REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X

VOLUME - 8 | ISSUE - 6 | MARCH - 2019

ALGORITHMIC TRADING, STOCK VOLATILITY AND STOCK DELIVERY

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ABSTRACT :

This study was carried out to investigate whether the deliverable to the total trade volume of the stocks were affected by stock volatility, the paper determined if this phenomenon impacted the investments made by investors. The paper examined the relationship between stock volatility and delivery quantity traded to total quantity traded for two companies listed on NSE NIFTY. The data of both the companies confirmthat there exists arelationship between delivery quantity traded to total quantity traded and stock volatility. Hence, the results of the study showed that the volatility and volatility index showed a significant association with trading and deliverable volumes.

KEYWORDS : *Algorithmic Trading, Stock volatility, Volatility Index, stock deliverables.*

INTRODUCTION

There is a remarkable improvement in computer power and system frameworks which connected computers universally. This advancement has significantly changedperceptions in the financial trading scene which is widely considered. Critical technological concepts incorporate automation -; the advent of electronic trading, a speed which incorporates lesseninglatency as updatesin the systems and also venture into updated technology, HFT(High Frequency Trading) and AT (Algorithmic Trading), and automated data handling.

Technological patterns incorporate the automated handling of data and the effect of electronic informationon the quality of markets. Gross-Klussmann and Hautsch (2011) demonstrated that there were substantial intraday impacts after the breakout of Reuters news ticker data concerning the stocks. In Riordan et al. (2013), itdemonstrated that there were uneven impacts of positive and negative stock-specific data on the quality of markets. The expanding pertinence of social media has turned out to be clear when a fake tweet brought about a dive in the securities exchange. This tweet about a besieging in the White House which was the aftereffect of a Twitter hack on April 23, 2013, prompted plunges in the securities exchanges and a 143 fall in the Dow Jones industrial normal (The Guardian, 2013).

In an online survey in trading by One Market Data LLC, a firm which gained expertise in tick data administration and analytics expressed that "exposed potential flaws in social media's accessibility to feed investment and trading strategies, but it also showed the effect that the new form of data was having on the financial markets" (One Market Data, 2013). Subsequently, 18% of surveycontributors said that they are presently utilising social media for trading, while 35% said that they were exploring ways to blend social media into trading methodologies. With the expanding significance and interest of speculators in online networking, the demand for solutions to utilize social media information will likewise be desired to develop.

HFT is a subdivision of AT which is usually characterized as the utilization of computer algorithms to aid the trading procedure (Hendershott et al., 2011). While prevalent AT algorithms are basic transaction cost limiting algorithms, supposed "slice and dice" algorithms, which split larg orders into smaller ones with the end goal to limit the price effect and transaction costs (Gomber and Gsell, 2006), HFT algorithms are more perplexing. Since HFT includes several trading techniques, there is no particular definition for HFT, yet trading attributes comprisehigh-speed dealers that the controllers and academics focus on.

REVIEW OF LITERATURE

Agundu, Prince Umor C., Wula, James T. (2017) investigated the association between dividend per share and stock price. In the systematic framework, dividend per share acts as an independent variable is a proxy for the financial performance of the companies, while the prices of the stock of the companies listed on the Nigerian Stock Exchange (NSE) acts as the dependent variable. The standardpostulation is that the investors depend on Key Financial Indicators (KFIs) in making coherent investment decisions. All 26 firms on the *Daily Official List* on 31st December, 2014 were qualified for participation, by expending a profit – dividend payment filter, 18 (69%) of the companies selected. The panel data enclosedyears (2009-2014) and 108 observations made. Data analysis methods includecorrelation, t-test, descriptive statistics and regression analyses. The results recognized that stock price is significantly related to dividend per share, at the 0.05 level. Itsuggested that investment analysts should mine describinginformation to notice the changing aspects of dividends, specifically in the consumer goods market segment. In tracing larger competitive stock pricing affluences, they should reengineer internal market devices to deliberatelylookout against scenic transaction drawbacks principally in delicate trading situations.

