



# Asian Journal of Management and Commerce

E-ISSN: 2708-4523

P-ISSN: 2708-4515

Impact Factor (RJIF): 5.61

AJMC 2025; 6(2): 801-808

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Received: 05-05-2025

Accepted: 10-06-2025

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## Impact of earnings announcement on stock return volatility

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### Abstract

The study examines the impact of earnings announcements on stock return volatility, with a focus on how market participants respond to new information regarding a firm's financial performance. The research focuses mainly on the large-cap companies covering 13 different sectors in the Nifty 50 index. The present study uses the stock price data from June 2019 to June 2024 covering 21 quarterly periods. GARCH methodology was used for estimating the variance series for returns volatility. Variance series of returns volatility of stocks were used to check the impact of results announcement. Findings of the study reveal that earnings announcements significantly impact daily return volatility with differing impacts on PAT margin during upward and downward movements. For downward movement in PAT, the results indicate increased return volatility than that in case of up movement suggesting that negative financial news triggers stronger investors reactions. The study contributes to the existing literature by providing empirical evidence on how corporate disclosures change the market dynamics offering insights into the relationship between Investor behaviour and stock price volatility during corporate events such as earnings announcements. The results have a real-world inferences for the stakeholders marking it for better understanding of the market reactions to disclosures.

**Keywords:** Earnings announcement, GARCH, nifty 50, stock return volatility, PAT margin.

### 1. Introduction

Since earnings declarations offer the market with novel information about the company, which is eventually reflected in the stock prices. Since the 1950s, the examination of stock market efficiency has been a major contemporary issue in financial research. According to the Efficient Market Hypothesis, which was put forth by Fama in 1970, stock prices ought to take into account all the relevant information. Therefore, when firm declares its earnings, the release of fresh information should cause an instant change in the company's stock price, leading to volatility swings. The response of the stock market to earning announcements is immediate and engender changes in the stock's prices and volatility and this can give a strong basis for research studies and framing financial strategies.

'(Ball and Brown, 1968)' <sup>[1]</sup> for the very first time demonstrated that stock prices react to earning announcements and made a distinction between good news and Bad news by looking at earnings followed by research by '(Beaver, 1968)' <sup>[2]</sup> who established a relationship between stock price volatility, trading volume, and earnings announcement and concluded that both trading volume and stock volatility significantly increase during the earnings announcement period. A large body of literature in the context of the US and Chinese markets such as '(Beaver, 1968)' <sup>[2]</sup> '(Easton and Zmijewski, 1989)' <sup>[17]</sup> '(Chari, Jagannathan and Ofer, 1988)' <sup>[21]</sup> '(Gennotte and Truemann, 1996)' <sup>[19]</sup> and '(Kross and Schroeder, 1984)' <sup>[10]</sup> '(Dongwei Su, 2000)' <sup>[15]</sup> '(Liu, Q., & Zhang, Y, 2015)' <sup>[12]</sup> '(Tang, K. T., & Yan, M, 2015)' <sup>[18]</sup> '(Liu, Z., & Zhu, H, 2019)' <sup>[12]</sup> and '(Lei Qin, 2020)' <sup>[12]</sup> also concluded that stock prices respond positively to announcements of increase in earnings and negatively to announcements of decrease in earnings. This study contributes to this line of research for the Indian Stock Market as very few studies have been conducted in this context for such a fast-growing market.

For an economy like India, this type of research plays a pivotal role in understanding the market microstructure and how the announcement of earnings impacts the stock volatility and changes the market dynamics. Few studies in the context of Indian Stock Market such as '(Sehgal, 2015)' <sup>[13]</sup> '(Sharma, 2009)' <sup>[14]</sup> '(Verma, 2020)' <sup>[16]</sup> '(Dsouza, 2017)' <sup>[5]</sup> and '(Sharanappa, 2023)' have observed that as earnings announcements occur at regular intervals, it led to stock price increases and heightened price volatility. These announcements present a valuable opportunity to assess whether they generate predictable returns for investors. Since earnings reports contain crucial information that impacts stock prices,

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investors eagerly anticipate the earnings season as a potential opportunity for profit. The main aim of this research is to find whether there is the same positive relation between stock return volatility and earnings announcements found in other European countries and in US and Chinese markets. This study also provides empirical evidence on the relationship between daily stock return volatility and volatility one month before the earnings announcement and how the up moves and down moves in earnings affect the return volatility.

