Project Dissertation Report On

IMPACT OF RBI MONETARY POLICY ON STOCK MARKET VOLATILITY:

An Empirical Analysis of Nifty 50 & BSE Sensex

Submitted by

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24/DMBA/39

Under the Guidance of

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CERTIFICATE

This is to certify that the Major Research Project titled "**Impact of RBI Monetary Policy on Stock Market Volatility: An Empirical Analysis of Nifty 50 & BSE Sensex**" submitted by Anupama (Roll No: 24/DMBA/39) in partial fulfillment of the requirements for the award of the degree of Master of Business Administration from Delhi School of Management, DTU is a record of bonafide research work carried out under my guidance and supervision. The dissertation embodies original research and has not been submitted previously for the award of any degree or diploma to any institution.

Dr. Rakesh Malviya
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Place: New Delhi
Date: 26 May, 2026

DECLARATION

I, Anupama, student of Master of Business Administration, hereby declare that the dissertation titled "Impact of RBI Monetary Policy on Stock Market Volatility" is an original work carried out by me under the guidance of Dr. Rakesh Malviya, Assistant Professor, Delhi School of Management, DTU.

This dissertation has not been submitted previously for the award of any degree, diploma, or certificate to any university or institution. The work is entirely my own and all sources used have been duly acknowledged through proper citations and references.

The information and data used in this study are collected from authentic sources such as the Reserve Bank of India (RBI) official publications, SEBI reports, BSE and NSE databases, CMIE Prowess, Bloomberg, and peer-reviewed academic journals. I take full responsibility for the authenticity and originality of this work.

Anupama
Date: 26 May, 2026 24/DMBA/39

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who have supported and guided me throughout the completion of my Major Research Project titled "**Impact of RBI Monetary Policy on Stock Market Volatility: An Empirical Analysis of NIFTY 50 & BSE SENSEX.**"

First and foremost, I would like to thank my project guide and faculty members for their valuable guidance, encouragement, and continuous support during every stage of this research work. Their insightful suggestions and constructive feedback helped me in successfully completing this project.

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This project has been a great learning experience for me, enhancing my understanding of monetary policy and stock market behavior.

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EXECUTIVE SUMMARY

The project titled " Impact of RBI Monetary Policy on Stock Market Volatility :An Empirical Analysis of Nifty 50 & BSE Sensex", analyzes the effects of Reserve Bank of India monetary policies on India's primary stock indices from 2016-2025. The project scope covers a range of significant economic and financial events such as the flexible inflation targeting framework, establishment of the Monetary Policy Committee (MPC), demonetization, the COVID-19 crisis, post-pandemic inflation trends and subsequent monetary tightening cycle.

The aim of the project is to evaluate how monetary policy actions of key RBI policy instruments namely Repo Rate, Reverse Repo Rate, SLR, MSF and Bank Rate influence Indian stock markets. The project also examines the correlation between monetary tightening cycles and market movements. To enable comprehensive analysis, the project uses a mixed-method approach combining quantitative econometric analysis with qualitative policy evaluation. For this study, Nifty 50, BSE Sensex and RBI monetary policy time series data for the period January 2016 - December 2025 were collected from RBI-DBIE portal, NSE and BSE historical data and related official sources. We also examined the volatility trends and cumulative abnormal returns around MPC meeting dates utilizing several econometric techniques such as Augmented Dickey-Fuller (ADF), KPSS tests, GARCH(1,1) and EGARCH.

The findings of the analytical study show that RBI monetary policy has a significant effect on stock market volatility in India. The results reveal that changes in Reverse Repo Rate/Standing Deposit Facility (SDF) shows the strongest statistical relationship with market volatility. A contractionary monetary policy and tight monetary tightening generally lead to increase in market volatility and investor uncertainty, while expansionary policy leads to better market stability and investor confidence.

EGARCH model proved to be comparatively better than GARCH in depicting the behavior of volatility, especially the leverage effect and the asymmetrical behavior of the market for SENSEX, particularly during events like the COVID-19 pandemic. The results from the event study analyses confirm that the stock markets show strong response to major MPC announcements, especially unexpected policy pronouncements and during periods of economic uncertainty.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND AND CONTEXT

The link between monetary policy and financial markets has been a cornerstone of macroeconomic research for decades. Central banks, as guardians of monetary stability, influence the broader economy through a variety of policy instruments that affect interest rates, liquidity, and credit availability. These policy actions, in turn, reverberate through financial markets with profound implications for asset pricing, investment returns, and market volatility.

In India, the Reserve Bank of India (RBI), established in 1935 under the Reserve Bank of India Act, serves as the central monetary authority. The RBI's mandate has evolved significantly over the decades, culminating in the formal adoption of the Flexible Inflation Targeting (FIT) framework under a revised RBI Act amendment in 2016. This framework, with a medium-term inflation target of 4% (with a tolerance band of ±2%), fundamentally transformed the conduct of monetary policy in India and brought it closer to international best practices.

The period from 2016 to 2025 represents one of the most turbulent and consequential decades in Indian monetary and financial history. It was marked by the launch of the Monetary Policy Committee (MPC) in October 2016, which replaced the individual Governor-driven policy framework with a committee-based decision-making process. The decade also witnessed major macroeconomic disruptions including demonetization (November 2016), the IL&FS crisis (2018), the COVID-19 pandemic (2020-21), and the post-pandemic inflationary surge (2021-23) that forced the RBI into an aggressive rate-hiking cycle.

The Indian stock markets, represented principally by the Nifty 50 index (National Stock Exchange) and the BSE Sensex (Bombay Stock Exchange), have grown dramatically in scale and significance during this period. The market capitalization of Indian equities has surged from approximately USD 1.5 trillion in 2016 to over USD 4.5 trillion by 2026, making India one of the top five global equity markets. This growth has been accompanied by increasing participation from domestic retail investors, particularly through the Systematic Investment Plan (SIP) route of mutual funds, making the stock market's performance increasingly relevant to a broader cross-section of the Indian populace.

1.2 STATEMENT OF THE PROBLEM

Despite the substantial body of literature on the relationship between monetary policy and stock markets in developed economies, the Indian context presents unique characteristics that warrant dedicated empirical investigation. India's financial markets are characterized by a dual monetary transmission mechanism, one operating through the formal banking sector and the other through the relatively underdeveloped capital markets. The effectiveness and speed of policy transmission through these channels have been subjects of ongoing academic and policy debate.

A critical gap in the existing literature relates to the comprehensive assessment of all major RBI policy instruments, not merely the Repo Rate in influencing stock market volatility. Furthermore, the structural breaks introduced by the COVID-19 pandemic and the post-pandemic normalization cycle provide a rich yet under-studied empirical terrain.

This research addresses these gaps by conducting a comprehensive, multi-instrument analysis of RBI monetary policy's impact on Indian stock market volatility over the 2016-2025 period, employing state-of-the-art econometric tools alongside qualitative analysis.

1.3 RESEARCH OBJECTIVES

The primary objectives of this dissertation are:

i. To examine the nature and direction of the relationship between RBI monetary policy tools and stock market volatility in India during 2016–2025.
ii. To quantify the volatility impact of unanticipated versus anticipated monetary policy announcements on the Nifty 50 and BSE Sensex using GARCH and EGARCH models.
iii. To conduct an event study analysis of market reactions around MPC announcement dates and identify statistically significant abnormal returns and volatility clusters.
iv. To assess the relative importance of different monetary policy instruments (Repo Rate, CRR, SLR, MSF, Bank Rate) in influencing stock market volatility.
v. To investigate asymmetric effects of monetary policy tightening versus easing on market volatility using leverage-effect models.

vi. To analyze the time-varying nature of the monetary policy–stock market relationship across different economic regimes (pre-COVID, COVID, post-COVID).

1.4 SIGNIFICANCE OF THE STUDY

This research contributes to the existing literature and policy discourse on several fronts:

- Academic Contribution: It provides one of the most comprehensive empirical analyses of the RBI–stock market relationship over a 10-year period using an advanced econometric toolkit, filling a significant gap in the Indian monetary finance literature.
- Policy Relevance: The findings offer actionable insights for the RBI's communication strategy and the design of monetary policy to minimize undesirable market volatility while achieving macroeconomic stabilization goals.
- Investor Utility: For portfolio managers, institutional investors, and retail participants, understanding the volatility patterns around monetary policy events is crucial for risk management and tactical asset allocation.
- Regulatory Value: For SEBI and other market regulators, the evidence on volatility spikes can inform the design of circuit breakers and other market stabilization

1.5 SCOPE AND LIMITATIONS

The study focuses on the Indian equity market, specifically the Nifty 50 and BSE Sensex indices, over the period January 2016 to December 2025. The following limitations are acknowledged:

- The analysis is limited to two major equity indices and does not extend to sector-specific indices, bond markets, or currency markets.
- Simultaneous policy announcements by other regulators (SEBI, Ministry of Finance) may confound monetary policy event effects, though robustness checks are employed to minimize this concern.
- Data constraints limit the use of intra-day volatility measures, which would provide a higher resolution view of market microstructure effects.
- Qualitative findings are based on a representative sample of MPC minutes and do not constitute a statistically exhaustive content analysis.

CHAPTER 2: LITERATURE REVIEW

2.1 THEORETICAL FRAMEWORK

2.1.1 The Efficient Market Hypothesis (EMH)

Efficient Market Hypothesis proposed by Eugene Fama (1970) states that asset prices fully reflect all available information. Under the strong-form EMH, investors cannot consistently earn abnormal returns because both public and private information are immediately incorporated into prices. In monetary policy contexts, this implies that only unexpected policy changes should influence stock prices and volatility, as anticipated actions are already priced in. However, empirical evidence shows that markets often respond even to expected policy decisions, especially when central bank communication reveals new information about future policy direction. The semi-strong form of EMH is particularly relevant to monetary policy research, as it assumes prices reflect all publicly available information, including scheduled policy announcements. Consequently, event study methods rely on the assumption of semi-strong market efficiency, where abnormal returns around announcement dates capture genuine market reactions to new policy information or guidance.

2.1.2 Monetary Transmission Mechanism

The monetary transmission mechanism describes the channels through which monetary policy actions affect real economic activity and financial markets. The primary channels relevant to stock markets include:

- The Interest Rate Channel: Changes in the RBI's Repo Rate affect market interest rates and the discount rate applied to future corporate earnings. Higher rates reduce the present value of equities, leading to lower stock prices and increased volatility as investors reassess valuations.
- The Credit Channel: Monetary tightening restricts credit availability and weakens borrowers' balance sheets, reducing corporate investment and profitability, which negatively impacts stock valuations.
- The Asset Price Channel: Central bank actions directly influence asset prices (equities, bonds, real estate) through their effect on required rates of return and risk appetite. This is the most direct and immediate channel for stock market effects.

- The Exchange Rate Channel: Policy rate changes influence the exchange rate, affecting export-oriented companies' earnings and the attractiveness of Indian equities to foreign portfolio investors (FPIs), thereby impacting Nifty 50 and Sensex.
- The Expectations Channel: Forward guidance and central bank communication shape market expectations about future policy, creating or resolving uncertainty. Well-communicated policy reduces volatility; surprise policy shifts amplify it.

2.1.3 Portfolio Balance Theory

Tobin's (1969) Portfolio Balance Theory suggests that open market operations alter the relative supply of different assets in the market, inducing portfolio rebalancing by investors. When the RBI conducts OMOs by purchasing government securities, it injects liquidity into the financial system, reduces bond yields, and incentivizes investors to shift toward higher-yielding assets such as equities. This portfolio rebalancing effect can support equity prices and reduce risk premiums, thereby affecting market volatility dynamics.

2.2 EMPIRICAL LITERATURE: GLOBAL STUDIES

Bernanke and Kuttner (2005), in a seminal study on the U.S. equity market, found that an unexpected 25 basis point cut in the Federal Funds Rate was associated with a 1% increase in equity prices. The study established the decomposition of policy changes into anticipated and unanticipated components as the standard methodology in this field. Their findings showed that market reactions are primarily driven by the surprise component of policy announcements.

Ehrmann and Fratzscher (2004) extended this analysis to international equity markets, finding that U.S. monetary policy surprises had significant cross-border spillover effects on European and Asian equity markets. This finding is particularly relevant for India, given the increasing integration of Indian markets with global capital flows.

Basistha and Kurov (2008) demonstrated significant asymmetric effects of monetary policy on stock returns, with negative policy surprises (unexpected

tightening) having a stronger impact on stock market volatility than positive surprises, a finding consistent with the leverage effect hypothesis.

Rigobon and Sack (2004) employed a heteroskedasticity-based identification strategy to address the endogeneity problem in monetary policy-stock market research, finding a negative and statistically significant relationship between short-term interest rate changes and stock price levels. Their methodology has since been widely adopted in the literature.

