6: RESULT OF EGARCH MODEL

S.No	Name of the Stock	p-value	Coefficient C(5)	Coefficient C(6)
1	Axis Bank	0.0000	-0.076051	0.959998
2	IndusInd Bank	0.0000	-0.046711	0.976002
3	SBI	0.0000	-0.027965	0.873458
4	HDFC Bank	0.0000	-0.040007	0.978356
5	ICICI Bank	0.0000	-0.063176	0.986201
6	Tata Motors	0.0000	-0.043388	0.998312
7	Maruti Suzuki	0.0000	-0.043887	0.962092
8	Ashok Leyland	0.0000	-0.030417	0.994817
9	Bajaj Auto	0.0000	-0.021606	0.961828
10	Hero MotoCorp	0.9045	-0.000826	0.984609
11	Dr. Reddy's Laboratories	0.0000	-0.012571	0.940848
12	Cipla	0.0461	0.019318	0.937522
13	Sun Pharma	0.0000	-0.037630	0.964899
14	Lupin	0.0000	-0.034978	0.865618
15	Aurobindo Pharma	0.0000	-0.081580	0.923613

RESULTS AND DISCUSSION:

Descriptive Analysis:

Descriptive statistics of all the selected stocks are summarized in Table 2. The arithmetic average of the return (mean return) of all the stocks is negative, indicating that the stock prices have declined during the study period. The negative returns suggest that most of the selected stocks underperformed during this period. Among these stocks, SBI (-0.0014) has delivered the least negative return, followed by ICICI Bank (-0.0003) and HDFC Bank (-0.0133).However, stocks like Tata Motors (-0.1729) and Ashok Leyland (-0.1580) have experienced significant negative returns, reflecting poor performance in the automobile sector. The descriptive statistics also show that most of the stocks have positive skewness, meaning that there is a higher probability of extreme positive returns than negative returns. However, some stocks like Axis Bank (-0.0403) and Dr. Reddy's Laboratories (-0.0027) exhibit slightly negative skewness, suggesting a higher probability of extreme negative returns. The kurtosis values of all the stocks are greater than 3, indicating that the selected financial time series are fat-tailed and do not follow a normal distribution. This suggests that extreme returns (both positive and negative) occur more frequently than in a normal distribution, implying higher risk and volatility in these stocks.

Unit Root Test:

The ADF test results show that for all selected stocks, the test statistic values are significantly lower than the critical values at 1%, 5%, and 10% significance levels. The p-values for all stocks are 0.0000, which is less than 0.05, leading to the rejection of the null hypothesis that the returns have a unit root. This confirms that the stock returns are stationary, making them suitable for further statistical modeling and volatility analysis. For instance, the test statistic for Axis Bank is -37.7051, SBI is -51.2566, HDFC Bank is -22.1379, ICICI Bank is -37.8390, Tata Motors is -51.0047, Maruti Suzuki is -46.1438, Ashok Leyland is -50.0529, Bajaj Auto is -50.2404, Hero MotoCorp is -47.6573, Dr. Reddy's Laboratories is -46.0855, Cipla is -49.8713, Sun Pharma is -50.2689, Lupin is -50.2698, and Aurobindo Pharma is -49.4478. These results indicate strong stationarity across all selected stocks, ensuring their suitability for time-series analysis and volatility modeling.

ARCH Test:

The ARCH model results confirm the presence of heteroscedasticity in the return series of all selected stocks, as indicated by the significant p-values (0.000) for both the F-statistic and Chi-square tests, except for Lupin, which has a p-value of 0.0539, suggesting weaker evidence of heteroscedasticity. The R-squared values indicate the proportion of variation explained by the model, with ICICI Bank (0.1510) and HDFC Bank (0.0543) showing relatively higher values, while stocks like Bajaj Auto (0.0091) and Aurobindo Pharma (0.0300) show lower explanatory power. The Durbin-Watson statistics for all stocks range between 2.00 and 2.12, indicating minimal autocorrelation in the residuals. For example, Axis Bank has an R-squared of 0.0485 and a Durbin-Watson statistic of 2.08, SBI has an R-squared of 0.0139 and a Durbin-Watson statistic of 2.01, and Tata Motors has an R-squared of 0.0480 with a Durbin-Watson statistic of 2.12. Overall, the results validate the application of the ARCH model in analyzing the volatility patterns of these stocks.