The research is organised into four sections. 'Review of Literature' provides a brief review of relevant literature. 'Data and Methodology' section deals with the Research methodology adopted for the study followed by the 'Results and Discussions' of the study. The last segment of the study contains 'Major Findings and Conclusions' of the study.

### 1.1 Research Objectives

1. To examine the relationship between stock return volatility and earnings announcement.
2. To analyse the behaviour of stock return volatility before, during, and after earnings announcement.
3. To examine how the up and down moves in earnings affect the stock return volatility.

### 1.2 Research Hypothesis

**H0<sub>1</sub>:** Mean of Daily return volatility around the earnings announcement and the average volatility over one month prior to earnings announcement in case of up move is the same.

- **H0<sub>2</sub>:** Mean of Daily return volatility around the earnings announcement and the average volatility over one month prior to earnings announcement in case of down move is the same.
- **H0<sub>3</sub>:** There is no significant difference in stock return volatility influenced by up and down movements in earnings.

## 2. Review of Literature

The relationship between earnings announcement and stock return volatility has been a vital topic in financial research. There are some prominent studies which have been conducted in foreign and Indian contexts.

The groundwork that pioneered empirical research on the relationship between stock prices and trading volumes and earnings disclosures was William H. Beaver's "The information content of annual earnings announcements" (1968) <sup>[2]</sup>. Beaver in his study showed how a reduction in information asymmetry brought about by earnings announcement led to changes in stock prices and increased trading activity, especially when results fall short of expectations. His research laid the foundation for subsequent studies in this area and is still frequently referenced in studies examining how financial disclosures affect market behavior '(Beaver, 1968)' <sup>[2]</sup>.

As the market adapts to new information, stock prices react to earnings surprises, as demonstrated by '(Ball and Brown, 1968)' <sup>[1]</sup> who were among the first to document the information content of earnings releases. Their work helped many researchers for further study in this field such as '(Easton and Zmijewski, 1989)' <sup>[17]</sup> who demonstrated a strong correlation between price fluctuations surrounding earnings announcements and earnings expectations and deviations. This suggests that the size of earnings shocks

play a crucial role in understanding price reactions.

'(Chari, Jagannathan, and Ofer, 1988)' <sup>[21]</sup> dived into how the stock market's response is affected by the time of earnings releases. Their research showed that as a result market anticipation and information asymmetry, early announcements typically had a greater impact on price volatility than later ones. This demonstrates how effectively the market responds to new information.

Focusing on how investors perceive and respond to earnings announcement, '(Gennotte and Truemann, 1996)' <sup>[19]</sup> found out that investor activity can occasionally increase market volatility, particularly in situations when the reported results are unclear. These findings support the idea that substantial volatility may be induced by both positive and negative changes in PAT margins.

'(Kross and Schroeder, 1884)' <sup>[10]</sup> found that firms with consistent positive results experienced lower post-announcement volatility, signifying that consistency and certainty in results reduce uncertainty in market. On the other hand, '(Dongwei Su, 2000)' <sup>[15]</sup> explored the market reactions in Chinese market context and in his study found that earnings announcement affects stock prices differently in emerging economies due to different levels of information efficiency.

Recent studies by '(Liu, Q., & Zhang, Y, 2015)' <sup>[12]</sup> and '(Tang, K. T., & Yan, M, 2015)' <sup>[18]</sup> highlights the role of market sentiment and earnings quality in explaining stock price reactions. They argue that high-quality earnings reports, characterized by reliability and transparency, tend to reduce volatility, whereas vague reports exacerbate uncertainty.

Further, '(Liu, Z., & Zhu, H, 2019)' <sup>[12]</sup> examined the effects of earnings announcement in the context of corporate governance, showing that firms with strong governance structures experience less volatility around earnings announcement. Lastly, '(Chen, J., Zhang, H., & Li, S, 2018)' <sup>[20]</sup> presented machine learning models to forecast volatility, offering a cutting-edge method that expands upon the traditional econometric models used in earlier studies.