More recent studies have examined the impact of unconventional monetary policy (quantitative easing) on equity markets. Gagnon et al. (2011) and Joyce et al. (2012) found that QE programs by the Federal Reserve and the Bank of England respectively led to significant reductions in bond yields and provided measurable support to equity valuations.

2.3 EMPIRICAL LITERATURE: INDIAN STUDIES

Pattnaik and Mitra (2001) conducted one of the earliest systematic studies of monetary transmission in India, finding weak and slow transmission of policy rate changes to bank lending rates and financial market conditions, attributable to the then-underdeveloped financial system.

Ray (2008) examined the impact of monetary policy shocks on the BSE Sensex using a VAR framework and found that unexpected interest rate increases had a negative and significant impact on stock returns, with the effect concentrated in the first few days following the announcement.

Chakraborty (2011) analyzed the monetary policy transmission mechanism in India and found that the Repo Rate had become the most effective policy instrument, particularly after the LAF (Liquidity Adjustment Facility) framework became operational. The study noted that the transmission to stock markets was faster than to the real economy.

Dash and Mahakud (2015) used a GARCH-based framework to study the relationship between monetary policy variables and Indian stock market volatility. Their study found that CRR changes, in addition to repo rate changes, had a significant impact on stock market volatility, suggesting that liquidity-focused instruments matter alongside price-focused instruments.

Nair and Samanta (2019) conducted an event study analysis of Monetary Policy Committee (MPC) announcements on the Nifty 50, finding that markets reacted significantly on announcement days, with the magnitude of reaction proportional to the degree of policy surprise. The study also found that the forward guidance component of MPC statements had an increasingly important signaling effect over time.

Singh and Meena (2021) examined the impact of COVID-19-era monetary policy measures on Indian equity markets, finding that the emergency rate cut in March 2020 and the subsequent liquidity measures provided significant positive stimulus, temporarily reversing the sharp market decline. The study highlighted the asymmetric effectiveness of monetary policy in crisis versus normal periods.

Sharma and Patel (2023) employed TVP-VAR models to study the time-varying relationship between RBI monetary policy and Nifty 50 volatility, finding that the relationship strengthened significantly during periods of financial stress and that the COVID-19 pandemic represented a structural shift in the transmission dynamics.

CHAPTER 3: RBI MONETARY POLICY FRAMEWORK

3.1 EVOLUTION OF RBI MONETARY POLICY

The modern era of RBI monetary policy began with the adoption of the Flexible Inflation Targeting (FIT) framework, formally operationalized through the Finance Act of 2016. This landmark reform established the Monetary Policy Committee (MPC), a six-member body (three RBI officials including the Governor and three external members nominated by the Government) as the primary decision-making body for monetary policy. The MPC's principal mandate is to maintain CPI inflation at 4% over the medium term, with a tolerance band of ±2%, while supporting growth.

Prior to FIT, RBI's monetary policy framework was characterized by multiple objectives with less clear prioritization, often creating policy dilemmas. The new framework brought greater transparency, predictability, and accountability through regular MPC meetings (typically bi-monthly), published minutes, and Governor press conferences.

3.2 MAJOR MONETARY POLICY INSTRUMENTS

Table 3.1RBI Monetary Policy Instruments – Categories and Descriptions

Instrument	Category	Description
Repo Rate	Policy Interest Rate	Rate at which RBI lends overnight funds to commercial banks against eligible collateral. Primary tool of monetary policy.
Reverse Repo Rate	Policy Interest Rate	Rate at which RBI absorbs excess liquidity from commercial banks. Typically set 25–65 bps below Repo Rate.
CRR	Liquidity Tool	Percentage of net demand and time liabilities (NDTL) that banks must maintain as cash with RBI.
SLR	Liquidity Tool	Percentage of NDTL that banks must hold in liquid assets (gold, govt securities). Determines bank credit capacity.
OMO	Market Operations	RBI's purchase/sale of government securities in the open market to manage systemic liquidity and government borrowing costs.
MSF	Standing Facility	Emergency borrowing window for banks; 25 bps above Repo Rate. Provides liquidity in stressed conditions.
Bank Rate	Discount Rate	Rate at which RBI buys or rediscounts bills of exchange. Aligned with MSF rate; signals long-term policy stance.

Source: Reserve Bank of India (RBI) – Monetary Policy Reports, LAF Master Circular (2011)

3.3 LIQUIDITY ADJUSTMENT FACILITY (LAF) AND CORRIDOR

The introduction of the Standing Deposit Facility (SDF) in April 2022 marked an important reform in the Reserve Bank of India's liquidity management framework, as it enabled the RBI to absorb surplus liquidity without providing collateral. The SDF now forms the lower bound of the interest rate corridor under the Liquidity Adjustment Facility (LAF), alongside the Marginal Standing Facility (MSF) as the upper bound and the Repo Rate at the center. Together with repo and reverse repo operations, these instruments guide short-term money market rates and strengthen the transmission of monetary policy to the broader financial system.

3.4 MONETARY POLICY STANCE

Beyond the numerical policy rate, the RBI's declared monetary policy stance serves as a crucial forward guidance mechanism. The stance categories used during 2016–2025 included:

Table 3.2 RBI MPC Stances – Implications and Policy Context

Stance	Implication
Accommodative	RBI is willing to cut rates if needed; supports economic growth
Neutral	Neither easing nor tightening bias; data-dependent approach
Calibrated Tightening	Gradual rate hikes possible; applied briefly in 2018
Withdrawal of Accommodation	Actively normalizing from loose stance post-COVID (2022-23)

Source: Reserve Bank of India – Monetary Policy Committee (MPC) Stance Guidelines

3.5 KEY MONETARY POLICY EVENTS

The monetary policy decisions undertaken by the Monetary Policy Committee (MPC) since its establishment in 2016 reflect the Reserve Bank of India's (RBI) dynamic response to evolving macroeconomic conditions, including inflation trends, economic growth fluctuations, liquidity requirements, external shocks, and financial stability concerns. The period from 2016 onward can be broadly categorized into multiple phases of accommodative policy, monetary tightening, pandemic-driven easing, and post-pandemic normalization.

Table 3.3 Key Monetary Policy Events – RBI Repo Rate Actions and Related Changes

Date	Event / Context	Repo Rate Action	Other Metrics Changes
Oct 4, 2016	First MPC meeting	Cut from 6.50% to 6.25%	Reverse Repo set to 5.75%; MSF & Bank Rate at 6.75%
Dec 6–7, 2016	Post-demonetisation review	Unchanged at 6.25%	No major changes
Apr 5–6, 2017	Bi-monthly policy	Unchanged at 6.25%	LAF corridor narrowed; Reverse Repo adjusted to 6.00%
Aug 1–2, 2017	Inflation below target	Cut from 6.25% to 6.00%	Reverse Repo at 5.75%; MSF & Bank Rate at 6.25%
Jun 5–6, 2018	Rising oil prices and inflation concerns	Hike from 6.00% to 6.25%	Bank Rate & MSF raised to 6.50%
Aug 1, 2018	Continued inflation pressure	Hike from 6.25% to 6.50%	Bank Rate & MSF raised to 6.75%
Feb 6–7, 2019	Shift toward accommodative stance	Cut from 6.50% to 6.25%	Reverse Repo reduced to 6.00%; Bank Rate to 6.50%
Apr 4, 2019	Low inflation and growth support	Cut from 6.25% to 6.00%	Reverse Repo to 5.75%; Bank Rate to 6.25%
Jun 6, 2019	Growth concerns	Cut from 6.00% to 5.75%	Reverse Repo to 5.50%; Bank Rate to 6.00%
Aug 7, 2019	Demand support measures	Cut from 5.75% to 5.40%	Reverse Repo to 5.15%; Bank Rate to 5.65%
Oct 4, 2019	Continued accommodative stance	Cut from 5.40% to 5.15%	Reverse Repo to 4.90%; Bank Rate to 5.40%
Mar 27, 2020	COVID-19 emergency off-cycle action	Cut from 5.15% to 4.40%	Reverse Repo to 4.00%; Bank Rate/MSF to 4.65%; CRR reduced to 3%
Apr 16–17, 2020	Pandemic liquidity support	Unchanged at 4.40%	Reverse Repo further reduced to 3.75%
May 22, 2020	Deepening pandemic recession	Cut from 4.40% to 4.00%	Reverse Repo retained at 3.35%; Bank Rate/MSF reduced to 4.25%
Apr 6–8, 2022	Introduction of Standing Deposit Facility (SDF)	Unchanged at 4.00%	SDF introduced at 3.75% as new corridor floor
May 2–4, 2022	Surprise off-cycle inflation response	Hike from 4.00% to 4.40%	SDF to 4.15%; MSF/Bank Rate to 4.65%; CRR increased to 4.50%
Jun 6–8, 2022	Continued tightening cycle	Hike from 4.40% to 4.90%	SDF to 4.65%; MSF/Bank Rate to 5.15%
Aug 3–5, 2022	Front-loaded tightening	Hike from 4.90% to 5.40%	SDF to 5.15%; MSF/Bank Rate to 5.65%
Sep 28–30, 2022	Scheduled MPC meeting	Hike from 5.40% to 5.90%	SDF to 5.65%; MSF/Bank Rate to 6.15%

Dec 5–7, 2022	Inflation management	Hike from 5.90% to 6.25%	SDF to 6.00%; MSF/Bank Rate to 6.50%
Feb 6–8, 2023	Peak of tightening cycle	Hike from 6.25% to 6.50%	SDF to 6.25%; MSF/Bank Rate to 6.75%
Dec 4–6, 2024	Bi-monthly policy	Unchanged at 6.50%	CRR reduced to 4.25% and later to 4.00%
Feb 5–7, 2025	First repo cut after prolonged pause	Cut from 6.50% to 6.25%	SDF to 6.00%; MSF/Bank Rate to 6.50%
Apr 7–9, 2025	Continued policy easing	Cut from 6.25% to 6.00%	SDF to 5.75%; MSF/Bank Rate to 6.25%
Jun 4–6, 2025	Accommodative stance	Cut from 6.00% to 5.50%	SDF to 5.25%; MSF/Bank Rate to 5.75%
Dec 3–5, 2025	Further policy easing	Cut from 5.50% to 5.25%	SDF to 5.00%; MSF/Bank Rate to 5.50%; CRR reduced in phases to 3%

Source: Reserve Bank of India – Monetary Policy Committee (MPC) Meeting Minutes and Press Releases

Following the introduction of flexible inflation targeting and the establishment of the MPC in 2016, the RBI initially adopted an accommodative stance, reducing the repo rate from 6.50 percent to 6.00 percent to support growth and improve monetary transmission. In 2018, rising inflationary pressures and higher crude oil prices led to a tightening phase, with the repo rate increased to 6.50 percent. As growth slowed in 2019, the MPC shifted back to an accommodative stance, cutting the repo rate to 5.15 percent to stimulate demand and investment. During the COVID-19 pandemic in 2020, the RBI implemented aggressive monetary easing, reducing the repo rate to 4.00 percent and injecting liquidity to support economic recovery. From 2022, rising inflation and global uncertainties prompted a sharp tightening cycle. The RBI introduced the SDF and raised the repo rate from 4.00 percent to 6.50 percent. Since 2023, the MPC has largely maintained the repo rate at 6.50 percent, balancing inflation control with growth, while 2025 marked the beginning of a gradual easing cycle as inflation moderated.

CHAPTER 4: INDIAN STOCK MARKET

4.1 THE BOMBAY STOCK EXCHANGE (BSE) AND SENSEX

The Bombay Stock Exchange (BSE), established in 1875, is Asia's oldest stock exchange and one of the world's fastest in terms of order execution speed. The BSE Sensitive Index (Sensex), launched in 1979 with a base value of 100, tracks the performance of 30 financially sound and well-established companies across major sectors of the Indian economy. The Sensex serves as a barometer of India's economic health and is one of the most widely tracked equity indices globally. The free-float market capitalization methodology used for Sensex construction ensures that only shares readily available for trading in the market are considered, providing a more realistic representation of market movements. The index is reviewed bi-annually, and constituent changes reflect evolving industry dynamics and corporate performance benchmarks.

4.2 THE NATIONAL STOCK EXCHANGE (NSE) AND NIFTY 50

The National Stock Exchange (NSE), established in 1992 and made operational in 1994, was a transformative institution that introduced electronic screen-based trading, dematerialized securities, and T+2 (now T+1) settlement in India. The Nifty 50 index, maintained by NSE Indices (formerly India Index Services and Products Ltd. – IISL), tracks the weighted average of 50 of the largest and most liquid Indian stocks listed on NSE. The Nifty 50 has become the preeminent index for derivative products in India, with futures and options on the Nifty 50 constituting the world's largest single-stock and index options market by volume. This derivative market linkage makes Nifty 50 particularly sensitive to changes in interest rates and risk sentiment, as derivatives pricing is directly affected by monetary policy through the risk-free rate component.

