



Impact of RBI Interest Rate Announcements on Stock Prices in Banking Sector: A Statistical Analysis

Presented

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Abstract

This study investigates the impact of the Reserve Bank of India's (RBI) interest rate announcements on stock returns and market volatility, focusing on the Nifty Bank Index. The analysis considers stock price behavior within a 4-day window before and after the announcements, employing statistical tools such as the t-test for mean comparison and the F-test for variance analysis.

Our findings reveal that while there is no significant difference in mean returns between announcement and non-announcement days, the variance in daily returns is notably higher during announcement periods. This indicates that although the mean returns suggest a stable reaction—possibly due to market participants anticipating the policy outcomes—the increased variance highlights greater market volatility on announcement days. This implies that investors experience heightened uncertainty or adjust their positions when rate changes are officially confirmed.

These results suggest that while the market is efficient at pricing in expectations of RBI's policy actions, the actual announcements still introduce an element of volatility, reflecting a short-term adjustment period. This research enhances the understanding of market reactions to central bank policies in emerging economies like India, providing useful insights for both investors and policymakers. Future studies could explore the effects of different event windows and macroeconomic conditions to provide a broader perspective on stock market behavior in response to monetary policy changes.

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Chapter 1

Report

1.1 Introduction

Interest rate announcements by central banks, such as the Reserve Bank of India (RBI), are critical events for financial markets. These announcements typically include updates on key policy rates, such as the repo rate, which directly influence borrowing costs, liquidity, and overall economic growth. The Repo Rate is the interest rate at which the Reserve Bank of India (RBI) loans money to commercial banks.

Repo Rate full form is Repurchase Agreement or Repurchasing Option. Banks obtain loans from the Reserve Bank of India (RBI) by selling qualifying securities. In this report we have mainly considered the effect of repo rate change on banking sector. In response to interest rate changes, investors often adjust their portfolios to reflect the anticipated impact on corporate profits, economic conditions, and the cost of capital. Consequently, stock markets are highly sensitive to such announcements, and significant changes in stock prices and volatility can occur around these events. Understanding how markets react to monetary policy decisions is essential for investors, policymakers, and economists alike, as it provides insights into market efficiency, investor sentiment, and the overall economic outlook. This study aims to analyze the effect of RBI interest rate announcements on stock returns and their volatility in banking sector.

1.2 Objective of the Study

The primary objective of this study is to analyze the impact of the Reserve Bank of India's (RBI) interest rate announcements on stock returns and market volatility. Specifically, the study aims to address the following research questions: In banking sector,

1. Do RBI interest rate announcements lead to significant changes in stock returns, particularly on announcement days compared to non-announcement days ?

2. Does the volatility (variance) of stock returns differ significantly on announcement days, indicating heightened uncertainty of market reactions to the policy change?

To answer these questions, we employ statistical tools, such as the t-test and F-test, to compare the means and variances of stock returns on announcement and non-announcement days. By focusing on the immediate aftermath of the announcements, this study intends to quantify the short-term effects of RBI's monetary policy decisions on stock market behavior. Additionally, this study seeks to contribute to the understanding of how financial markets react to central bank policy in emerging economies, especially in the context of India's dynamic financial landscape.

Through this analysis, we aim to provide insights that can aid investors in making informed decisions regarding portfolio adjustments around RBI interest rate announcements, as well as offer policymakers a clearer understanding of the broader market impact of their monetary policy actions.

1.3 Data Preparation

1.3.1 Selection of Stock

Since we are examining the impact on banking sector, so we have chosen **Bank NIFTY** index stock of banking sector in India. It reduces the influence of outliers, providing a more stable and reliable measure of sector trends compared to single company stocks. The historical data (Apr 2016 - Oct 2024) has been collected from NSE India and the dates for monetary policy committee meetings has been collected from RBI.