Ajay Vignesh T M, Balasubramanian P, Lakshmi Yermal (2017) in theirstudy investigated whether the quantity of deliveryto total quantity traded of a stock impacts stock return. The paper examined the association between delivery quantity traded to total quantity traded and stock return for 13 companies in the banking sector of NSE NIFTY. Unit root test was employed to determine return and stationary of volume data, and it approved that both factors were tested to examine the association and itfound that for two of the thirteen companies, a stock return was granger causing delivery quantity traded to total quantity traded. It suggested that the market efficient market hypothesis holds.

Biais et al. (2012) in their investigation inferred that HFT could trade on latest information quicker, causing non-beneficial,selection costs for non-HFT investors. Moreover, the researchers suggested that HFT required symbolic fixed technological investments, and that only hugeassociations would sufficiently equipped for making the aforementioned fixed speculations on investments, significantly leaving investors and small size firms to endure severeselection costs from HFT.

Martinez et al. (2012)concluded from their proposed model that HFT obtained and traded on data right before access was made available to other people and hostile selection forced upon themarket-makers. Consequently, it specified that liquidity was not as good and the price effectiveness did not exist anymore. The researchers concentrated on HFTs that claimed liquidity.

Hendershott et al. (2012) found in his study thatsmall trade sizes were focused upon by the algorithmic dealers, though human traders prevalently centered themselves on trades of blocks which were large comprising of 5,000 shares or more. The researchers sawthat when the bid-ask spreads were moderately non-feasible, the algorithmic dealers exhausted liquidity and when the bid-ask spreads were generally accessible, greater liquidity observed in the stock markets. The articulation above recommended that the algorithmic traders helped the stock markets in upholding a level of liquidity that was reliable.

Kumar (2010)investigated the demographic factors of the Volatility Index of India (VIX) along with its, association with the Indian markets and its analyticalcontrol for predicting future variance. The researcher analyzed thediffusion of volatility between developed markets and Indian markets. Quantile regression methodology employed in order to analyze theobserved associations of the volatility index. It was detected that the average Ivix level stood at 35.89 per cent. Volatility projections procured from Ivixcomprisedsignificant evidence about apprehended market volatility whichspecified that Ivix is an unbiased estimator of future realized volatility.

Christos Floros (2007)examined the impacts of embracing International Accounting standards on Greek stock market volatility. The researchers measured data of the Athens Stock Exchange on a day-to-day basis from 2003-2005 of four essential indices. It found that the advent of International accounting standards did not have a positive impact on Greek stock market volatility. The approximation of three types of GARCH provisions confirmed the same. Moreover, the unrestricted variance specifiedlesser volatility of the market in Greece for all indices. The researcher made it beneficial for the financial managers to trade with the Greek stock indices.

Frimpong et al. (2006)displayed and projected volatility (conditional variance) on the Ghana Stock Exchange using a Random Walk, EGARCH (1, 1), GARCH (1, 1) and TGARCH (1, 1) models. The researchersemployed a distinctive Databank Stock Index (DSI) on three days a week basis in order to examine the crescendos of the Ghana stock market volatility, throughout 10 years. The volatility models along with their requirement and forecast performance were measured. The volatility grouping, asymmetry effects and leptokurtosis foundrelated tothe returns of the stock market on growing stock markets. The GARCH models on the Ghana Stock Exchangewere estimated to have insistent high degree of conditional volatility of stock returns.

Llorente, G., Michaely, R., Saar, G., & Wang, J. (2002) examined the dynamic association between stock volumes and stock returns. The researchers found that volatility in an association between volume and return autocorrelation is in line within the scope of informed trading.

STOCK VOLATILITY

Volatility is a statistical measure of the diffusion of yields for a given security or market index. Volatility can either be measured using the variance or standard deviation between rewards from the stocks or market index. It considered that the higher the volatility, the riskier the security.

Market volatility is ascertained using the Volatility Index. A risky market is determined when a high reading is seen on the index. Higher volatility implies that the value of a stockdispensed over a higherarray of values. It implies that the price of the stock can varyvividly over a short period of time in any direction (up or down). Lower volatility implies that the value of the stock does not vacillatevividly, and inclines to be fixed.