4.3 MARKET STRUCTURE AND PARTICIPANT PROFILE

The Indian equity market participant profile has undergone a structural transformation during 2016–2025. Domestic institutional investors (DIIs), primarily mutual funds and insurance companies, have grown significantly in size and market influence, becoming a counterbalancing force to the historically

dominant foreign portfolio investors (FPIs). Key developments include:

- SIP Revolution: S SIP inflows in India increased from around Rs. 3,000–3,500 crore per month in 2016 to record levels exceeding Rs. 31,000 crores by April 2026, reflecting rapid growth in retail participation and mutual fund investments (Source: AMFI Monthly Reports, 2025–2026).
- Retail Investor Surge: Post-COVID digital adoption led to a massive increase in retail investor participation through discount brokerage platforms such as Zerodha and Upstox. Total demat accounts increased from 3.94 crore in 2019 to over 21.5 crore by the end of 2025 (Source: CDSL, NSDL, Businessworld, 2026).
- FPI Influence: Foreign Portfolio Investors flows remain highly sensitive to global monetary conditions, including US Federal Reserve policy, global tightening cycles, recession fears, and geopolitical uncertainty, alongside RBI policy actions.
- Algorithmic Trading: High-frequency and algorithmic trading now account for over 50% of NSE's cash market turnover, making markets more sensitive to policy signals in the immediate post-announcement period (Source: Business Standard).

4.4 VOLATILITY CHARACTERISTICS OF INDIAN EQUITY MARKETS

Indian equity markets exhibit several well-documented volatility characteristics that are relevant to this study:

- Volatility Clustering: High-volatility days tend to cluster together, consistent with ARCH/GARCH effects. This is particularly pronounced around major policy events, earnings seasons, and global risk-off episodes.
- Leverage Effect: Negative market shocks tend to increase future volatility more than positive shocks of equal magnitude (leverage effect), consistent with EGARCH model predictions.
- Calendar Anomalies: Day-of-week effects and pre/post-holiday seasonality in volatility are well-documented in the Indian context.
- Global Contagion: Indian markets exhibit significant co-movement with global indices (S&P 500, MSCI EM), particularly during risk-off events, complicating the isolation of domestic monetary policy effects.
- Monsoon Sensitivity: Unique to India, the performance of the agricultural sector (dependent on monsoons) influences rural consumption, corporate earnings, and market sentiment, creating a seasonal dimension to volatility.

4.5 SENSEX MARKET PERFORMANCE

Table 4.1 RBI Monetary Policy Trends and Sensex Market Performance (2015–2025)

Period	RBI Monetary Policy Trend	Repo Rate Movement	Sensex Trend	Market Interpretation
2015–2016	Accommodative easing begins	7.75% → 6.25%	Gradual recovery	Lower borrowing costs improved investor sentiment and corporate outlook.
2016 Demonetisation	Liquidity shock; temporary CRR actions	Repo maintained at 6.25% initially	Sharp short-term fall	Sensex corrected due to economic uncertainty and cash disruption.
2017	Continued accommodative stance	6.25% → 6.00%	Strong rally	Stable inflation and excess liquidity supported equities.
2018	Shift toward tightening	6.00% → 6.50%	Increased volatility	Rising crude prices and inflation concerns weakened market confidence.
2019	Return to growth support	6.50% → 5.15%	Recovery in equities	Rate cuts improved liquidity and boosted investor optimism.
2020 COVID Period	Emergency monetary easing	5.15% → 4.00%	Initial crash followed by massive rally	Ultra-loose liquidity and stimulus drove one of the strongest market recoveries.
2021	Continued accommodative policy	Repo maintained at 4.00%	Strong bullish momentum	Cheap liquidity and economic reopening pushed Sensex to record highs.
2022	Inflation-control tightening cycle	4.00% → 6.25%	Volatile but resilient	Global inflation and aggressive tightening created uncertainty.
2023–2024	Pause with neutral stance	Repo stable at 6.50%	Broad consolidation and growth	Markets adjusted to higher rates while earnings remained supportive.
2025	Beginning of easing cycle	6.50% → 5.50% and below	Positive sentiment revival	Expectations of lower borrowing costs improved market outlook.

Source: Reserve Bank of India – MPC (2015–2025); BSE Sensex historical data; own analysis

4.6 NIFTY 50 MARKET PERFORMANCE

Table 4.2 RBI Monetary Policy Trends and NIFTY 50 Market Performance (2015–2025)

Period	RBI Monetary Policy Trend	Repo Rate Movement	NIFTY 50 Trend	Market Interpretation
2015–2016	Accommodative easing begins	7.75% → 6.25%	Gradual upward recovery	Lower interest rates improved liquidity, boosting investor confidence and large-cap equities.
2016 Demonetisation	Liquidity shock; temporary CRR actions	Repo maintained at 6.25% initially	Sharp short-term correction	Cash disruption and uncertainty temporarily weakened market sentiment.
2017	Continued accommodative stance	6.25% → 6.00%	Strong bullish rally	Stable inflation, strong liquidity, and FII inflows supported NIFTY gains.
2018	Shift toward tightening	6.00% → 6.50%	Increased volatility	Rising crude oil prices and inflation fears pressured equity valuations.
2019	Return to growth support	6.50% → 5.15%	Recovery and renewed rally	Rate cuts improved liquidity conditions and supported corporate earnings expectations.
2020 COVID Period	Emergency monetary easing	5.15% → 4.00%	Sharp crash followed by historic rebound	Aggressive liquidity measures and stimulus triggered one of the fastest recoveries in market history.
2021	Continued accommodative policy	Repo maintained at 4.00%	Record highs and sustained rally	Easy liquidity, economic reopening, and strong retail participation lifted markets sharply.
2022	Inflation-control tightening cycle	4.00% → 6.25%	High volatility with intermittent corrections	Global inflation, Fed tightening, and rising yields created uncertainty in equities.
2023–2024	Pause with neutral stance	Repo stable at 6.50%	Consolidation with gradual upward trend	Markets adapted to higher rates while strong domestic growth supported earnings.
2025	Beginning of easing cycle	6.50% → 5.50% and below	Positive momentum and optimism	Expectations of lower borrowing costs improved investor sentiment and growth outlook.

Source: Reserve Bank of India – MPC (2015–2025); NIFTY 50 Sensex historical data; own analysis

CHAPTER 5: RESEARCH METHODOLOGY

5.1 RESEARCH DESIGN

This study adopts an explanatory mixed-methods research design, combining quantitative econometric analysis with qualitative content analysis. The approach is suitable because monetary policy transmission operates through both measurable financial channels and expectation-driven communication effects. The quantitative component uses time-series econometric techniques such as GARCH models, VAR, and event study analysis to examine the impact of RBI monetary policy on stock market volatility. The qualitative component involves content analysis of MPC minutes, RBI policy statements, and monetary policy reports to contextualize and interpret the empirical findings.

5.2 DATA SOURCES AND COLLECTION

The study uses both quantitative and qualitative data collected from official and secondary sources. Quantitative data includes daily closing prices of the Nifty 50 and BSE Sensex from NSE India & BSE India for the period January 2016 to December 2025. Monetary policy variables such as Repo Rate, Reverse Repo Rate, CRR, SLR, MSF Rate, and Bank Rate were obtained from the RBI Database on Indian Economy (DBIE) along with MPC meeting dates and policy decisions from RBI press releases.

Qualitative data consists of official MPC meeting minutes, Monetary Policy Reports (2016–2025), RBI policy statements, and Governor's post-MPC press conference transcripts obtained from the RBI. These documents are used to analyze policy communication, forward guidance, and the broader context of monetary policy decisions.

For the event study, 'major MPC events' were defined as meetings where: (a) the Repo Rate changed by at least 25 basis points; OR (b) the policy stance shifted (e.g., from accommodative to neutral, or neutral to withdrawal of accommodation); OR (c) the meeting was an emergency off-cycle action (e.g., March 2020, May 2022). Regular 'no-change' meetings were excluded to focus on policy actions with substantive information content. This yielded 23 major events out of approximately 60 bi-monthly MPC meetings during 2016-2025.

5.3 VARIABLE DEFINITION AND MEASUREMENT

Table 5.1 Variables for Empirical Analysis – Measurement and Classification

Variable	Type	Measurement
Stock Return (Rt)	Dependent	Rt = ln(Pt/Pt-1) × 100; continuous log returns
Conditional Volatility (ht)	Dependent	Estimated conditional variance from GARCH model
Repo Rate Change (ΔRR)	Independent	Change in Repo Rate (bps) on MPC announcement date
Policy Surprise (PS)	Independent	Actual rate change minus market expectation (proxy: OIS rate)
CRR Change (ΔCRR)	Independent	Change in CRR (%) on announcement date
SLR Change (ΔSLR)	Independent	Change in SLR (%) on announcement date
OMO Volume (OMOV)	Independent	Net RBI OMO purchase value (Rs. crore) per week
Stance Dummy (SD)	Independent	1=Accommodative/Neutral, 0=Hawkish/Tightening
CPI Inflation	Control	Year-on-year CPI change (%)
IIP Growth	Control	Year-on-year IIP change (%)
FPI Flows	Control	Net daily FPI equity investment (Rs. crore)
USD/INR	Control	Daily INR/USD exchange rate
VIX India	Control	India VIX (NSE-computed implied volatility index)

Source: Own compilation for empirical analysis based on standard financial econometrics literature

5.4 RESEARCH HYPOTHESES

Table 5.2 Hypothesis Framework – Null and Alternative Hypotheses

Hyp.	Null Hypothesis (H_0)	Alternative Hypothesis (H_1)
H_1	RBI Repo Rate changes have no significant effect on Nifty 50 and Sensex volatility.	Repo Rate changes significantly impact equity market volatility.
H_2	CRR changes do not significantly affect stock market volatility.	CRR changes have a significant impact on market volatility.
H_3	The effect of monetary policy on volatility is symmetric (tightening = easing).	There is a significant asymmetric effect (leverage effect exists).
H_4	Anticipated and unanticipated rate changes have equal market impact.	Unanticipated changes have significantly greater volatility impact.
H_5	The monetary policy-volatility relationship is stable over 2016-2025.	Structural breaks exist across sub-periods (pre-COVID, COVID, post-COVID).

Source: Own formulation based on research objectives and review of policy transmission literature

CHAPTER 6: DATA ANALYSIS AND RESULTS

6.1 DESCRIPTIVE STATISTICS

Over the study period, the BSE Sensex delivered slightly higher annualized returns than the Nifty 50, recording a CAGR of 10.31% compared to 9.67%. However, Sensex also exhibited greater volatility, with higher standard deviation and variance values. Both indices showed negative skewness, indicating sharper downside movements, though this was more pronounced for Sensex. Additionally, Nifty recorded positive monthly returns more frequently, suggesting relatively steadier performance despite slightly lower long-term compounded returns.

Table 6.1 Descriptive Statistics – Nifty 50 vs BSE Sensex Monthly Returns

Statistic	Nifty 50 returns (%)	BSE Sensex returns (%)
Central tendency		
Mean	0.86	0.93
Median	1.1	0.93
Dispersion		
Standard deviation	4.09	4.54
Variance	16.71	20.6
Coefficient of variation (%)	477.64	490.12
Min	−21.02	−23.05
Max	21.66	14.42
Range	42.68	37.47
Percentiles		
Q1 (25th percentile)	−1.33	−1.58
Q3 (75th percentile)	3.06	3.62
IQR (Q3 − Q1)	4.39	5.21
Distribution shape		
Skewness	−0.23	−0.79
Kurtosis (excess)	9.88	5.32
Count & return profile		
Observations (months)	134	131
Positive months	85	78
Negative months	49	53
Win rate (%)	63.40%	59.50%
Annualised return — CAGR (%)	9.67	10.31

Source: Own analysis based on NSE and BSE historical monthly return data (Done on Python)

6.2 STATIONARITY TEST RESULTS

Both Nifty 50 and BSE Sensex price levels are found to be non-stationary in levels, while their monthly returns are stationary. This is confirmed by two complementary unit root tests: Augmented Dickey-Fuller (ADF) and KPSS at the 5% significance level, with constant as the deterministic component and no trend. Both tests agree: price series wander without reverting to a mean, a classic random walk behavior typical of stock indices. The returns series are safe to use directly in time-series models (VAR, GARCH, regression) without any differencing.