### 2.1 Literature in the Indian context

In the Indian context, it is clearly evident that earning announcement significantly influence the stock prices in the Indian market.

'(Sehgal, 2015)' <sup>[13]</sup> in his study showed whenever earnings are released in the market it significantly changes the stock price whether earnings are negative or positive. The results also highlights that the Indian stock market is not fully efficient because it reacts slowly to earnings announcement. The study also emphasizes that Indian investors might not respond immediately to new information because of less information access or may be as a result of behavioral biases.

Study by '(Sharanappa, 2023)' highlights the impact of earnings announcement made during the trading hours or non-trading hours on stock prices through event study methodology to analyze stock price movements and volatility around earnings announcement window. They found that announcement made during trading hours shows fast price adjustments than those made during non-trading hours. This suggests that investor behaviour and market efficiency vary depending on when information is released. Studies by '(Verma, 2020)' <sup>[16]</sup> and '(Sharma, 2009)' <sup>[14]</sup> demonstrate that earnings announcement increase volatility

and generate abnormal returns around announcement date by employing event study methodology to examine the market's reaction to earnings reports, focusing on price movements and volatility before and after the announcements. Their findings reveal that earnings announcement significantly affect stock prices, highlighting the informational value of earnings reports in the Indian equity market. The study offers evidence of market inefficiencies, as stock prices do not fully adjust to new information immediately, also found the importance of earnings as a market moving event in India.

Study '(Kundu and Banerjee, 2021)' <sup>[11]</sup> highlights the relationship between earning predictability and stock return in Indian equity market by using the statistical models to assess how earning predictability influences stock price movements and how accurately earnings can be forecasted. Their study provide evidence that firms with more predictable earnings tend to show less stock return volatility while less predictable earnings lead to higher volatility around earnings announcement.

All these studies when taken together, supports that stock price volatility is generally determined by earnings announcement, with different market variables such as earning surprise, report quality and announcement timing.

### 3. Research Methodology

The research study explores the relationship between earnings announcement and stock return volatility using data from NIFTY 50 top companies selected from 13 different sectors, based on their rankings as of the last trading day of August 2024 for the period from June 2019 to June 2024 covering 21 quarterly periods. The methodology of the study combines econometric techniques with a focus on quarterly earnings announcement and changes in Profit After Tax (PAT) margins, distinctly analysing positive and negative changes in PAT margin. The following steps outline the research methodology along with the steps undertaken to analyse the data using EViews and SPSS.

#### 3.1 Data Collection

- **Stock Price Data:** Daily stock price data of the largest NIFTY 50 companies in relations of their market Cap from 13 different sectors as on 30th August 2024 is taken from Yahoo Finance. The basis for taking largest companies from each sector is to avoid over reliance on one sector and to get the better insights of sector specific vulnerabilities. A list of all the companies is presented Appendix A.
- **Earnings Announcement Data:** Quarterly Earnings Announcement dates with the PAT margin from June 2019 to June 2024 of selected companies were extracted from the Moneycontrol.com. To ensure accuracy of the data cross-validation was performed manually from the official website of the respective companies.
- **Variables:** Stock prices, quarterly PAT margins, changes in PAT margin (positive and negative changes separately), earnings announcement dates, daily return volatility around result announcement and 1\_M before earning announcement volatility details of which is

given in Online Appendix<sup>1</sup>.

**3.2 Data Structuring and Analysis:** Data preparation of the study started by calculating the Daily return from the adjusted closing price of the stocks by using the following formula  $R_t = \ln(P_t/P_{t-1})$ . After generating the Return series, the Variance series for volatility was estimated using GARCH methodology using the EViews software.

Consequent to Quarterly result announcements PAT margins of all the stocks in the sample were collected from the respective websites of the companies and then segregated as per positive (Cases where the changes in PAT margin is higher than the previous quarter) and negative (Cases where the changes in PAT margin is lower than the previous quarter) changes in PAT margin.