Volatility Index (VIX)

Volatility Index is a measure of the market's anticipation of unpredictability over the near term. Volatility often described as the "rate and magnitude of changes in prices" also known as risk. India VIX is a volatility index based on the NIFTY Index Option prices. Historical data specifies that Indian VIX has a strong negative association with the Nifty. This implies that every time VIXdecreases, Nifty increases and every time it increases, a decrease is forthcoming.

Stock Deliverables

Stock Deliverables refer to a particular section of the total volume of traded shares which permanent transferred into the dematerialized account of one person from another. Stock deliverables means that the ownership gets transferred. Trading volume on a counter on any given day includes an essential share of deliverable trades and intraday trades. An increase in deliverable volume, when observed with the movement of the prices of the stock, show the short-term trend of the market on the counter. An increase in the deliverables with a price rise could signal massive demand for the buyers and vice-versa.

A higher percentage of quantity to be delivered signifies that the following trend persists. The high the deliverable quantity percentage to the quantity traded, the better it is, as it would signify that most of the traders or speculators would be expecting for the price to scale up if the stock followed an uptrend and fall further if it was a downtrend. Though, just as the percentage of deliverable volume is more significant, it is not suggestive ofpurchasing the stock, if the percentage of deliverable quantity is high when there is a decline in the stocks of the company, the signal poses a warning that the downtrend may continue.

An increase in the percentage of delivery of a stock signifies amassing or dissemination patterns of active traders who are selling or buying the scrip. Traders who trade daily desire highly-traded scripts are a deliverable quantity which is low, but those who invest are suggested to witness delivery percentage in line with the variations in the stock prices. The increase in delivery percentage with a spike and fall in the prices of the stocks signal a bullish and bearish trend, respectively. A fall in the percentage of delivery followed by, a raise in the prices of the stockdistinguish that, the scrip follows a pattern according to the trading behavior of speculators or traders. It is important to note that the uptrend observed with prices is not sustainable when there is a fall in the volume of delivery, and the prices of the stock signify a market trend reversal. Similarly, an increase in the volume of delivery possessing a fall in the prices of the stocksignals bearishness in the market concerning the stock on that particular day.

Figure 1: An example of stock deliverables of ICICI Bank

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The above figure 1shows the statistics of ICICI bank where the traded volume and percentage of deliverables seen. The market capitalization of the bank is 145,335.80 crores and the price earnings ratio remains at 14.94%. The figure mentions the traded volume of ICICI bank to be 808,226 , and the percentage of deliverables stood at 26.82. If there is an increase or decrease in the percentage of deliverables, it means that the investors desire to hold the stocks of the bank for a longer or shorter period.

Deliverables = Inter day traded share.
Volume traded = Intra-day traded shares + Inter day traded share.
Deliverables % = (Inter day traded shares/Total volume traded) × 100

The increase in the percentageofdeliverables indicates a strong sign that investors are interested in holding the stock for the long term in the stock. This happens as the inter day trades are more than intra-day trading. Similarly, the decrease in the percentageofdeliverables indicates a weak sign that investors are not interested in holding the stock for the long termin the stock. This happens as the inter day trades are less than intra-day trading.

The quantity of delivery aids the traders and speculators to comprehendthe market trend showing the number of traders who are interested in holding the stock for a more extended period. Generally, if a stock possesses a lowdelivery percentage, it means that traders are not interested in holding the stock and only focusing on making short term gains.

OBJECTIVES OF THE STUDY:

1. To understand stock volatility and stock deliverables in securities markets.
2. To determine the relationship between stock volatility and delivery quantity traded to total quantity traded.

HYPOTHESIS OF THE STUDY:

H0: There exists no relationship between stock volatility and delivery quantity traded to total quantity traded.

H1: There exists a relationship between stock volatility and delivery quantity traded to total quantity traded.

Data Analysis and Interpretation:

This paper attempts to find a relation between the stock volatility and stock deliverables volume of two companies –Power Finance Corporation (PFC) and National Aluminum Company Limited (NALCO) which listed on the National Stock Exchange (NSE), India. The study compares the stock deliverables of the respective companies, ascertain their volatilities using the VIX and then derive a relationship between the two and determine and, it is feasible to make investments made in the two companies above.