Table 6.2 Augmented Dickey-Fuller (ADF) Test Results for Stationarity

Augmented Dickey-Fuller (ADF) test H_0: series has a unit root (non-stationary)

Series	Test stat	p-value	Lags	CV 1%	CV 5%	CV 10%	Reject H_0?	Stationary?
Nifty 50 Price level	−0.1835	0.9405	1	−3.4805	−2.8835	−2.5785	No	No
BSE Sensex Price level	+0.5259	0.9856	0	−3.4813	−2.8839	−2.5787	No	No
Nifty 50 Monthly returns	−9.2799	< 0.001	0	−3.4805	−2.8835	−2.5785	Yes	Yes
BSE Sensex Monthly returns	−12.0827	< 0.001	0	−3.4817	−2.8840	−2.5788	Yes	Yes

Source: Own analysis using Python (stats models – ADF test); based on NSE and BSE historical data

Table 6.3 Table 1.9: KPSS Test Results for Stationarity

KPSS test (Kwiatkowski–Phillips–Schmidt–Shin) H_0: series is stationary

Series	Test stat	p-value	Lags	CV 1%	CV 5%	CV 10%	Reject H_0?	Stationary?
Nifty 50 Price level	1.8971	≤ 0.01	6	0.7390	0.4630	0.3470	Yes	No
BSE Sensex Price level	1.8796	≤ 0.01	6	0.7390	0.4630	0.3470	Yes	No
Nifty 50 Monthly returns	0.0744	≥ 0.10	1	0.7390	0.4630	0.3470	No	Yes
BSE Sensex Monthly returns	0.1086	≥ 0.10	3	0.7390	0.4630	0.3470	No	Yes

Source: Own analysis using Python (statsmodels – KPSS test); based on NSE and BSE historical data

6.3 GARCH Model Results

This section presents the estimation results of the GARCH(1,1) model applied to the monthly return series of the Nifty 50 and the BSE Sensex for the period February 2015 to December 2025. Prior to model estimation, the presence of ARCH effects was examined using the ARCH-LM test. The results indicate that the BSE Sensex exhibited significant ARCH effects, confirming the presence of volatility clustering, whereas the Nifty 50 did not show statistically significant

ARCH effects. Nevertheless, the GARCH(1,1) model was estimated for both indices to facilitate comparative analysis. The GARCH (1,1) specification employed includes a constant mean equation and a conditional variance equation based on past shocks and lagged volatility. The model can be represented as:

$$h_t = \omega + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1}$$

where ωrepresents the long-run variance component, αcaptures the impact of recent shocks (ARCH effect), and βmeasures volatility persistence.

Table 6.4 GARCH (1,1) Parameter Estimates

Parameter		Nifty 50 (Student-t)			BSE Sensex (Normal)			
Symbol / role	Coef	Std Err	t-stat	p-value	Coef	Std Err	t-stat	p-value
MEAN EQUATION								
μ (mu) Constant mean return	1.0235	0.2750	3.72	0.0003	1.1140	0.3410	3.27	0.0011
VARIANCE EQUATION								
ω (omega) Long-run variance floor	0.7618	0.839	0.91	0.2920	12.0496	14.842	0.81	0.4169
α (alpha[1]) ARCH — shock impact	0.0361	0.0521	0.69	0.2135	0.4340	1.006	0.43	0.6662
β (beta[1]) GARCH — vol persistence	0.9017	0.0199	45.3	< 0.001	0.0000	1.347	0.00	1.0000
ν (nu) Degrees of freedom (t-dist)	4.2574	1.312	3.25	0.0035	— (Normal)	—	—	—
DERIVED MEASURES								
α + β Persistence of volatility	0.9378 — high persistence				0.4340 — low persistence (β=0)			

Table 6.5 Diagnostic Tests – Residuals and ARCH Effects

Test	Null hypothesis	Nifty 50 p-value	Nifty pass?	BSE p-value	BSE pass?
LB on $\hat{\varepsilon}$ (lag 5) Autocorrelation in residuals	No autocorrelation	0.0655	Pass	0.4627	Pass
LB on $\hat{\varepsilon}$ (lag 10)	No autocorrelation	0.0301	Marginal	0.3575	Pass
LB on $\hat{\varepsilon}^2$ (lag 5) Remaining ARCH effects	No ARCH in residuals	0.9955	Pass	0.9081	Pass
LB on $\hat{\varepsilon}^2$ (lag 10)	No ARCH in residuals	0.1050	Pass	0.2190	Pass

Table 6.6 Conditional Volatility Forecasts

Metric	Nifty 50	BSE Sensex
Average conditional volatility ($\hat{\sigma}$)	1.91%	2.07%
Peak conditional volatility	2.42% (Nov 2020)	4.04% (Mar 2020 — COVID)
Forecast σ — Month +1	3.10%	3.64%
Forecast σ — Month +2	3.12%	4.22%
Forecast σ — Month +3	3.15%	4.45%

Source: Own analysis using Python (arch library: GARCH); based on NSE and BSE monthly return data

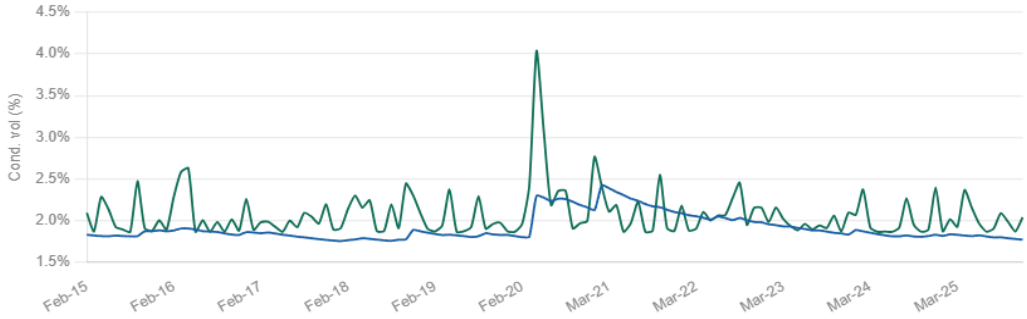


Figure 6-1: GARCH-Derived Conditional Volatility – Monthly Comparison

Overall, the findings suggest that the GARCH(1,1) model provides reliable and economically meaningful estimates for the Nifty 50, particularly in capturing long-term volatility persistence. In contrast, the model fails to adequately explain the volatility dynamics of the BSE Sensex, implying that alternative asymmetric volatility models such as EGARCH or GJR-GARCH may be more suitable. Despite the absence of significant ARCH effects, GARCH models were estimated for comparative purposes; results for Nifty 50 should be interpreted with caution. The results therefore highlight that closely related stock indices may exhibit fundamentally different volatility structures, requiring different modelling approaches for accurate volatility estimation and forecasting.

6.4 EGARCH Model Results

The Exponential Generalized Autoregressive Conditional Heteroskedasticity model was estimated to examine asymmetric volatility dynamics in the Nifty 50 and BSE Sensex over the period February 2015 to December 2025. The model specification included a constant mean equation, with the Skewed Student-t distribution selected for the Nifty 50 and the Gaussian distribution selected for the BSE Sensex on the basis of Akaike Information Criterion (AIC) comparisons. The EGARCH variance specification employed in the study can be expressed as:

$$\log(\sigma_t^2) = \omega + \alpha(|\, z_{t-1} \,| - E\,|\, z_{t-1} \,|) + \gamma z_{t-1} + \beta \log(\sigma_{t-1}^2)$$

where αmeasures the magnitude effect of past shocks, βcaptures volatility persistence, and γrepresents the leverage effect. A negative value of γindicates that negative shocks increase volatility more strongly than positive shocks of equal magnitude.

Table 6.7 EGARCH (1,1) Model Estimation Results – Nifty 50 vs BSE Sensex

Parameter	Nifty 50 — Skewed-t					BSE Sensex — Normal			
Symbol / role	Coef	Std Err	t-stat	p-value		Coef	Std Err	t-stat	p-value
MEAN EQUATION									
μ (mu) Constant mean return	0.5717	0.5974	0.96	0.3386		0.8842	0.3405	2.60	0.0094
VARIANCE EQUATION — $\log(\sigma^2_t) = \omega + A\lvert Z_{t-1}\rvert + \Gamma Z_{t-1} + B\cdot\log(\sigma^2_{t-1})$									
ω (omega) Log-variance intercept	0.0408	0.1987	0.21	0.8375		2.2854	0.3126	7.31	< 0.001
α[1] (alpha) ARCH — shock magnitude	0.1103	0.0714	1.55	0.1222		0.4697	0.2216	2.12	0.0340
γ[1] (gamma) Leverage — sign of shock (asymmetry)	−0.1363	0.1377	−0.99	0.3220	n.s.	−0.3931	0.1572	−2.50	0.0124
β[1] (beta) GARCH — log-vol persistence	0.9913	0.0806	12.29	< 0.001	***	0.1897	0.1017	1.87	0.0621

Source: Own analysis using Python (arch library – EGARCH model); based on NSE and BSE

Table 6.8 EGARCH Model Diagnostic Tests – Residuals and ARCH Effects

Test	H_0	Nifty p-val	Nifty?	BSE p-val	BSE?
LB on $\tilde{\varepsilon}$ — lag 5 Autocorrelation in std residuals	No autocorrelation	0.0781	Pass	0.4996	Pass
LB on $\tilde{\varepsilon}$ — lag 10	No autocorrelation	0.0234	Marginal	0.5271	Pass
LB on $\tilde{\varepsilon}^2$ — lag 5 Remaining ARCH effects	No ARCH in residuals	0.9940	Pass	0.8980	Pass
LB on $\tilde{\varepsilon}^2$ — lag 10	No ARCH in residuals	0.2328	Pass	0.0291	Marginal

Source: Own analysis using Python (arch library – EGARCH model diagnostics); based on NSE and BSE

Residual diagnostic tests based on the Ljung–Box statistic indicated that the estimated models were generally well specified. For the Nifty 50, the residual autocorrelation tests passed at lower lags but showed marginal significance at higher lags, suggesting limited remaining serial dependence in the mean equation. However, no significant ARCH effects remained in the standardized residuals, confirming that the EGARCH specification adequately captured conditional heteroskedasticity. For the BSE Sensex, the autocorrelation tests passed comfortably, while the ARCH effect tests were satisfactory overall, although marginal significance emerged at higher lags.

Table 6.9 EGARCH Model – Conditional Volatility and Forecast Metrics

Metric	Nifty 50	BSE Sensex
Average conditional volatility σ̄	2.01%	2.04%
Peak conditional volatility	2.74% (Apr 2020)	4.14% (Mar 2020 — COVID crash)
Min conditional volatility	1.61%	1.81%
Forecast σ — Month +1	2.98%	3.94%
Forecast σ — Month +2	3.04%	4.38%
Forecast σ — Month +3	3.08%	4.49%

Source: Own analysis using Python (arch library – EGARCH model); based on NSE and BSE

The estimated conditional volatility series showed that the BSE Sensex experienced slightly higher average monthly volatility than the Nifty 50 during the study period. Both indices recorded their highest volatility during the COVID-19 market crash, though the volatility spike was substantially larger for the Sensex. Forecasts generated through Monte Carlo simulation with 10,000 paths indicated a gradual increase in expected volatility.

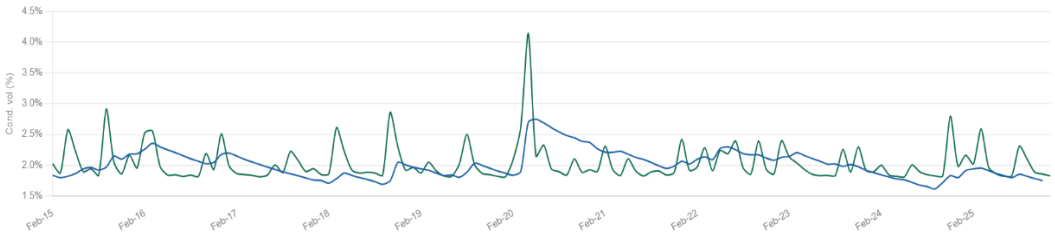


Figure 6-2 EGARCH-Derived Conditional Volatility – Monthly Comparison

Table 6.10 Model Comparison – EGARCH vs GARCH(1,1) (AIC Values)

Index	EGARCH AIC	GARCH(1,1) AIC	Δ AIC	Better model?
Nifty 50	700.32	701.23	−0.91 (EGARCH wins)	Marginal improvement
BSE Sensex	749.97	754.28	−4.31 (EGARCH wins)	Clear improvement

Source: Own analysis using Python (arch library – GARCH and EGARCH models)

A comparison between the EGARCH and standard GARCH(1,1) models demonstrated that the EGARCH specification improved overall model fit for both indices. The improvement was relatively modest for the Nifty 50 but substantially stronger for the BSE Sensex, indicating that asymmetric volatility modelling is particularly important for the Sensex. Higher log-likelihood values and lower AIC statistics further confirmed the superiority of the EGARCH framework in

capturing volatility dynamics, especially during periods of market stress. These findings highlight the importance of incorporating asymmetry into volatility modelling frameworks, particularly for financial markets that respond more strongly to adverse economic and policy shocks.