The five-day volatility is calculated by taking the average of daily stock return volatilities for a window of five trading days surrounding the earnings announcement. Specifically, this period includes the two trading days (-2) prior to the announcement, the announcement day (0) itself, and the two trading days (+2) following the announcement and the one-month volatility is computed by averaging the daily stock return volatilities over one month period irrespective of the number of trading sessions fall in that month from the announcement date.

After calculating the daily return volatility around the result announcement and 1\_M before earnings announcement, T test was applied by using the SPSS software on the final data to test the proposed hypothesis, results of which are discussed in the next section.

#### T Statistic on SPSS for Hypothesis Testing

- **Paired sample T test:** Paired sample t test was conducted to test the first two hypothesis. This test is used to compare the mean of two related samples of the same population to test the significant difference between their means. For Up and down move, mean of 1\_M volatility and Daily return volatility around the result announcements were used for testing the null hypotheses.
- **T test for independent Sample:** Independent t test is used to determine the significant difference between the means of two independent groups or unrelated groups. Mean of Daily return volatility for up and down moves are the two unrelated groups used in this study to test the last hypothesis as these are two distinct groups supposed to show different effects on volatility. For conducting independent t statistic, both distinct groups were classified by naming them positive and negative in SPSS and then calculating the p value for accepting or rejecting the null hypothesis.
- In this study, an independent t-test was applied to evaluate the significant difference between the means of two independent or unrelated groups: the mean of daily return volatility for up moves and down moves. These two groups were selected to assess the distinct impact of positive and negative changes in PAT margin on volatility. In SPSS, the groups were classified and labelled as "positive" and "negative" to facilitate

<sup>1</sup> <https://docs.google.com/spreadsheets/d/1objooCozy2BLTK-qpNhWaUJeDMNUt0mj/edit?usp=sharing&ouid=113814555053319120080&rtopof=true&sd=true>

analysis. The p-value from the test was then calculated to determine whether to accept or reject the null hypothesis.

#### 4. Results & Discussion

##### 4.1 Paired sample T-test for up-moves in Earnings

The paired sample t-test was conducted to compare daily return volatility for up moves in earnings around quarterly result announcement and one month prior to the earning announcement. The mean volatility around results announcements is slightly lower than the average volatility

one month prior to the earnings announcement as shown in Table 1. The correlation between the two periods is strong and statistically significant, indicating a close relationship between volatility before and around earnings announcements. Despite this, the paired t-test results ( $t = -.559$ ,  $df = 107$ ,  $p=0.577$ ) showed that the difference in volatility between the two periods is statistically not significant, suggesting that earnings announcement do not have any considerable impact on daily return volatility for up moves in earnings resulting in failing to reject the null hypothesis.