A. Data pertaining to stock deliverables

Figure 2: Stock Deliverables of stocks listed on NSE

Gross Deliverables - Nifty Midcap 50

BSE | NSE | COMBINED | Nifty Midcap 50 | 28 Dec 15:47

BSE SENSEX
CNX NIFTY
BSE SMALLCAP
BSE MIDCAP
BSE 100
BSE 200
BSE 500
BSE BANKEX
BSE CAPITAL GOODS
BSE OIL & GAS
BSE METAL
BSE INFO TECH
BSE AUTO
BSE HEALTHCARE

Company Name	Last Price	Chg	Chg %	Dely %	5-Day Avg Del %	Delivery Volumes	5-Day Avg Deliverable	Traded Volumes	Graph
REC	122.00	5.80	4.99	48.95	46.53	17,000,795	8,823,306	34,732,410	
Power Finance	105.10	4.50	4.47	48.30	36.92	13,585,276	6,115,399	28,127,479	
NALCO	63.90	1.20	1.91	62.35	52.28	11,371,312	5,379,008	18,237,550	
IDFC Bank	42.95	0.20	0.47	39.83	29.96	9,695,932	6,253,746	24,344,889	
NBCC (India)	56.70	2.80	5.19	43.17	35.26	9,293,563	4,463,872	21,527,626	
Tata Power	77.10	0.10	0.13	55.64	42.56	7,231,354	3,333,603	12,997,320	
Dish TV	38.00	0.45	1.20	46.01	34.66	6,134,396	2,161,647	13,333,486	
Tata Global Bev	220.80	0.75	0.34	59.24	40.74	5,634,002	1,941,999	9,509,683	
PNB	78.45	0.50	0.64	18.04	15.49	4,458,523	4,247,972	24,709,123	
Federal Bank	93.25	-0.85	-0.90	26.33	30.26	3,867,711	4,375,602	14,686,963	
Dewan Housing	240.35	0.70	0.29	34.79	16.49	3,523,101	2,437,108	10,126,105	
Reliance Power	29.10	0.65	2.28	21.21	16.05	2,838,333	1,740,100	13,382,122	
Jindal Steel	161.05	2.55	1.61	29.82	15.53	2,811,536	1,398,826	9,427,164	
M&M Financial	476.15	12.90	2.78	60.13	45.86	2,018,709	1,005,799	3,357,073	

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The above figure 2 shows the data about the stock deliverables of various companies listed on NSE. When the stock deliverables of Power Finance Corporation is seen, it observed that the deliverable volumes of the company were 1,35,85,276 and the traded volumes stood at 2,81,27,479. It known that the traded volume comprises both of inter-day and intra-day trades. The percentage change in the deliverables has been 4.47% (increase) which shows that the investors are interested in holding the stock for a more extended period. However, the traded volume and stock deliverables of NALCO stand at 1,82,37,550 and 1,13,71,312 Rupees respectively. The percentage change in the deliverables has been 1.91% (increase) which shows that the investors are interested in holding the stock for a more extended period. It should noted that Power Finance Corporation has higher values of traded volume, stock deliverables and percentage change in the deliverables than NALCO. It indicates a strong sign that the traders consider investing in Power Finance Corporation rather than NALCO, although the signs of long term holding are active in both the companies.

Figure 3(a): Deliverables of Power Finance Corporation

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Figure 3(b): Deliverables of National Aluminum Company

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It observed from figure 3(a) and (b) that the quantity to be delivered it's studied along with the price of the shares. When the share price of the stock escalates along with the higher percent of quantity to be delivered to the traded quantity, this trend signifies bullishness in the stock because most buyers at this time would be expecting the stock price to increase. This pattern is seen in the stock of PFC (Figure 3(a)).Similarly, when the price of the stock falls with a higher percent of quantity to be delivered to the traded quantity, this trend signifies bearishness in the stock as most of the sellers would be expecting for the price of the stock to decrease. This pattern is seen in the stock of NALCO (Figure 3(b)).

B. Volatility data of both the companies

As mentioned above, volatility is a statistical measure of the diffusion of yields for a given security or market index.