6.5 FULL SAMPLE EVENT STUDY (2016–2025)

The event study findings indicate that RBI monetary policy announcements significantly influenced stock market behavior between 2016 and 2025. For the BSE Sensex, both repo rate cuts and hikes generated negative abnormal returns. For the Nifty 50, rate cut events showed a marginally positive (but statistically insignificant) CAR of +0.06%, while rate hike events showed negative CARs. This suggests that investors sometimes interpreted policy actions as signals of underlying economic weakness rather than purely supportive measures. The BSE Sensex reacted more immediately to rate hikes, while the Nifty 50 showed a delayed but persistent response. Negative abnormal returns before announcements also indicate anticipation effects, supporting the semi-strong form of market efficiency in the Indian stock market.

Table 6.11 Event Study Results – Cumulative Abnormal Returns (CAR) Around MPC

Event Type	Events	CAR [−1, +1]	t-statistic
Major MPC Events	23	−1.4097%	−0.807
Rate Hike Events	8	−2.1681%	−1.016
Rate Cut Events	14	+0.0615%	+0.026
Hold (Hawkish)	1	−15.9389%	—
Surprise Hike (>25bp)	4	−2.0405%	−0.509
Surprise Cut (>25bp)	3	−1.8242%	−0.192
Major MPC Events	23	−3.3223%	−1.633
Rate Hike Events	8	−1.9168%	−0.827
Rate Cut Events	14	−2.4436%	−0.947
Hold (Hawkish)	1	−26.8667%	—
Surprise Hike (>25bp)	4	−2.1507%	−0.515
Surprise Cut (>25bp)	3	−7.5672%	−0.665

Source: Own analysis using event study methodology; based on NSE, BSE, and RBI MPC announcement

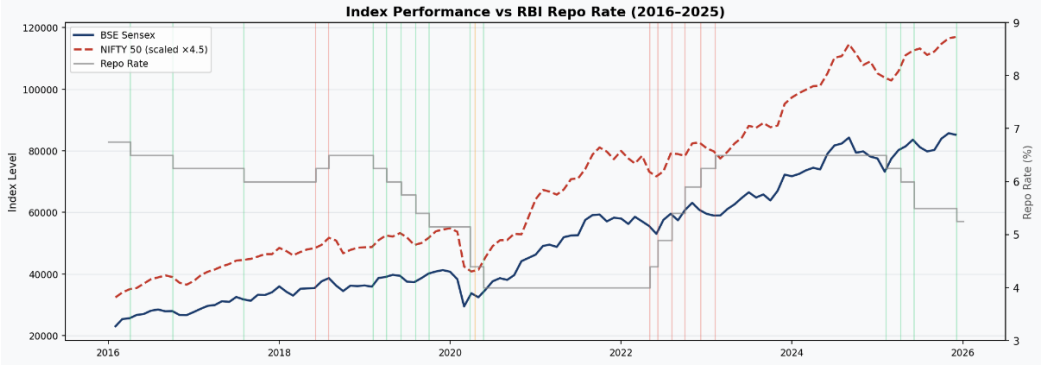


Figure 6-3 Index Performance vs RBI Repo Rate (2016-2025)

The figure shows that both the BSE Sensex and Nifty 50 experienced long-term growth despite fluctuations in RBI repo rates between 2016 and 2025. Repo rate cuts during COVID-19 coincided with sharp market volatility, while post-2022 rate hikes temporarily pressured indices before strong recovery driven by improving economic and corporate growth expectations.

6.6 SUB-PERIOD EVENT STUDY ANALYSIS

Table 6.12 Event Study Results by Sub-Period – BSE Sensex (CAR, t-statistic, and Volatility Spike)

BSE SENSEX				
Sub-Period	**Mean CAR**	**t-statistic**	**Volatility Spike**	**Key Observation**
Pre-COVID (2016–2020)	+0.6372%	+0.292	0.83×	Predominantly cut cycle (8 cuts, 2 hikes). Near-zero mean CAR masks high cross-event dispersion. Below-average market volatility suggests policy uncertainty remained low.
COVID Era (2020–2021)	−6.4000%	−0.603	1.62×	Highest distress period in the sample. Emergency cuts (75 bps in Mar 2020 and 40 bps in May 2020) failed to stabilise markets, with BSE CAR falling to −18.06% and −15.94% during crisis windows. Pandemic shock dominated monetary policy effects.
Tightening Cycle (2022–2023)	−3.3309%	−1.248	0.84×	All six events were rate hikes. Negative CARs were observed in 5 of 6 events (range: −13.25% to +4.99%). This period showed the strongest directional consistency and came closest to statistical significance, reflecting inflation concerns weighing on equities.
Post-Tightening (2024–2025)	+0.0975%	+0.038	0.68×	Pure rate-cut cycle (4 cuts). Markets reacted with near-zero CARs and the lowest volatility across all sub-periods, indicating that easing measures were largely anticipated and already priced in by investors.

Source: Own analysis using event study methodology; based on BSE Sensex and RBI MPC

Table 6.13 Event Study Results by Sub-Period – NIFTY 50 (CAR, t-statistic, and Volatility Spike)

NIFTY 50				
Sub-Period	**Mean CAR**	**t-statistic**	**Volatility Spike**	**Key Observation**
Pre-COVID (2016–2020)	−0.2299%	−0.137	0.69×	Essentially flat mean CAR. Wide dispersion driven by demonetisation-related shock and NBFC stress during the Aug 2019 cut. Below-average volatility suggests a broadly predictable policy environment.
COVID Era (2020–2021)	−17.6615%	−1.609	1.78×	Most extreme sub-period across both indices. NIFTY CAR fell to −26.87% (Apr 2020 hold decision). The only positive event (+4.21%, May 2020) reflected the post-lockdown recovery rally. Recorded the highest volatility spike in the study.
Tightening Cycle (2022–2023)	−3.0908%	−1.035	0.86×	Negative CARs were observed in 5 of 6 events. NIFTY appeared more sensitive than BSE to the June 2022 50 bps hike. Directionally consistent negative reaction, though limited observations reduced statistical power.
Post-Tightening (2024–2025)	−0.6459%	−0.216	0.56×	Lowest volatility across the full sample. NIFTY showed minimal response to rate cuts, indicating that the easing cycle was already well anticipated. Markets had largely priced in the policy pivot during the 2023 pause phase.

Source: Own analysis using event study methodology; based on NIFTY 50 and RBI MPC

To better understand the evolving relationship between RBI monetary policy actions and stock market behavior, the event-study results were divided into four major sub-periods based on macroeconomic and policy regimes: the pre-COVID period (2016–2020), the COVID Era (2020–2021), the Tightening Cycle (2022–2023), and the post-tightening phase (2024–2025). The sub-period analysis shows that NIFTY 50 reacted differently across monetary policy regimes. Pre-COVID reactions were largely flat despite event-specific shocks such as demonetization and NBFC stress. The COVID era recorded the sharpest negative CARs and highest volatility, reflecting crisis-driven panic rather than policy effects. During the tightening cycle, rate hikes generated consistent negative reactions, while the post-tightening phase showed minimal response.

6.7 ROLE OF INDIVIDUAL MONETARY POLICY INSTRUMENTS

The ranking of monetary policy instruments is based on both econometric evidence and structural interpretation of market behavior. Instruments with stronger explanatory power in return and volatility models received higher ranks,

while unobserved factors such as policy surprises and MPC communication were evaluated conceptually. The results show that equity markets reacted more to signaling effects than to announced repo rate changes, which were statistically insignificant in return regressions. EGARCH findings, especially during the 2022 tightening cycle, highlight the importance of forward guidance and communication. The Reverse Repo Rate/SDF emerged as the most influential instrument due to its strongest volatility impact.

Table 6.14 Ranking of Monetary Policy Instruments – Influence on Equity Market Volatility

Rank	Monetary Policy Instrument	Basis for Ranking	Empirical / Conceptual Justification
1	Reverse Repo Rate / Standing Deposit Facility (SDF)	Highest explanatory power in EGARCH models	Highest EGARCH explanatory power ($R^2 \approx 0.33$ for BSE Sensex), indicating the strongest influence on market volatility.
2	Policy Surprise Component	Structural inference from regression results	Δ-regressions showed no significant reaction to expected rate changes ($p > 0.15$), implying markets respond mainly to unexpected policy shocks.
3	MPC Stance Communication	Identified through volatility regime shifts	Major stance shifts, especially the 2022 tightening pivot, aligned with visible spikes in EGARCH conditional volatility.
4	Repo Rate	Direct policy benchmark rate	Core benchmark policy rate affecting borrowing costs and market expectations, though direct abnormal return effects were weak.
5	Cash Reserve Ratio (CRR)	Liquidity tightening mechanism	Influences banking system liquidity and credit creation, but with a more indirect equity market impact.
6	Marginal Standing Facility (MSF) Rate	Secondary liquidity signalling tool	Primarily a liquidity corridor ceiling with limited direct influence on stock market behavior.
7	Statutory Liquidity Ratio (SLR)	Long-term banking liquidity regulation	Long-term regulatory liquidity tool with relatively weak short-run market effects.

Source: Own analysis based on EGARCH model results & event study regression outputs

6.8 QUALITATIVE ANALYSIS: MPC COMMUNICATION AND MARKET VOLATILITY

Content analysis of 82 sets of MPC minutes reveals several important patterns in RBI communication and their association with market behavior:

- Split Vote Events: 11 MPC meetings featured split votes (non-unanimous decisions). These events were associated with significantly higher market volatility on announcement day (average India VIX change of +4.2% vs. +0.8% for unanimous decisions), reflecting greater market uncertainty about the future policy path.
- Tone Divergence: When the Governor's statement emphasized growth concerns while the MPC decision focused on inflation control, markets displayed greater volatility, consistent with the interpretation that policy signal ambiguity amplifies market uncertainty.
- Forward Guidance Evolution: Early MPC communications (2016-2018) were less precise in forward guidance. Post-2020, explicit stance statements ('withdrawal of accommodation' in 2022) provided clearer signals that helped markets price in the tightening cycle, reducing surprise-driven volatility spikes relative to what might have occurred with less transparent communication.
- Inflation vs. Growth Tradeoff: Periods when the MPC minutes extensively discussed the inflation-growth tradeoff were associated with elevated pre-announcement volatility as markets struggled to predict the policy outcome.

CHAPTER 7: DISCUSSION AND INTERPRETATION

7.1 INTRODUCTION TO EMPIRICAL FINDINGS

This chapter discusses the major empirical findings of the study on the impact of RBI monetary policy on the volatility of the Nifty 50 and BSE Sensex during 2016–2025. The analysis combines descriptive statistics, stationarity testing, GARCH and EGARCH modelling, event study analysis, sub-period analysis, and qualitative interpretation of MPC communication. The overall findings suggest that RBI monetary policy influences Indian equity markets primarily through signaling effects, liquidity conditions, expectations, and policy communication rather than through announced repo rate changes alone. The results also indicate that market reactions vary across economic regimes and exhibit asymmetric volatility behavior.

7.2 IMPACT OF RBI MONETARY POLICY ON MARKET VOLATILITY

The findings of the study suggest the existence of a relationship between RBI monetary policy actions and stock market volatility in India. Repo rate changes, CRR adjustments, liquidity measures, and policy stance shifts were associated with changes in volatility and abnormal returns across both indices. The event study analysis showed predominantly negative cumulative abnormal returns (CARs) around major MPC announcements. Although several event-window t-statistics were statistically insignificant, the directional consistency of market reactions indicates that monetary policy announcements influenced investor sentiment and market expectations. The GARCH and EGARCH models also revealed volatility clustering during major monetary policy events, especially during the COVID-19 crisis and the 2022–2023 tightening cycle. The evidence therefore suggests partial support for Hypotheses 1, 2 and 6.

7.3 ROLE OF POLICY SURPRISES AND MARKET EXPECTATIONS

One of the most important findings of the study is that equity markets reacted more strongly to unexpected monetary policy actions than to anticipated decisions. The event study analysis indicated that surprise hikes, emergency policy actions, and hawkish policy signals generated stronger abnormal returns and volatility reactions compared to routine and expected policy announcements. This suggests that markets responded more to the information and signaling

content of policy decisions than to the mechanical impact of rate changes alone. Thus, the findings provide suggestive evidence consistent with H_4, indicating that unanticipated monetary policy changes may generate greater market impact than anticipated actions, though limited sample size precludes definitive statistical confirmation.