**Table 1:** Paired Samples Statistics

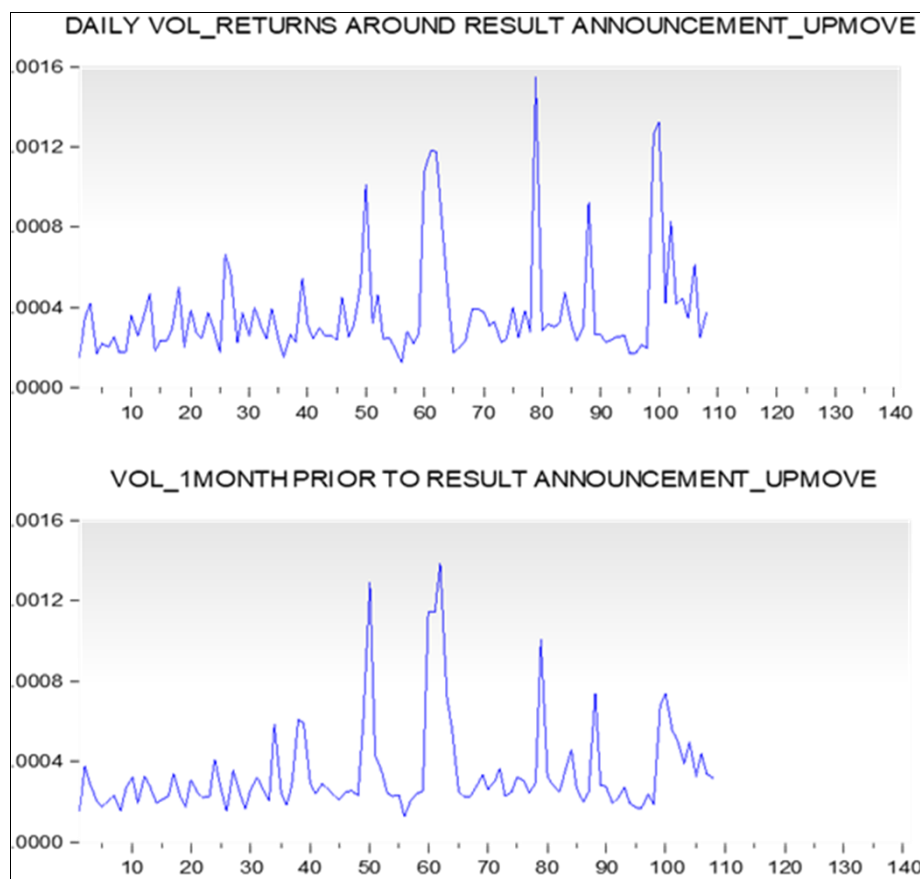
	Mean	N	Std. Deviation	Std. Error Mean	Paired sample correlation		
					N	correlation	Sig.
Pair 1 Daily Vol_Returns Around Result Announcement_Upm Ove	.00005919	108	.000195706	.000018832	108	.926	.000
Vol_1month Prior To Result Announcement_Upm Ove	.00006343	108	.000153261	.000014748			

**Paired Samples Test**

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence ...				
				Lower	Upper			
Pair1dailyvol_Returns Around Result Announcement_Upm Ove -Vol_1month Prior To Result Announcement Upm Ove	-.000004241	.000078835	.000007586	-.000019279	.000010797	-.559	107	.577

The corresponding graph:1 shows daily and average one-month prior return volatility suggests that the same trend in variance series for volatility has continued even around the quarterly earnings announcements and there are only

negligible differences in the two graphs. The results for up move in earnings here relate to the large cap companies whose stocks are normally less volatile than their mid and small cap counterparts (Sangram Keshari Jena, 2021)



**Graph 1:** Daily and Average One-Month Prior Return Volatility Around Quarterly Earnings Announcements



#### 4.2 Paired sample T-test for down-moves in Earnings

The paired sample t-test was conducted to compare daily return volatility for down moves in earnings around quarterly result announcement and one month prior to the earning announcement. Table 2 shows the strong correlation between the two periods indicating that volatility before and

around earnings announcements for down moves is closely related which is also verified by the t-test results ( $t = -2.018$ ,  $df = 140$ ,  $p = 0.045$ ). As shown in the table below P value is less than the significance level which is 5% leading to the rejection of null Hypothesis.