LIST OF BANK NIFTY STOCKS										
COMPANY NAME	WEIGHT	CMP	PRICE CHANGE	MARKET CAP (CR)	52W HIGH	52W LOW	ROE	P/E	P/B	EBITDA (CR)
HDFCBANK	27.04%	1755.25	-2.60 (-0.15%)	1341289.65	1794.00	1363.55	16.88	20.35	2.91	65907.29
BANKBARODA	1.84%	262.55	+4.65 (+1.80%)	135774.11	299.70	190.65	16.91	7.09	1.07	25781.5
AXISBANK	11.18%	1166.50	-5.20 (-0.44%)	360898.3	1339.65	980.35	17.98	13.81	2.19	25444.04
PNB	0.91%	106.98	+2.27 (+2.17%)	122951.51	142.90	74.55	8.70	9.61	1.08	25922.62
KOTAKBANK	11.72%	1762.60	+5.45 (+0.31%)	350433.81	1942.00	1543.85	15.29	24.96	3.17	10634.52
IDFCFIRSTB	1.08%	66.89	+0.58 (+0.87%)	48938.53	92.45	59.30	9.67	21.10	1.34	4397.99
FEDERALBNK	1.68%	204.74	+0.47 (+0.23%)	50216.69	207.60	139.40	14.71	12.63	1.60	5616.06
SBIN	11.27%	854.80	+5.60 (+0.66%)	762876.52	912.00	555.15	18.81	11.49	2.06	93398.69
BANDHANBNK	1.98%	183.23	+1.96 (+1.08%)	29517.83	263.10	167.30	10.82	10.58	1.25	3799.41
AUBANK	2.69%	609.80	-4.00 (-0.65%)	45354.6	813.40	553.70	13.04	24.10	2.85	2694.03
INDUSINDBK	5.58%	1077.65	-12.45 (-1.14%)	83948.19	1694.50	1018.10	15.32	10.33	1.29	9109.69
ICICIBANK	23.03%	1302.35	+5.65 (+0.44%)	918743.4	1362.35	914.75	18.89	20.99	3.61	35978.49

Figure 1.1: Stocks and their weights in Bank Nifty

1.3.2 Selection of Announcement and Non-Announcement Days

- *Announcement Days* are those days on which the change of interest rates (*repo rates*) are announced. The Reserve Bank of India (RBI) typically announces the repo rate during its Monetary Policy Committee (MPC) meetings, which occur every two months. These meetings are scheduled in advance and are usually held in April, June, August, October, December, February, and April, depending on the RBI's annual policy calendar.
- *Non-announcement Days* are the rest of the time of the year when trading happens normally.

For announcement day, we have considered the date when Monetary Policy Committee meeting minutes has been broadcasted. But often there has been a movement around the event day because of anticipation of stocks by investors prior the event and the effect of the event may not be immediate. The pre-event window (4 days before the announcement) captures any anticipation effects or market movements leading up to the event, as investors might adjust their portfolios based on expected news. The post-event window (4 days after the announcement) captures the immediate market response to the event, allowing time for market participants to fully digest the information and adjust their expectations. The 4-day window is considered long enough to account for short-term adjustments but not too long to include unrelated factors or broader market trends. So we have considered a 4- day pre-event and 4-day post event window to capture all the effects of the event. We have calculated the daily returns on each of these days and took the average of the 9 daily returns as the indicative daily return of announcement day. The daily return can be calculated by the following formula:

$$\text{Daily Return} = \frac{\text{Closing Price of Current Day} - \text{Closing Price of previous day}}{\text{Closing Price of Previous Day}}$$

1.4 Theory

1.4.1 Theory of t-test

The t-test is a statistical test used to determine if there is a significant difference between the means of two groups, which may be related to certain features or conditions. Let X_1, X_2, \dots, X_{n_1} be a random sample of size n_1 with population mean μ_1 and population variance σ^2 . Y_1, Y_2, \dots, Y_{n_2} be another random sample of size n_2 with population mean μ_2 and population variance σ^2 . The t-test assumes that the data follows a normal distribution, and it helps in testing hypotheses about population means.

For two independent samples, the t-statistic is calculated as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where \bar{X}_1 and \bar{X}_2 are the sample means, s_p is pooled standard deviation.

- **Null Hypothesis**(H_0) : $\mu_1 = \mu_2$
- **Alternative Hypothesis**(H_1): $\mu_1 \neq \mu_2$

. Degrees of Freedom is calculated as $n_1 + n_2 - 2$ If the calculated t-statistic is larger than critical value (i.e., the p-value is below a chosen significance level, usually 0.05), the null hypothesis is rejected, indicating a significant difference between the two groups.