Figure 4(a): Beta/Volatility of Power Finance Corporation on Daily/Weekly/Monthly Period

Beta Values of Power Finance Corporation Ltd.							
Period	Long Term Beta *	Daily - One Month Range	Daily - Three Month Range *	Weekly - One Year Range	Weekly - Two Year Range	Weekly - Two Year Range	Monthly - Two Year Range
Beta	**1.21**	1.17	1.22	0.903	1.16	1.20	0.803
Mean	111.87	93.76	91.60	90.19	111.64	111.36	110.45
Standard Deviation	10.38 %	4.28 %	3.67 %	5.62 %	5.11 %	7.91 %	10.52 %

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Figure 4(b): Beta/Volatility of National Aluminum Company (NALCO) on Daily/Weekly/Monthly Period

Beta Values of National Aluminium Co. Ltd.							
Period	Long Term Beta *	Daily - One Month Range	Daily - Three Month Range *	Weekly - One Year Range	Weekly - Two Year Range	Weekly - Two Year Range	Monthly - Two Year Range
Beta	**1.13**	1.34	0.569	0.500	1.03	1.11	0.958
Mean	57.71	64.01	66.12	69.40	71.57	71.48	71.32
Standard Deviation	11.72 %	1.99 %	2.69 %	4.91 %	5.32 %	7.88 %	11.53 %

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In the above figures 4(a) and (b), beta or data showing the volatility of both companies Power Finance Corporation and National Aluminum Company Limited on daily/weekly/monthly period shown. Generally, a beta value less than one means that the stock is less volatile than the market, whereas a beta value of more than one means that the stock is more volatile than the market. When the variance in volatility throughout one year seen, it observed that PFC has a beta value of 0.903 and NALCO has a beta value of 0.500. It means that the value closer to 1 (0.903) is more volatile than the value farther than 1 (0.500). Stocks that are more volatile ensure profitability and more rewards.

Also, the figures show the mean and standard deviation of the beta values. It observed that PFC has a standard deviation of 5.62%, higher than that of NALCO which is 4.91%. Hence, it concluded that the volatility of PFC is more than that of NALCO which might urge the investors to invest their funds in the stocks of PFC.

Volatility Index is a measure of the market's anticipation of unpredictability over the near term as mentioned above. Here, the VIX of the two companies under study are compared with the VIX of the market and results are drawn.