GARCH Model:

The GARCH model results for all 15 selected stocks indicate significant volatility clustering, as evidenced by the highly significant p-values (0.000) for all stocks. This confirms that past shocks and past volatility strongly influence current volatility. The sum of the ARCH term (RESID(-1)^2) and the GARCH term (GARCH(-1)) is close to 1 for most stocks, indicating persistent volatility, meaning that shocks to returns have long-lasting effects. Stocks like Axis Bank (0.97), IndusInd Bank (0.98), Tata Motors (1.00), and Maruti Suzuki (0.99) show high volatility persistence, implying that fluctuations in their returns tend to continue over time. SBI (0.89) and Aurobindo Pharma (0.89) exhibit relatively lower persistence, suggesting that their volatility dissipates more quickly. Other stocks such as HDFC Bank (0.96), ICICI Bank (0.98), Ashok Leyland (0.97), Bajaj Auto (0.96), Hero MotoCorp (0.97), Dr. Reddy's Laboratories (0.91), Cipla (0.92), Sun Pharma (0.97), and Lupin (0.94) also exhibit strong volatility persistence. The relatively high GARCH terms across all stocks indicate that past volatility plays a dominant role in predicting future volatility. These findings confirm the

presence of conditional heteroskedasticity in all selected stocks, justifying the application of the GARCH model for better risk estimation and volatility forecasting.

EGARCH:

The EGARCH model results for all 15 selected stocks reveal significant volatility dynamics, as indicated by the highly significant p-values (0.000) for most stocks, except for Hero MotoCorp (0.9045) and Cipla (0.0461). The negative values of C(5) for most stocks, such as Axis Bank (-0.076051), IndusInd Bank (-0.046711), SBI (-0.027965), HDFC Bank (-0.040007), ICICI Bank (-0.063176), and others, confirm the presence of a leverage effect, where negative shocks increase volatility more than positive shocks of the same magnitude. Bajaj Auto (-0.021606) and Aurobindo Pharma (-0.081580) exhibit relatively weaker leverage effects, while Cipla (0.019318) has a positive value, indicating a different volatility pattern. The high persistence parameter (C(6)) for all stocks, such as Tata Motors (0.998312), HDFC Bank (0.978356), IndusInd Bank (0.976002), and Maruti Suzuki (0.962092), suggests that volatility shocks are long-lasting. These results highlight the EGARCH model's effectiveness in capturing asymmetries and persistent volatility in stock returns, making it a suitable approach for modeling risk and return dynamics in financial markets.

FINDINGS:

The study confirms the presence of heteroscedasticity in the return series of all selected stocks through the ARCH test, as indicated by the significant p-values (0.000), except for Lupin (0.0539), which shows weaker evidence. The R-squared values suggest varying explanatory power, with ICICI Bank (0.1510) and HDFC Bank (0.0543) showing relatively higher values, while Bajaj Auto (0.0091) and Aurobindo Pharma (0.0300) have lower values, indicate minimal autocorrelation in the residuals, validating the use of ARCH models to analyze volatility patterns.

The GARCH model results highlight significant volatility clustering across all stocks, with the sum of the ARCH and GARCH terms being close to 1, indicating persistent volatility. Stocks like Tata Motors (1.00), Maruti Suzuki (0.99), and IndusInd Bank (0.98) exhibit high volatility persistence, meaning fluctuations in their returns tend to last longer. SBI (0.89) and Aurobindo Pharma (0.89) show relatively lower persistence, suggesting quicker dissipation of volatility. The strong influence of past volatility on future volatility across all stocks justifies the application of the GARCH model for better risk estimation and forecasting.

The EGARCH model findings reveal significant asymmetries in volatility, with negative shocks having a greater impact than positive ones, as indicated by the negative C(5) values for most stocks. Stocks like Tata Motors (0.9983), HDFC Bank (0.9784), and IndusInd Bank (0.9760) show high volatility persistence. Cipla, with a positive C(5) value (0.0193), follows a different volatility pattern. The results confirm that the EGARCH model effectively captures asymmetric effects and persistent volatility, making it a robust tool for modelling risk and return dynamics in financial markets.

LIMITATIONS OF THE STUDY:

The study is limited to 15 stocks from the banking, automobile, and pharmaceutical sectors within the NSE, which may not fully capture the broader market dynamics, making it difficult to generalize the findings to other industries or stock exchanges. The exclusion of stocks from other sectors might result in an incomplete view of market volatility.

The research period of 2014-15 to 2023-24 may not account for long-term market fluctuations or future trends. Market behavior is shaped by economic conditions, technological advancements, and geopolitical events, which could influence volatility patterns beyond this timeframe.

The focus on stock-specific volatility overlooks important macroeconomic factors like inflation, interest rates, and fiscal policies, which play a significant role in shaping market movements and investor behavior. Ignoring these elements may limit the study's ability to explain sudden market shocks or instability.

The reliance on historical stock price data assumes past trends predict future volatility, but market behavior can be influenced by investor sentiment, speculative trading, and unforeseen market shifts, making predictions based on historical patterns less reliable in rapidly changing conditions.

CONCLUSION:

The study concludes that stock volatility in the selected NSE stocks exhibits distinct characteristics, such as volatility clustering, the leverage effect, and significant persistence. The results from the ARCH, GARCH, and EGARCH models demonstrate that volatility is heavily influenced by past market movements, with negative shocks having a more substantial impact on future volatility than positive shocks. The study also highlights sectoral variations in volatility patterns and suggests that understanding these dynamics can aid investors and portfolio managers in optimizing risk management and decision-making strategies.

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