1.4.2 Theory of F-test

The F-test is a statistical test used to compare two variances to determine if they are significantly different. The test statistic is based on the ratio of two sample variances. Assume that there are two independent samples coming from normal distribution with same population variance.

For two independent samples, the F-statistic is calculated as:

$$F = \frac{s_1^2}{s_2^2}$$

where: s_1^2 is the variance of the first sample, s_2^2 is the variance of the second sample. Degrees of Freedom, $df = (n_1 - 1, n_2 - 1)$ where n_1, n_2 are the size of sample groups. The null hypothesis (H_0) for the F-test assumes that the variances of the two groups are equal, i.e., $H_0 : \sigma_1^2 = \sigma_2^2$. The alternative hypothesis (H_A) is that the variances are different. If the computed F-statistic exceeds a critical value (determined by the significance level and degrees of freedom), the null hypothesis is rejected.

1.5 Hypotheses

We have conducted 2 types of hypothesis tests on our data :

1. **t-test:**

- **Null:** The Mean Return on Announcement Days (μ_1) and Non-Announcement Days (μ_2) are same i.e. $\mu_1 = \mu_2$
- **Alternative:** $\mu_1 \neq \mu_2$

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2. **F-test:**

- **Null:** The Variance (volatility) of daily returns on Announcement Days (σ_1) and Non-Announcement Days (σ_2) are same i.e. $\sigma_1 = \sigma_2$.
- **Alternative:** $\sigma_1 \neq \sigma_2$.

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1.6 Statistical Analysis and Results

1.6.1 Assumptions

For conducting the t-test and F-tests the following assumptions are made: It is assumed that the daily returns of both announcement days and non-announcement days follow a normal distribution with equal variance. Also the daily returns are assumed to be independent of each other. The study further assumes that no significant market events (other than interest rate announcements) occurred during the observation period. So any abnormal returns can be attributed to the interest rate announcement.

1.6.2 Test Results

- **t-test Results:** Number of non-announcement days are more compared to number of announcement days since there are only 6 meetings in a single year. So to overcome this issue, we have used *Bootstrap Method* where we have created many resampled datasets (in thousands), calculated the t-statistic for each dataset and used the distribution of these t-statistics to estimate the standard error and construct confidence intervals.

For this test, our 95% confidence interval is $[-2.075128, 1.71282]$

Since 0 belongs in the confidence interval, there is not enough evidence to reject null hypothesis. Hence the expected daily returns on announcement days and non-announcement days are same.

- **F-test results:** Here we have used random sampling with replacement to create a dataset of non-announcement day returns of the size same as that of announcement day returns. Here p-value comes out to be $5.859e - 09 < 0.05$, so there enough evidence to reject the null