**Table 2:** Paired Samples Statistics

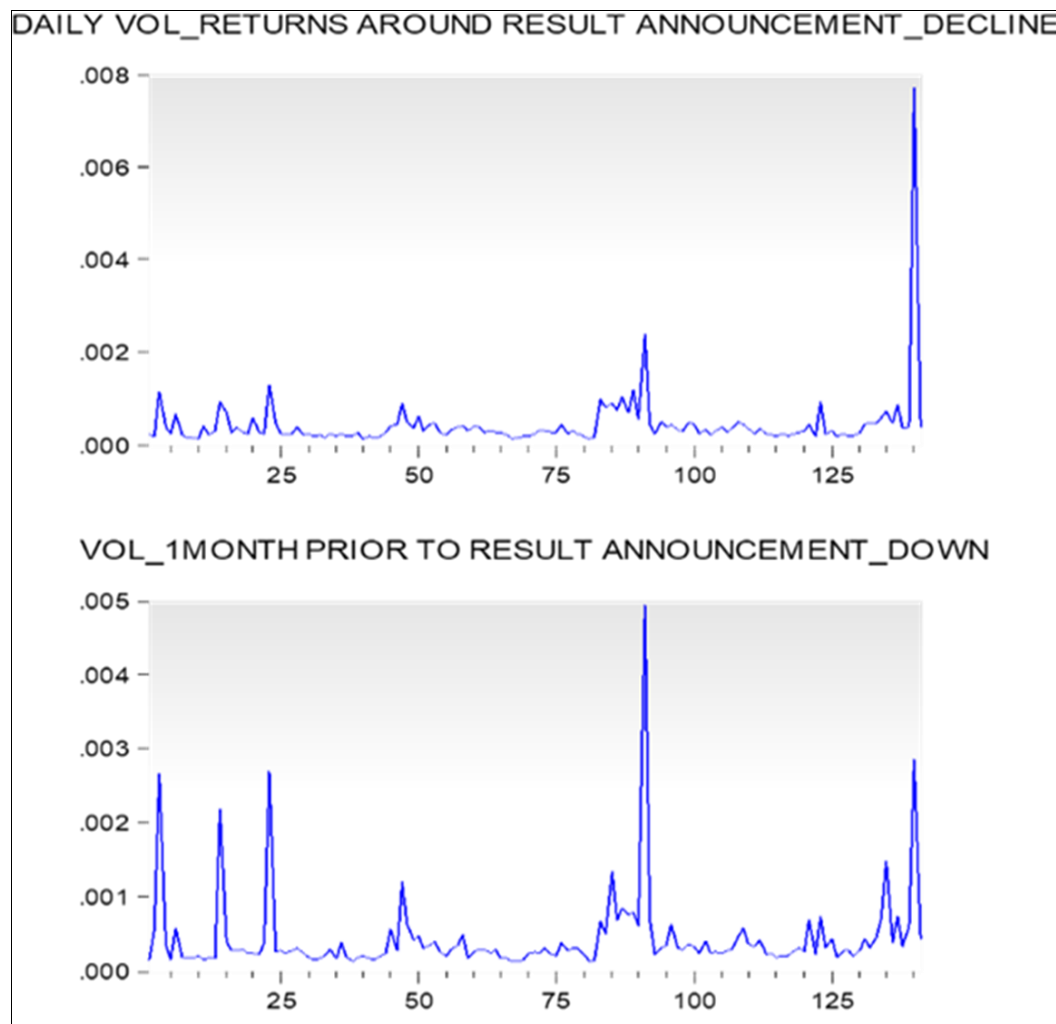
	Mean	N	Std. Deviation	Std. Error Mean	Paired sample correlation		
					N	correlation	Sig.
Pair 1 Daily Vol Returns Around Result Announcement Decline	.00004440	141	.000126534	.000010656	141	.911	.000
Vol_1month Prior To Result Announcement Downmove	.00005406	141	.000137787	.000011604			

**Paired Samples Test**

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95%Confidence ...				
				Lower	Upper			
Pair1dailyvol_Returns Around Result Announcement_Decline -Vol_1Month Prior to Result Announcement Downmove	.000009660	.000056834	.000004786	-.000019122	-1.97E-7	-2.018	140	.045

T statistics results are aligned with the graph 2 which represents that there is significant difference between the daily return volatility for down moves in earnings around quarterly result announcement and one month prior to the earning announcement and the graph corresponding to the table also suggest diverse insight about market microstructure. There is higher volatility one month before

earning announcement as compared to the period around the results announcement which is shown by the spikes in the 1\_M graph. Various factors such as information asymmetry along with ongoing speculation, anxiety and panic may lead to added volatility in the market around announcement and once the earnings are disclosed, market uncertainty is resolved as market absorbs the available information.



**Graph 2:** Daily Return Volatility for Downward Earnings Moves: One-Month Prior vs. Around Quarterly Announcements

### 4.3 T-test for Independent Samples

The statistics in the **Table 3** explained that there is no significant difference in the two independent groups (by assuming equal variance) as confirmed by Levene's Test.