Figure 5(a): VIX compared with Power Finance Corporation

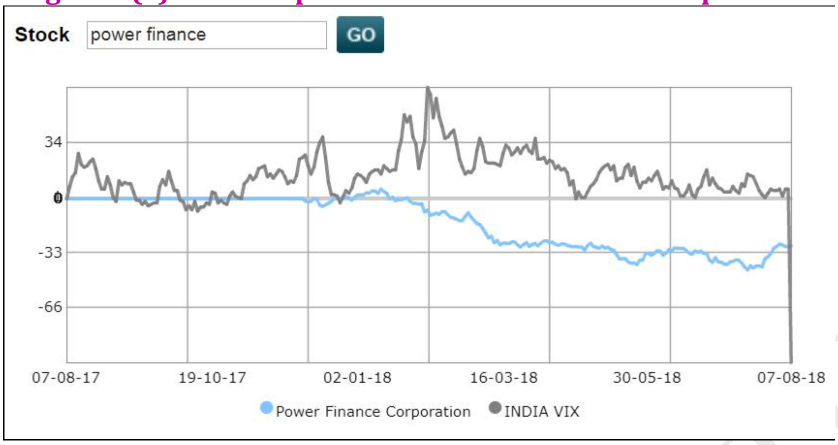

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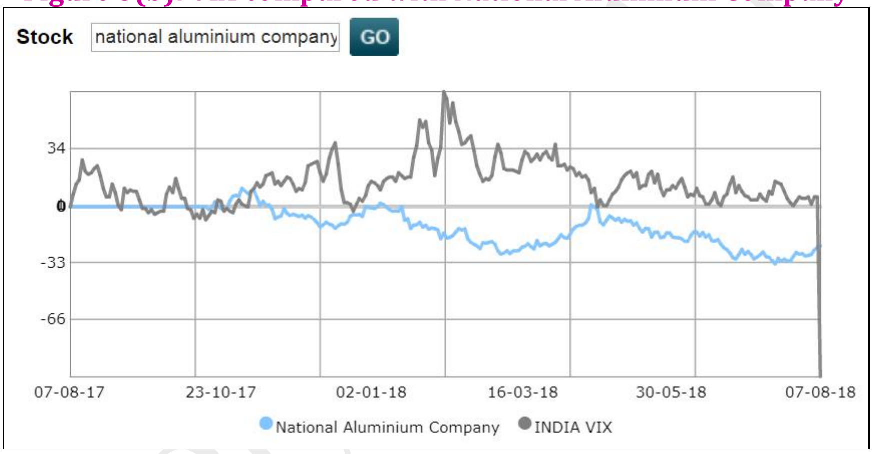
Figure 5(b): VIX compared with National Aluminum Company



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From the above figures 5(a) and 5(b), it observed that the market has been volatile in 2018 affecting many companies concerning the prices. When the two figures were compared, it found that when the VIX was high the trend of the stocks in the market was low. It concluded that the trend for PFC wasmuch lower than for NALCO. The low trend indicates a significant sell off and once the VIX loses momentum and falls, the market rallies up resulting in significant purchases from traders and speculators.

C. Investment ideas

This section based on the volatility index and stock deliverables provides an opinion if the investors must invest in the two companies.

Power Finance Corporation

Figure 6: Market Trend of Power Finance Corporation for investment

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The above technical analysis in figure 6 pertains to Power Finance Corporation Limited which finds the market to be range bound between Rs. 48 to 172 which means that the market was moving in the said range. A range bound market provides a profitable opportunity possessing the least risk for intraday trading.Once the market is range bound, it trend near the support zone range. After analysis, it found that the Price Earnings Ratio of the company looks attractive which means that the current investor demand for the company's share is high as the share price is not as high. The investors are recommended to buy the shares of the company. The financial performance of the company in 2018 was healthy and, the peer comparison was also significant showing Power Finance Corporation was doing well than the other companies.

National Aluminum Company

Figure 7: Market Trend of NALCO for investment

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The above technical analysis in figure 7 pertains to National Aluminum Company Limited which finds the dominant trend of the market is bullish. The short-term price of the stock however, showed a down side trend. It also seen that a support zone formed at 57 and the resistance shall move up from 79 to 87. The price is seen following a three drive pattern which could offer excellent risk/reward ratio. The market for NALCO anticipates an upside breakoutcalling for purchase when the stock price rises as shown in the above figure.The investors are suggested to purchase the shares of the company. The financial performance of the company has been healthy in 2018 and the peer comparison was significant showing that NALCO has been doing well than the other companies.

CONCLUSION

India is one of the quicklydeveloping markets; It's volatility index designed and administered by an organized exchange, NSE. The stock deliverables are also an essential part of the Indian stock market which generally meant for long term holding or positional trade. This study investigated therelationship between the stock market volatility and the stock deliverables. The paper examined the relationship between stock volatility and delivery quantity traded to total quantity traded for two companies listed on NSE NIFTY. It learnt from the study that the volatility trading strategy of straddles is essential to be accustomed often. As the volatility in the market increases, the market shows a buy signal where the investors could recover their losses and make more profits. As the volatility in the market decreases, the market indicates a sell signal where the investors save themselves from losing more money on their stocks. The quantity of delivery aids the traders and speculators to comprehend the market trend showing the number of traders who are interested in holding the stock for a more extended period. Generally, if a stock possesses a low delivery percentage, it means that traders are not interested in holding the stock and only focusing on making short term gains.

The data of both the companies confirm that there exists a relationship between delivery quantity traded to total quantity traded and stock volatility. Hence, the results of the study showed that the volatility and volatility index showed a significant association with trading and deliverable volumes rejecting the null hypothesis and accepting the alternate hypothesis. The researcher concentrated on analyzing two companies that are listed on the NSE. As the companies selected for the study were large-cap and mid-cap companies, the study could not identify the relationship that has comparatively low market capitalization.

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