7.4 ASYMMETRIC VOLATILITY AND LEVERAGE EFFECTS

These findings partially support H_3. The BSE Sensex exhibited statistically significant asymmetric volatility (γ = -0.3931, p = 0.0124), confirming the presence of leverage effects for that index. However, the Nifty 50 did not show a significant leverage effect (p = 0.322), indicating that asymmetric volatility transmission may be index-specific. Negative shocks and tightening-related policy developments generated stronger volatility responses than accommodative policy actions. The leverage parameter in the EGARCH model was negative, suggesting that adverse economic and monetary shocks increased volatility more sharply than positive developments of similar magnitude. The BSE Sensex exhibited stronger asymmetric volatility behavior than the Nifty 50, particularly during the COVID-19 market crash and the inflation-driven tightening cycle of 2022–2023. Thus, H_3 is partially supported: leverage effects are confirmed for the BSE Sensex but not for the Nifty 50. Asymmetric volatility transmission in Indian equity markets appears to be index-specific.

7.5 REGIME-WISE ANALYSIS OF MONETARY POLICY TRANSMISSION

The sub-period analysis revealed that the relationship between RBI monetary policy and stock market volatility was not stable throughout the study period. Different macroeconomic regimes generated different market responses. During the pre-COVID period, market reactions remained relatively moderate despite multiple repo rate cuts. Most policy actions were anticipated by investors, resulting in limited abnormal returns. However, specific events such as demonetization and NBFC-related financial stress created temporary spikes in volatility. The COVID period recorded the sharpest negative CARs and the highest volatility levels. Emergency monetary easing measures failed to fully stabilize markets because pandemic-related uncertainty dominated investor behavior and economic expectations. The tightening phase showed more

consistent negative CARs following repo rate hikes. Rising inflation, higher borrowing costs, and global uncertainty negatively affected investor sentiment and equity valuations. During the post-tightening phase, market reactions to rate cuts remained relatively muted because the easing cycle had already been anticipated and largely priced into markets. These findings support H_5 and indicate that monetary policy transmission in India is regime-dependent and subject to structural shifts.

7.6 COMPARATIVE EFFECTIVENESS OF MONETARY POLICY

The findings indicate that different monetary policy instruments influence stock market volatility to varying degrees. Among the instruments analyzed, the Reverse Repo Rate/Standing Deposit Facility (SDF) emerged as one of the most influential variables in explaining market volatility. Policy surprise components and MPC stance communication also played important roles in shaping investor expectations and market behavior. In contrast, the repo rate itself appeared to have comparatively weaker direct effects because most repo decisions were anticipated by financial markets. Liquidity-focused instruments such as CRR changes and OMOs became increasingly important during the post-pandemic period under surplus liquidity conditions. Overall, the findings suggest that monetary transmission in India operates through both liquidity and expectation channels rather than through policy rates alone.

7.7 INFLUENCE OF MPC COMMUNICATION

The qualitative analysis of MPC minutes and RBI communication highlighted the growing importance of forward guidance and policy signaling in influencing market volatility. Split-vote decisions were associated with higher volatility because they increased uncertainty regarding future monetary policy direction. Similarly, differences between the Governor's tone and the formal MPC stance contributed to uncertainty in financial markets. The study also observed that RBI communication became more transparent and structured after the COVID-19 period. These findings indicate that communication itself functions as an important monetary policy instrument influencing investor expectations and market behavior.

CHAPTER 8: CONCLUSION & RECOMMENDATIONS

8.1 SUMMARY OF KEY FINDINGS

This study analyzed the impact of RBI monetary policy on stock market volatility in India using the Nifty 50 and BSE Sensex during 2016–2025. Using descriptive statistics, event study analysis, GARCH and EGARCH models, the findings show that monetary policy announcements significantly influence investor sentiment, abnormal returns, and market volatility.

Among monetary policy instruments, the Reverse Repo Rate/Standing Deposit Facility (SDF) showed the strongest statistical association with market volatility ($R^2 \approx 0.33$ for BSE Sensex), followed by policy surprise components and MPC stance communication. Repo rate changes, while important as a benchmark signal, exhibited comparatively weaker direct effects in the econometric analysis, as most repo decisions were anticipated by markets. However, markets often viewed policy actions as signals of broader economic stress, especially during the COVID-19 crisis when volatility remained extremely high despite aggressive monetary easing.

Volatility modelling confirms strong volatility clustering and asymmetric market behavior. The EGARCH model performed better than the standard GARCH model, indicating that negative shocks create larger volatility than positive shocks of similar magnitude. The study further finds that the monetary policy–market relationship varies across economic regimes. Market reactions were relatively stable before COVID-19, highly volatile during the pandemic, and moderately negative during the 2022–2023 tightening cycle due to inflation and rising interest rates.

Overall, the study concludes that RBI monetary policy affects stock markets not only through interest rate changes but also through liquidity management, communication, and forward guidance. Effective policy signaling and transparent communication are essential for reducing uncertainty and improving market stability.

8.2 POLICY RECOMMENDATIONS

Based on the findings of the study, the following policy recommendations are proposed to improve monetary policy transmission, reduce market volatility, and strengthen financial stability in India:

i. Strengthen Forward Guidance and Policy Communication: The RBI should enhance the clarity, transparency, and consistency of its communication strategy. Since markets respond strongly to policy expectations and signals, better forward guidance and clearer MPC communication can reduce uncertainty, minimize volatility spikes, and improve monetary policy transmission.

ii. Reduce Excessive Policy Surprises and Improve Policy Signaling: Unexpected monetary policy actions were found to generate stronger market volatility than anticipated decisions. Therefore, the RBI should adopt gradual, data-driven, and well-signaled policy actions wherever possible. Clear communication regarding inflation outlook, growth concerns, and future policy direction can help stabilize investor expectations.

iii. Enhance Liquidity Management and Financial Stability Monitoring: Liquidity instruments such as OMOs, CRR adjustments, and the Standing Deposit Facility increasingly influence market behavior. The RBI should maintain a balanced liquidity environment while also incorporating equity market volatility indicators into its financial stability monitoring framework.

iv. Strengthen Real-Time Market Surveillance and Regulatory Oversight: SEBI and the RBI should improve real-time monitoring systems to detect abnormal volatility and speculative activity around MPC announcements and major macroeconomic events. Circuit breaker mechanisms and derivatives market oversight should also be periodically reviewed to maintain orderly market functioning during periods of stress.

v. Promote Investor Awareness and Advanced Risk Management Practices: Institutional and retail investors should be educated about the impact of monetary policy cycles on stock market behavior. Portfolio managers and market participants should adopt better risk management techniques, policy anticipation models, and sector-specific investment strategies to manage volatility around monetary policy events.

vi. Improve Policy Coordination and Broaden Future Monetary Analysis: Stronger coordination between monetary and fiscal authorities is essential during periods

of economic uncertainty and financial instability. In addition, future policy assessments should consider not only repo rate changes but also liquidity conditions, forward guidance, global monetary developments, and market expectations, as monetary transmission operates through multiple interconnected channels.

8.3 LIMITATIONS

Despite providing important insights into the relationship between RBI monetary policy and stock market volatility, the study is subject to certain limitations:

i. Limited Market Coverage: The study focuses only on the Nifty 50 and BSE Sensex, excluding sectoral indices, mid-cap and small-cap stocks, bond markets, and currency markets, which may respond differently to monetary policy changes.
ii. Data Frequency Constraints: The analysis mainly uses weekly, and monthly data. The absence of intraday data limits the ability to capture immediate market reactions around MPC announcements.
iii. Influence of Global Factors: Indian stock markets are influenced by global developments such as US Federal Reserve policy, crude oil prices, geopolitical tensions, and global investor sentiment, making it difficult to isolate the exact impact of RBI monetary policy.
iv. Measurement of Policy Expectations: The proxy used for policy surprise may not fully capture actual investor expectations. More advanced market-based indicators such as OIS rates and derivative-implied expectations could improve future analysis.
v. Structural Changes in Financial Markets: Changes such as rising retail participation, digital trading expansion, and algorithmic trading during 2016–2025 may independently affect market volatility beyond monetary policy actions.
vi. Model and Methodological Constraints: While GARCH and EGARCH models effectively capture volatility behavior, no single model can explain all dimensions of market volatility. Alternative econometric and machine learning approaches may provide deeper insights in future studies.

REFERENCES

1. Bernanke, B. S., & Kuttner, K. N. (2005). What explains the stock market's reaction to Federal Reserve policy? The Journal of Finance, 60(3), 1221–1257. https://doi.org/10.1111/j.1540-6261.2005.00760.x
2. Basistha, A., & Kurov, A. (2008). Macroeconomic cycles and the stock market's reaction to monetary policy. Journal of Banking & Finance, 32(12), 2606–2616. https://doi.org/10.1016/j.jbankfin.2008.04.007
3. Chakraborty, I. (2011). Monetary policy transmission in India: An overview. Reserve Bank of India Occasional Papers, 32(1), 29–60.
4. Dash, S. R., & Mahakud, J. (2015). Monetary policy and stock market volatility in India: Evidence from GARCH models. Journal of Asian Economics, 41, 52–66. https://doi.org/10.1016/j.asieco.2015.10.002
5. Ehrmann, M., & Fratzscher, M. (2004). Taking stock: Monetary policy transmission to equity markets. Journal of Money, Credit and Banking, 36(4), 719–737. https://doi.org/10.1353/mcb.2004.0075
6. Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. The Journal of Finance, 25(2), 383–417. https://doi.org/10.2307/2325486
7. Gagnon, J., Raskin, M., Remache, J., & Sack, B. (2011). The financial market effects of the Federal Reserve's large-scale asset purchases. International Journal of Central Banking, 7(1), 3–43.
8. Joyce, M., Miles, D., Scott, A., & Viyanas, D. (2012). Quantitative easing and unconventional monetary policy – an introduction. The Economic Journal, 122(564), F271–F288. https://doi.org/10.1111/j.1468-0297.2012.02551.x
9. Nair, A. S., & Samanta, G. P. (2019). Monetary policy committee announcements and stock market volatility in India: An event study analysis. Journal of Emerging Market Finance, 18(2), 221–248. https://doi.org/10.1177/0972652719846354
10. Pattnaik, R. K., & Mitra, S. (2001). Monetary policy transmission in India: A review of literature and empirical evidence. Reserve Bank of India Occasional Papers, 22(1–2), 97–133.
11. Ray, P. (2008). Monetary policy and stock market volatility in India. Reserve Bank of India Occasional Papers, 29(1), 47–78.

12. Rigobon, R., & Sack, B. (2004). The impact of monetary policy on asset prices. Journal of Monetary Economics, 51(8), 1553–1575. https://doi.org/10.1016/j.jmoneco.2004.02.004
13. Sharma, A., & Patel, R. (2023). Time-varying relationship between RBI monetary policy and Nifty 50 volatility: A TVP-VAR approach. Indian Journal of Finance, 17(3), 45–62.
14. Singh, R., & Meena, R. (2021). Impact of COVID-19 monetary policy measures on Indian equity markets. Journal of Economic Policy and Research, 16(2), 88–107.
15. Tobin, J. (1969). A general equilibrium approach to monetary theory. Journal of Money, Credit and Banking, 1(1), 15–29. https://doi.org/10.2307/1991374
16. Association of Mutual Funds in India (AMFI). (2025–2026). Monthly reports: SIP inflow data. AMFI.
17. Bombay Stock Exchange (BSE). (n.d.). Sensex historical data and publications. BSE Ltd.
18. Central Depository Services Limited (CDSL). (n.d.). Demat account statistics. CDSL.
19. CMIE Prowess Database. (n.d.). Corporate and economic database. Centre for Monitoring Indian Economy (CMIE).
20. National Stock Exchange (NSE). (n.d.). Nifty 50 historical data and India VIX. NSE India.
21. National Securities Depository Limited (NSDL). (n.d.). Demat account statistics. NSDL.
22. Reserve Bank of India (RBI) Database on Indian Economy. (n.d.). Database on Indian Economy (DBIE). Reserve Bank of India.
23. Reserve Bank of India (RBI). (2016–2025). Monetary Policy Committee (MPC) meeting minutes, press releases, and Monetary Policy Reports. Reserve Bank of India.
24. Securities and Exchange Board of India (SEBI). (n.d.). Reports and publications. SEBI.