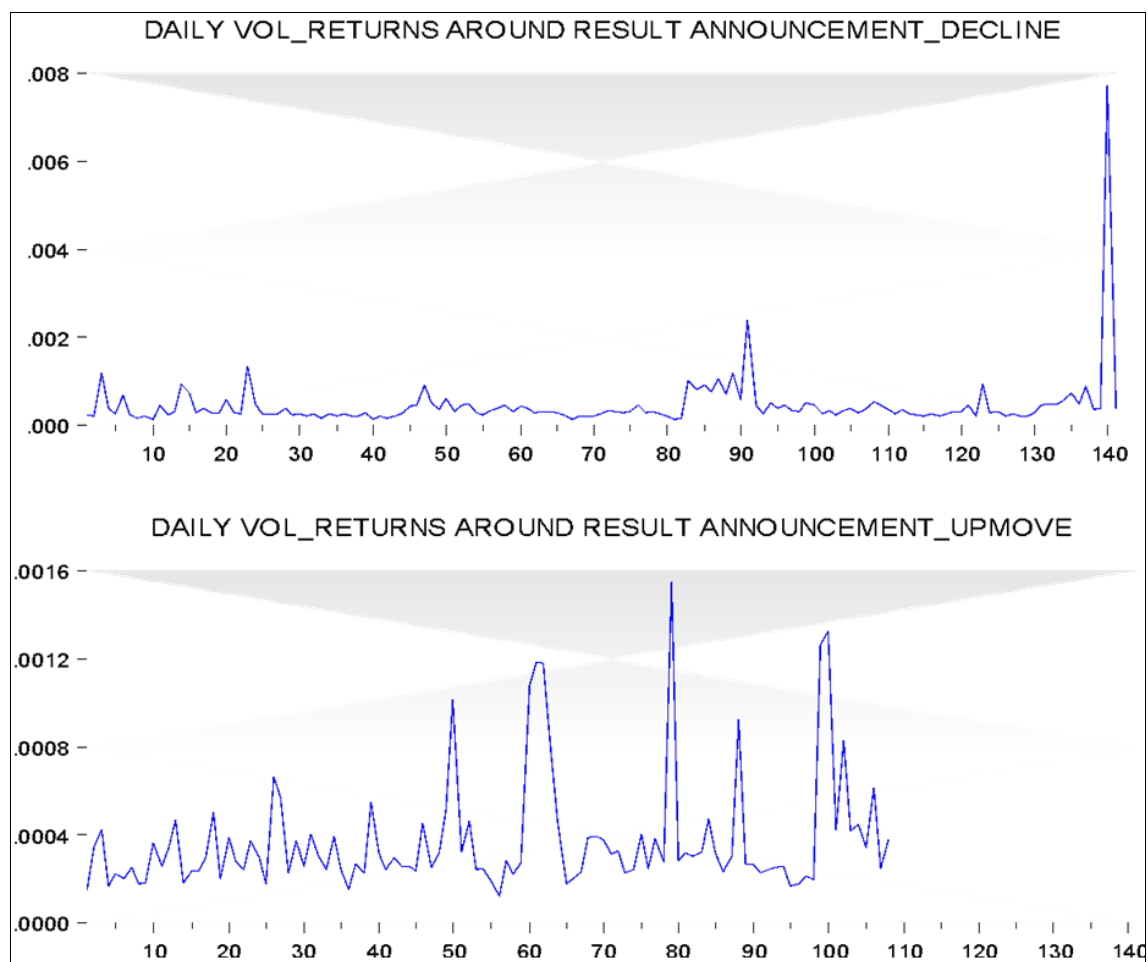
The t-test results ( $t = 0.722$ ,  $df = 247$ ,  $p = 0.471$ ) indicated no statistically significant difference in volatility between the two groups, as the p-value exceeded the 0.05 threshold resulting in the failure to reject the null hypothesis.