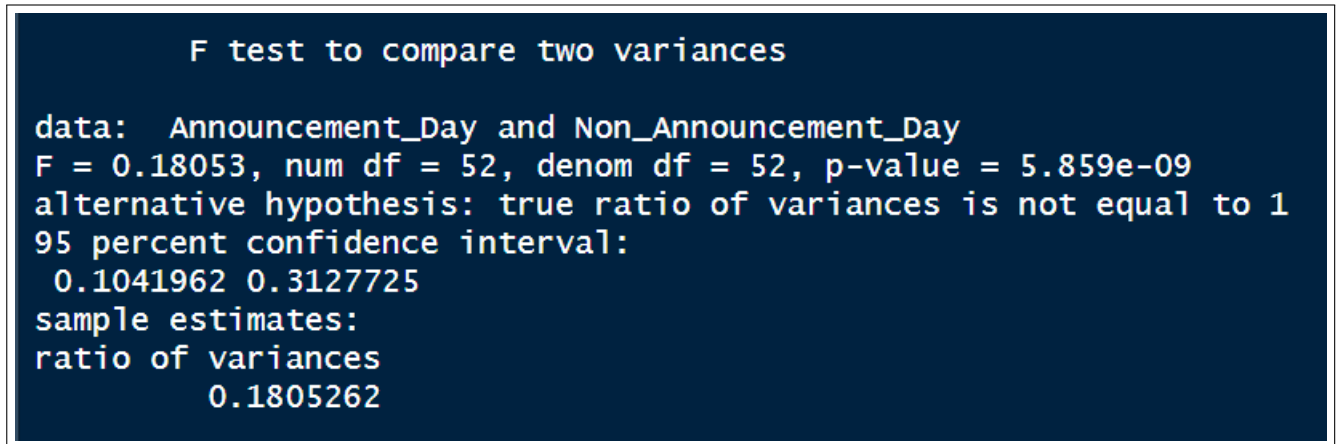


Figure 1.2: F-test Result

hypothesis. Hence there exists a significant difference of volatility for announcement days and non-announcement days.

1.7 Implications and Interpretations of Findings

1. Same Expected Daily Returns:

The fact that the expected daily returns for both announcement days and non-announcement days are the same suggests that, on average, the market does not exhibit a clear directional bias in its returns during the announcement period. Such results suggest that, at least in the short term (daily returns), market expectations might already be priced in, meaning investors likely anticipate the effects of announcements before they happen. This aligns with the efficient market hypothesis (**EMH**), which asserts that stock prices reflect all available information (Fama, 1970). If the market has already incorporated the potential outcomes of the announcement, the actual announcement may not lead to abnormal returns.

2. Different Variance of Daily Returns:

The significant difference in variance highlights that even if the mean return remains stable, announcement days are associated with increased market uncertainty. This is likely due to investors' varied interpretations of the implications of rate changes for future economic conditions and their potential impact on company earnings, inflation expectations, and overall economic growth.

The presence of higher variance suggests that announcement days are marked by a divergence of investor opinion and rapid trading activity, which translates into greater price swings. This heightened volatility can be attributed to algorithmic trading, speculative movements,

or rapid position adjustments by institutional investors reacting to nuanced details within the announcement or the governor’s commentary.

3. Implications for Traders:

- For **short-term traders & intra-day traders**, the finding that there is no significant difference in mean daily returns between announcement and non-announcement days implies that traders who focus on daily price movements might not find direct profit opportunities solely on announcement days. However, the evidence of differing variances suggests increased risk on announcement days, which can present opportunities for volatility-based strategies (e.g., straddles and strangles in options trading).
- **Long-term investors**, since the expected return does not differ significantly, long-term investors might view announcement days as less critical for immediate action. However, differing volatility can inform risk assessment for portfolio management, highlighting that announcements may affect the risk profile of their holdings in the short-term.

4. Implications for Portfolio Managers:

The different variances imply that portfolio managers need to account for potential higher volatility on announcement days when evaluating the risk associated with their portfolios. This can lead to adjustments in asset allocation, hedging strategies, or rebalancing in anticipation of rate decisions. The analysis reinforces the importance of monitoring performance over different periods (daily vs. cumulative). Managers may consider using extended windows for returns to better understand the lagged impacts of announcements on market behavior.

5. Implications for Policymakers:

The results suggest that market participants might anticipate rate announcements well in advance, indicating a need for transparency and clear communication from central banks like the RBI. Policymakers can gauge how their announcements influence market stability by assessing observed volatilities and market reactions

Conclusion:

In conclusion, the analysis of daily returns and volatility surrounding the Reserve Bank of India’s interest rate announcements reveals critical insights into market behavior. The lack of significant differences in mean daily returns between announcement and non-announcement days implies that financial markets may price in expectations of policy changes beforehand, aligning with the efficient market hypothesis. However, the observed differences in variances indicate that announcement days are associated with heightened risk and increased market reactions, which may extend beyond the announcement itself into a multi-day period.

These findings have various implications for different stakeholders. Short-term traders might leverage post-announcement volatility for trading opportunities, while long-term investors may remain relatively unaffected by daily returns but should consider the temporary impact on portfolio risk. Portfolio managers and financial analysts can integrate these insights into their risk management and forecasting models, respectively. For policymakers, understanding market responses to announcements can guide communication strategies to ensure stability and transparency. Overall, the study underscores the importance of assessing not only returns but also volatility when evaluating the impact of economic policy announcements on financial markets. This comprehensive view enables more informed decision-making across the investment and policy spectrum.