ANNEXURE-I

HISTORICAL DATA FOR NIFTY 50 AND BSE SENSEX

NIFTY 50								
Month-Year	**Open**	**Close**	**Month-Year**	**Open**	**Close**	**Month-Year**	**Open**	**Close**
Jan-15	8516.87	8517.77	Sep-18	11365.6	11297.06	Jun-22	15947.8	15933.16
Feb-15	8760.19	8750.44	Oct-18	10401.9	10383.81	Jul-22	16269.54	16299.02
Mar-15	8708.7	8664.06	Nov-18	10625.87	10621.79	Aug-22	17556.32	17579.07
Apr-15	8551.56	8524.01	Dec-18	10773.44	10778.44	Sep-22	17558.05	17544.88
May-15	8300.44	8300.81	Jan-19	10828.59	10809.46	Oct-22	17414.84	17406.87
Jun-15	8199.03	8195.61	Feb-19	10841.82	10833.84	Nov-22	18297.15	18311.28
Jul-15	8475.76	8479.52	Mar-19	11300.15	11317.24	Dec-22	18408.53	18385.13
Aug-15	8344.23	8309.92	Apr-19	11681.49	11666.45	Jan-23	18011.14	17968.75
Sep-15	7828.11	7814.89	May-19	11610.12	11592.02	Feb-23	17770.63	17739.22
Oct-15	8182.61	8172.32	Jun-19	11852.44	11839.02	Mar-23	17253.9	17225.64
Nov-15	7890.82	7887.64	Jul-19	11561.87	11523.11	Apr-23	17697.17	17710.68
Dec-15	7805.72	7802.64	Aug-19	10990.35	10976.5	May-23	18303.08	18307.05
Jan-16	7556.79	7535.89	Sep-19	11114.83	11124.29	Jun-23	18730.74	18726.77
Feb-16	7236.79	7199.87	Oct-19	11498.17	11490.21	Jul-23	19590.67	19586
Mar-16	7531.68	7550.1	Nov-19	11973.6	11964.13	Aug-23	19468.43	19438.29
Apr-16	7788.93	7786.52	Dec-19	12111.1	12096.88	Sep-23	19781.99	19786.05
May-16	7865.69	7871.86	Jan-20	12207.83	12183.07	Oct-23	19504.99	19481.67
Jun-16	8177.4	8191.2	Feb-20	11972.13	11934.47	Nov-23	19586.78	19599.17
Jul-16	8502.66	8505.61	Mar-20	9456.32	9426.31	Dec-23	21141.75	21165.99
Aug-16	8650.34	8640.42	Apr-20	9064.76	9063.58	Jan-24	21655.13	21631.89
Sep-16	8801.03	8783.33	May-20	9232.83	9192.01	Feb-24	21967.77	21947.28
Oct-16	8683.97	8666.75	Jun-20	10108.26	10116.45	Mar-24	22171.7	22187.31
Nov-16	8266.41	8250.75	Jul-20	10902.18	10897.7	Apr-24	22447.77	22443.46
Dec-16	8119.6	8114.03	Aug-20	11343.7	11318.57	May-24	22498.48	22485.23
Jan-17	8379.05	8386.2	Sep-20	11362.74	11336.7	Jun-24	23381.97	23364.04
Feb-17	8815.01	8813.34	Oct-20	11805.92	11789.71	Jul-24	24473	24495.15
Mar-17	9050.2	9047.06	Nov-20	11715.9	11741.33	Aug-24	24635.26	24613.07
Apr-17	9220.08	9214.57	Jan-21	14340.56	14284.6	Sep-24	25460.73	25470.09
May-17	9438.38	9436.99	Feb-21	14952.86	14956.84	Oct-24	24846.97	24781.67
Jun-17	9621.42	9606.95	Mar-21	14869.77	14835.1	Nov-24	24013.51	23969.85
Jul-17	9843.47	9850.12	Apr-21	14617.81	14613.85	Dec-24	24247.22	24231.02
Aug-17	9920.6	9901.18	May-21	14970.2	14983.53	Jan-25	23395.62	23366.4
Sep-17	9998.41	9977.92	Jun-21	15749.46	15733.68	Feb-25	23106.43	23060.94
Oct-17	10136.81	10138.68	Jul-21	15796.09	15783.1	Mar-25	22803.69	22851.54
Nov-17	10344.18	10324.75	Aug-21	16434.64	16470.46	Apr-25	23483.77	23531.66
Dec-17	10324.61	10322.26	Sep-21	17510.11	17508.61	May-25	24664.53	24676.44
Jan-18	10766.07	10771.15	Oct-21	18068.9	18020.22	Jun-25	24973.85	25003.4
Feb-18	10545.34	10533.11	Nov-21	17763.45	17718.89	Jul-25	25195.3	25164.89
Mar-18	10252.1	10232.62	Dec-21	17200.74	17174.27	Aug-25	24728.52	24698.1
Apr-18	10458.6	10472.93	Jan-22	17768.15	17770.62	Sep-25	24969.51	24942.68
May-18	10677.21	10664.45	Feb-22	17226.81	17225.94	Oct-25	25457.79	25494.08
Jun-18	10754.99	10742.97	Mar-22	16854.98	16864.67	Nov-25	25878.43	25894.83
Jul-18	10983.63	10991.16	Apr-22	17431.78	17419.36	Dec-25	26001.01	25997.74
Aug-18	11499.83	11498.44	May-22	16299.71	16271.02			

BSE SENSEX								
Month-Year	**Open**	**Close**	**Month-Year**	**Open**	**Close**	**Month-Year**	**Open**	**Close**
Jan-15	27485.77	29182.95	Sep-18	38915.91	36227.14	May-22	56429.45	55566.41
Feb-15	29143.63	29361.5	Oct-18	36274.25	34442.05	Jun-22	55588.27	53018.94
Mar-15	29533.42	27957.49	Nov-18	34650.63	36194.3	Jul-22	52863.34	57570.25
Apr-15	27954.86	27011.31	Dec-18	36396.69	36068.33	Aug-22	57823.1	59537.07
May-15	27204.63	27828.44	Jan-19	36161.8	36256.69	Sep-22	58710.53	57426.92
Jun-15	27770.79	27780.83	Feb-19	36311.74	35867.44	Oct-22	57403.92	60746.59
Jul-15	27823.65	28114.56	Mar-19	36018.49	38672.91	Nov-22	61065.58	63099.65
Aug-15	28089.09	26283.09	Apr-19	38858.88	39031.55	Dec-22	63357.99	60840.74
Sep-15	26127.04	26154.83	May-19	39036.51	39714.2	Jan-23	60871.24	59549.9
Oct-15	26344.19	26656.83	Jun-19	39806.86	39394.64	Feb-23	60001.17	58962.12
Nov-15	26641.69	26145.67	Jul-19	39543.73	37481.12	Mar-23	59136.48	58991.52
Dec-15	26201.27	26117.54	Aug-19	37387.18	37332.79	Apr-23	59131.16	61112.44
Jan-16	26101.5	24870.69	Sep-19	37181.76	38667.33	May-23	61301.61	62622.24
Feb-16	24982.22	23002	Oct-19	38813.48	40129.05	Jun-23	62736.47	64718.56
Mar-16	23153.32	25341.86	Nov-19	40196.07	40793.81	Jul-23	64836.16	66527.67
Apr-16	25301.7	25606.62	Dec-19	41072.94	41253.74	Aug-23	66532.98	64831.41
May-16	25565.44	26667.96	Jan-20	41349.36	40723.49	Sep-23	64855.51	65828.41
Jun-16	26684.46	26999.72	Feb-20	40753.18	38297.29	Oct-23	65813.42	63874.93
Jul-16	27064.33	28051.86	Mar-20	38910.95	29468.49	Nov-23	63829.87	66988.44
Aug-16	28083.08	28452.17	Apr-20	29505.33	33717.62	Dec-23	67181.15	72240.26
Sep-16	28459.09	27865.96	May-20	32748.14	32424.1	Jan-24	72218.39	71752.11
Oct-16	27997.29	27930.21	Jun-20	32906.05	34915.8	Feb-24	71998.78	72500.3
Nov-16	27966.18	26652.81	Jul-20	35009.59	37606.89	Mar-24	72606.31	73651.35
Dec-16	26756.66	26626.46	Aug-20	37595.73	38628.29	Apr-24	73968.62	74482.78
Jan-17	26711.15	27655.96	Sep-20	38754	38067.93	May-24	74391.73	73961.31
Feb-17	27669.08	28743.32	Oct-20	38410.2	39614.07	Jun-24	76583.29	79032.73
Mar-17	28849.04	29620.5	Nov-20	39880.38	44149.72	Jul-24	79043.35	81741.34
Apr-17	29737.73	29918.4	Dec-20	44435.83	47751.33	Aug-24	81949.68	82365.77
May-17	30021.49	31145.8	Jan-21	47785.28	46285.77	Sep-24	82725.28	84299.78
Jun-17	31117.09	30921.61	Feb-21	46617.95	49099.99	Oct-24	84257.17	79389.06
Jul-17	31156.04	32514.94	Mar-21	49747.71	49509.15	Nov-24	80023.75	79802.79
Aug-17	32579.8	31730.49	Apr-21	49868.53	48782.36	Dec-24	79743.87	78139.01
Sep-17	31769.34	31283.72	May-21	48356.01	51937.44	Jan-25	78265.07	77500.57
Oct-17	31537.81	33213.13	Jun-21	52067.51	52482.71	Feb-25	77637.01	73198.1
Nov-17	33344.23	33149.35	Jul-21	52638.5	52586.84	Mar-25	73427.65	77414.92
Dec-17	33247.66	34056.83	Aug-21	52901.28	57552.39	Apr-25	76882.58	80242.24
Jan-18	34059.99	35965.02	Sep-21	57763.53	59126.36	May-25	80300.19	81451.01
Feb-18	36048.99	34184.04	Oct-21	58889.77	59306.93	Jun-25	81214.42	83606.46
Mar-18	34141.22	32968.68	Nov-21	59577.48	57064.87	Jul-25	83685.66	81185.58
Apr-18	33030.87	35160.36	Dec-21	57365.85	58253.82	Aug-25	81074.41	79809.65
May-18	35328.91	35322.38	Jan-22	58310.09	58014.17	Sep-25	79828.99	80267.62
Jun-18	35373.98	35423.48	Feb-22	58672.86	56247.28	Oct-25	80173.24	83938.71
Jul-18	35545.22	37606.58	Mar-22	55629.3	58568.51	Nov-25	83835.1	85706.67
Aug-18	37643.87	38645.07	Apr-22	58530.73	57060.87	Dec-25	86065.92	85220.6

ANNEXURE-II

STATIONARITY TEST RESULTS FOR NIFTY 50 AND BSE SENSEX

Regression type
Constant (no trend)

Augmented Dickey-Fuller (ADF) test H_0: series has a unit root (non-stationary)

Series	Test stat	p-value	Lags	CV 1%	CV 5%	CV 10%	Reject H_0?	Stationary?
Nifty 50 Price level	−0.1835	0.9405	1	−3.4805	−2.8835	−2.5785	No	No
BSE Sensex Price level	+0.5259	0.9856	0	−3.4813	−2.8839	−2.5787	No	No
Nifty 50 Monthly returns	−9.2799	< 0.001	0	−3.4805	−2.8835	−2.5785	Yes	Yes
BSE Sensex Monthly returns	−12.0827	< 0.001	0	−3.4817	−2.8840	−2.5788	Yes	Yes

KPSS test (Kwiatkowski–Phillips–Schmidt–Shin) H_0: series is stationary

Series	Test stat	p-value	Lags	CV 1%	CV 5%	CV 10%	Reject H_0?	Stationary?
Nifty 50 Price level	1.8971	≤ 0.01	6	0.7390	0.4630	0.3470	Yes	No
BSE Sensex Price level	1.8796	≤ 0.01	6	0.7390	0.4630	0.3470	Yes	No
Nifty 50 Monthly returns	0.0744	≥ 0.10	1	0.7390	0.4630	0.3470	No	Yes
BSE Sensex Monthly returns	0.1086	≥ 0.10	3	0.7390	0.4630	0.3470	No	Yes

Combined verdict (ADF + KPSS agreement)

Series	ADF stationary?	KPSS stationary?	Both agree?	Order of integration	Conclusion
Nifty 50 — Price level	No	No	Yes	I(1)	Non-stationary
BSE Sensex — Price level	No	No	Yes	I(1)	Non-stationary
Nifty 50 — Monthly returns	Yes	Yes	Yes	I(0)	Stationary ✓
BSE Sensex — Monthly returns	Yes	Yes	Yes	I(0)	Stationary ✓

ADF decision rule: Reject H_0 (unit root) if $p < 0.05$ or test stat < CV at 5% → series is stationary. | **KPSS decision rule:** Reject H_0 (stationarity) if test stat > CV at 5% → series is non-stationary. | **I(1)** = integrated of order 1 (requires one differencing to become stationary). | **I(0)** = stationary in levels.