**Table 3:** Group Statistics

Independent Samples Test							
PAT Margin		N	Mean	Std. Deviation	Std. Error Mean		
Daily vol_returns positive around result		108	.00005919	.000195706	.000018832		
Announcement Negative		141	.00004440	.000126534	.000010656		
Independent Samples Test							
		Levene's Test for Equality of Variances		t-test for Equality of variance			
		F	Sig.	t	df	Sig.(2-tailed)	Mean difference
Daily Vol_Return Around Result Announcement	Equal variances assumed	2.271	.133	.722	247	.471	.000014781
	Equal variances not assumed			.683	172.940	.495	.000014781
Independent Samples Test							
		t-test for Equality of Means					
		Std. Error Difference	95% Confidence Interval of the Difference				
			Lower		Upper		
Daily Vol_Return Equal variances assumed Around Result		.000020486	-.000025569		.000055131		
Announcement Equal variances not assumed		.000021638	-.000027927		.000057489		

Though the descriptive statistics table mentioned above shows that there is no significant difference in the two groups but the visual analysis of the daily return volatility graphs reveals more frequent spikes around negative earnings announcements as compared to positive announcements. The graph 3 shows that positive changes in PAT margin are more stable and infrequent while the

negative changes in PAT leads to more frequent volatility spikes which is also supported by second hypothesis. These observations align with the theory of loss aversion developed by Daniel Kahneman and Amos Tversky (Tversky, 1979) which says that investors react more intensely to negative outcomes as compared to positive outcome.



**Graph 3:** Volatility Spikes: Negative vs. Positive Earnings Announcements (PAT Margin Changes)

## 5. Findings & Conclusion

The findings of this study indicate that earnings announcements have a significant impact on daily return volatility, with marked differences in the effects on upward and downward movements in Profit After Tax (PAT) margin. Specifically, in cases where earnings announcements correspond to an increase in PAT margin, the volatility over a one-month (1\_M) period prior to the announcement is comparable to volatility observed around the announcement itself, indicating minimal change. However, for announcements associated with a decline in PAT margin, the volatility dynamics differs notably - the 1\_M period before the announcement is significantly more volatile than during the period surrounding announcement. The independent sample t-test further supports these findings by highlighting that negative earnings announcements lead to significantly higher volatility around the earnings announcement period compared to positive earnings announcements. This asymmetry indicates that the market reacts more strongly to negative information, possibly due to investor sensitivity to adverse financial performance and increased risk aversion. Overall, these findings underscore the differentiated impact of earnings announcements on market volatility, with negative earnings exerting a more pronounced effect on volatility dynamics than positive earnings.

Overall, these findings emphasize the differentiated impact of earnings announcements on market volatility, with negative earnings creating a more substantial effect on volatility dynamics than positive earnings. This study underscores the importance of understanding investor sentiment and market behaviour in response to varying earnings outcomes, contributing to a more nuanced perspective on the market's reaction to financial disclosures. Future research could delve into a more detailed sentiment analysis of financial news to deepen the understanding of how market expectations and investor sentiment affect volatility around earnings announcements. Also, adding more market variables, extending the study period and sample size and employing advanced machine learning models, such as LSTM or BERT, for sentiment classification and forecasting could further improve the accuracy of volatility predictions. In this study only large cap companies, which represented all the sectoral groups within Nifty Index, were studied. Further studies can throw more light on understanding by comparing the changes in volatility in large, mid and small cap companies around earnings announcement. Extending the study period and analysing high-frequency trading data might also offer a more holistic perspective on the volatility dynamics around corporate actions.

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**Appendix A****Table 1:** Top Companies in the Nifty 50 index across sectors as of Last trading day of August 2024

<b>Sectors &amp; Weightage in Nifty</b>	<b>Companies</b>	<b>Weightage in Sector</b>
Financial Services (32.6%)	HDFC	11.02
IT (14.17%)	INFOSYS	6.27%
Oil and Gas fuels (11.97%)	Reliance	9.13%
FMCG (8.47%)	ITC	4.14%
Automobile and Auto (8.31%)	M&M	2.43%
Healthcare (4.5%)	Sunpharma	1.76%
Construction (3.87%)	LT	3.87%
Telecommunications (3.8%)	Bharti Airtel	3.80%
Metals and Mining (3.55%)	Tatasteel	1.12%
Power (3.14%)	NTPC	1.77%
Consumer Durables (2.59%)	Titan	1.33%
Construction Materials (2.06%)	Ultracement	1.17%
Services (0.97%)	Adani Ports	0.97%