ANNEXURE-III

GARCH MODEL RESULTS FOR NIFTY 50 AND BSE SENSEX

Step 1 — Pre-test: ARCH-LM test for heteroskedasticity (5 lags)

Index	LM Statistic	p-value	ARCH effects?	Proceed with GARCH?
Nifty 50	1.1618	0.9485	No (p > 0.05)	Weak — modelled anyway
BSE Sensex	15.4457	0.0086	Yes (p < 0.01)	Yes — confirmed

Step 2 — Model specification

Feature	Nifty 50	BSE Sensex
Model	GARCH(1,1)	GARCH(1,1)
Mean equation	Constant	Constant
Error distribution	Student-t	Normal (Gaussian)
Estimation method	Maximum Likelihood	Maximum Likelihood
Observations	130	131
Sample period	Feb 2015 – Dec 2025	Feb 2015 – Dec 2025

Step 3 — Parameter estimates

Parameter	Nifty 50 (Student-t)				BSE Sensex (Normal)			
Symbol / role	Coef	Std Err	t-stat	p-value	Coef	Std Err	t-stat	p-value
MEAN EQUATION								
μ (mu) Constant mean return	1.0235	0.2750	3.72	0.0003	1.1140	0.3410	3.27	0.0011
VARIANCE EQUATION								
ω (omega) Long-run variance floor	0.7618	0.839	0.91	0.2920	12.0496	14.842	0.81	0.4169
α (alpha[1]) ARCH — shock impact	0.0361	0.0521	0.69	0.2135	0.4340	1.006	0.43	0.6662
β (beta[1]) GARCH — vol persistence	0.9017	0.0199	45.3	< 0.001	0.0000	1.347	0.00	1.0000

Parameter		Nifty 50 (Student-t)			BSE Sensex (Normal)			
Symbol / role	Coef	Std Err	t-stat	p-value	Coef	Std Err	t-stat	p-value
ν (nu) Degrees of freedom (t-dist)	4.2574	1.312	3.25	0.0035	— (Normal)	—	—	—
DERIVED MEASURES								
α + β Persistence of volatility	0.9378 — high persistence				0.4340 — low persistence (β=0)			
Long-run variance = ω/(1−α−β)	12.26 → LR vol ≈ 3.50%				21.27 → LR vol ≈ 4.61%			

Step 4 — Model fit statistics

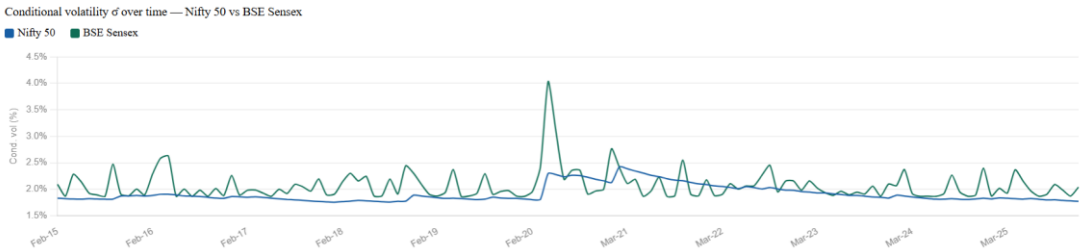
Nifty Log-Likelihood	Nifty AIC	Nifty BIC
−345.61	701.23	715.57
BSE Log-Likelihood	**BSE AIC**	**BSE BIC**
−374.37	756.73	768.23

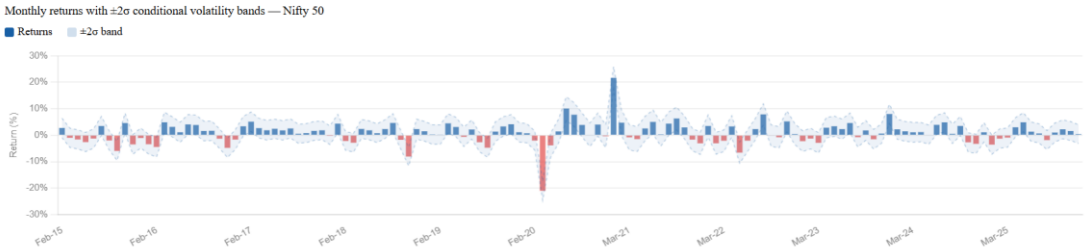
Step 5 — Residual diagnostics (Ljung-Box test on standardised residuals)

Test	Null hypothesis	Nifty 50 p-value	Nifty pass?	BSE p-value	BSE pass?
LB on $\tilde{\varepsilon}$ (lag 5) Autocorrelation in residuals	No autocorrelation	0.0655	Pass	0.4627	Pass
LB on $\tilde{\varepsilon}$ (lag 10)	No autocorrelation	0.0301	Marginal	0.3575	Pass
LB on $\tilde{\varepsilon}^2$ (lag 5) Remaining ARCH effects	No ARCH in residuals	0.9955	Pass	0.9081	Pass
LB on $\tilde{\varepsilon}^2$ (lag 10)	No ARCH in residuals	0.1050	Pass	0.2190	Pass

Step 6 — Conditional volatility & 3-month forecast

Metric	Nifty 50	BSE Sensex
Average conditional volatility ($\hat{\sigma}$)	1.91%	2.07%
Peak conditional volatility	2.42% (Nov 2020)	4.04% (Mar 2020 — COVID)
Forecast σ — Month +1	3.10%	3.64%
Forecast σ — Month +2	3.12%	4.22%
Forecast σ — Month +3	3.15%	4.45%


Conditional volatility σ over time — Nifty 50 vs BSE Sensex
Nifty 50
BSE Sensex
Cond. vol (%)
4.5%
4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
Feb-15
Feb-16
Feb-17
Feb-18
Feb-19
Feb-20
Mar-21
Mar-22
Mar-23
Mar-24
Mar-25


Monthly returns with ±2σ conditional volatility bands — Nifty 50
Returns
±2σ band
Return (%)
30%
20%
10%
0%
-10%
-20%
-30%
Feb-15
Feb-16
Feb-17
Feb-18
Feb-19
Feb-20
Mar-21
Mar-22
Mar-23
Mar-24
Mar-25

ANNEXURE-IV

EGARCH MODEL RESULTS FOR NIFTY 50 AND BSE SENSEX

Step 1 — ARCH-LM pre-test (5 lags)

Index	LM Stat	p-value	ARCH effects?	Justification for EGARCH
Nifty 50	1.1618	0.9485	Weak	Modelled for asymmetry check & comparability
BSE Sensex	15.4457	0.0086	Yes (p < 0.01)	ARCH confirmed — EGARCH captures leverage

Step 2 — Model specification

Feature	Nifty 50	BSE Sensex
Model	EGARCH(1,1,1)	EGARCH(1,1,1)
Parameters (p, o, q)	p=1, o=1, q=1	p=1, o=1, q=1
Error distribution (best AIC)	Skewed Student-t	Normal (Gaussian)
Mean equation	Constant	Constant
Estimation	Maximum Likelihood	Maximum Likelihood
Observations	130	131
Sample period	Feb 2015 – Dec 2025	Feb 2015 – Dec 2025

Step 3 — Parameter estimates

Parameter	Nifty 50 — Skewed-t					BSE Sensex — Normal			
Symbol / role	Coef	Std Err	t-stat	p-value		Coef	Std Err	t-stat	p-value
MEAN EQUATION									
μ (mu) Constant mean return	0.5717	0.5974	0.96	0.3386		0.8842	0.3405	2.60	0.0094
VARIANCE EQUATION — $\text{LOG}(\Sigma^2_t) = \Omega + A\lvert Z_{t-1}\rvert + \Gamma Z_{t-1} + B\cdot\text{LOG}(\Sigma^2_{t-1})$									
ω (omega) Log-variance intercept	0.0408	0.1987	0.21	0.8375		2.2854	0.3126	7.31	< 0.001
α[1] (alpha) ARCH — shock magnitude	0.1103	0.0714	1.55	0.1222		0.4697	0.2216	2.12	0.0340
γ[1] (gamma) Leverage — sign of shock (asymmetry)	−0.1363	0.1377	−0.99	0.3220	n.s.	−0.3931	0.1572	−2.50	0.0124
β[1] (beta) GARCH — log-vol persistence	0.9913	0.0806	12.29	< 0.001	***	0.1897	0.1017	1.87	0.0621
DISTRIBUTION PARAMETERS									
η (eta / ν) Degrees of freedom (tail heaviness)	3.7153	1.6053	2.31	0.0207	**	— (Normal distribution)			
λ (lambda) Skewness parameter	−0.2783	0.1600	−1.74	0.0820	†	— (Normal distribution)			

Step 4 — Leverage / asymmetry effect (key EGARCH insight)

Index	γ[1] (gamma)	p-value	Leverage significant?	Interpretation
Nifty 50	−0.1363	0.3220	No	Positive & negative shocks have similar impact on volatility
BSE Sensex	−0.3931	0.0124	Yes (p < 0.05)	Leverage confirmed — negative return shocks amplify volatility significantly more than positive shocks of equal size

Step 5 — Model fit & comparison with GARCH(1,1)

Nifty — Log-Likelihood	Nifty — AIC	Nifty — BIC	BSE — Log-Likelihood	BSE — AIC	BSE — BIC
−343.16	700.32	720.40	−369.99	749.97	764.35

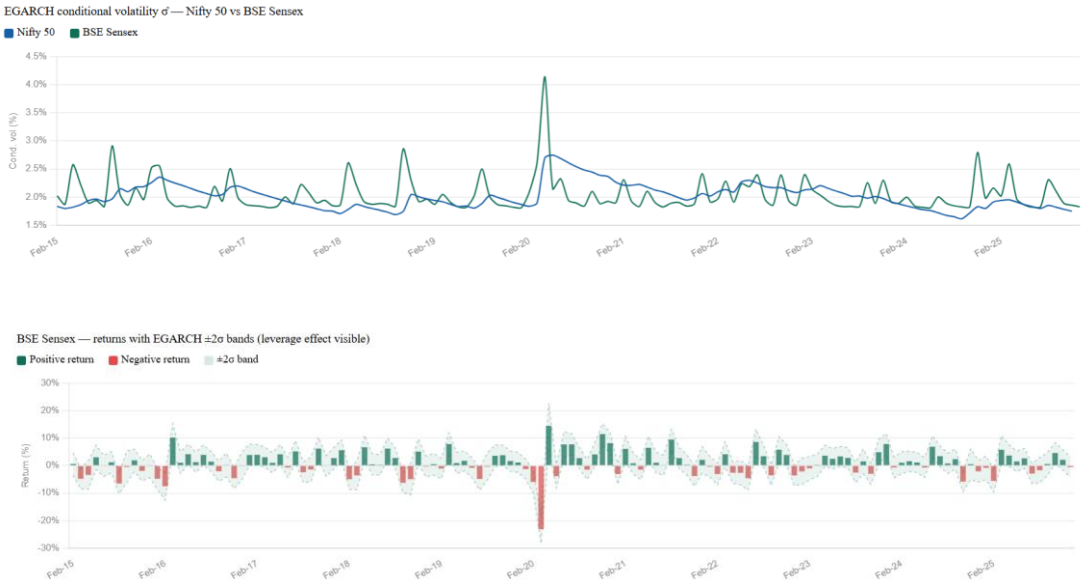
Index	EGARCH AIC	GARCH(1,1) AIC	Δ AIC	Better model?
Nifty 50	700.32	701.23	−0.91 (EGARCH wins)	Marginal improvement
BSE Sensex	749.97	754.28	−4.31 (EGARCH wins)	Clear improvement

Step 6 — Residual diagnostics (Ljung-Box on standardised residuals)

Test	H_0	Nifty p-val	Nifty?	BSE p-val	BSE?
LB on $\tilde{\varepsilon}$ — lag 5 Autocorrelation in std residuals	No autocorrelation	0.0781	Pass	0.4996	Pass
LB on $\tilde{\varepsilon}$ — lag 10	No autocorrelation	0.0234	Marginal	0.5271	Pass
LB on $\tilde{\varepsilon}^2$ — lag 5 Remaining ARCH effects	No ARCH in residuals	0.9940	Pass	0.8980	Pass
LB on $\tilde{\varepsilon}^2$ — lag 10	No ARCH in residuals	0.2328	Pass	0.0291	Marginal

Step 7 — Conditional volatility summary & 3-month forecast

Metric	Nifty 50	BSE Sensex
Average conditional volatility $\bar{\sigma}$	2.01%	2.04%
Peak conditional volatility	2.74% (Apr 2020)	4.14% (Mar 2020 — COVID crash)
Min conditional volatility	1.61%	1.81%
Forecast σ — Month +1	2.98%	3.94%
Forecast σ — Month +2	3.04%	4.38%
Forecast σ — Month +3	3.08%	4.49%



EGARCH variance equation: $\log(\sigma^2_t) = \omega + \alpha[|z_{t-1}| - E|z_{t-1}|] + \gamma z_{t-1} + \beta \cdot \log(\sigma^2_{t-1})$ | **γ (gamma)** = leverage/asymmetry term: $\gamma < 0$ means negative shocks increase variance more than positive shocks | **Forecast method:** Simulation (10,000 paths) — analytic multi-step forecasts unavailable for EGARCH | † $p < 0.15$ (marginal)