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IMPACT OF PRICE LIMIT ON STOCK PERFORMANCE

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Abstract:

Stock based price limits is a structural mechanism aimed at preventing excessive volatility in stock prices, preserving liquidity and preventing panic buying or selling. In the recent times, stock exchanges in addition to imposing additional margins, are using price limits as a structural tool to dis-incentivize price manipulation in stocks. Past empirical studies conducted using data of global stock exchanges, reported that price limits delay price discovery, and as a consequence take away the liquidity in the stock. This study aims at assessing the impact of stock based price limits on price discovery and trading activity using data from National Stock Exchange. The results indicate that price limits delay price discovery. Volume of shares traded remain at much higher level for 5 days after the event day. The Cumulative Average Abnormal Returns on the stocks hitting upper price band continue to increase after the event day. Hence, it is felt that price limits may have limited impact on trading volumes and stock returns.

JEL: G14,G18

Key Words: India, Stock Market, Price Limit, Stock price manipulation

1. Introduction:

Primary objective of market regulation is to ensure that markets are efficient , fair and less susceptible to Market crashes. Market structure affects the speed and quality of price discovery, liquidity, and the cost of trading (Madhavan ,2002). Efficient price discovery and ability to trade at low costs matter to all investors. Globally, stock exchanges use market wide circuit breakers, stock based circuit breakers, price bands to protect market stability and prevent extreme irrational movements to stock prices. Academic literature examining the utility of these restrictions presents conflicting opinions. Kim and Rhee (1997) conclude that **stocks that hit the price limit exhibit higher levels of volatility, delayed price discovery and increased trade volumes** on the day after the price limit hit. As against this, Ohuche and Ikoku (2014) conclude that **higher price limits help in moderating price volatility in Nigerian stock markets**. They favour the use of symmetric price limits as opposed to asymmetric ones, as they help in moderating price volatility.

Despite there being such conflicting evidence against price limits, Indian stock exchanges have incorporated both market wide circuit breakers and also price limits for stocks that are not included in derivative segment or not part of any derivative index. The effectiveness of price limits with respect to price discovery and trading activity in the exchanges needs to be empirically studied. This will be of use to both regulators and market participants. This study attempts to ascertain the impact of price limits on price discovery and trading activity in the National stock exchange, India.

The rest of the paper is organized as follows: Section 2 discusses the application of price limits in the Indian stock exchange. Section 3 covers a review of latest literature on price limits and its implications to market. The section also identifies the need for this study and

research gap. Section 4 details the research methodology. Section 5 presents the results and discussions. Section 6 provides conclusions and scope for further research.

2. Application of Price limits at Stock Exchange

At the stock level, both the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) apply daily trading price limits in bands of 20%, 10% and 5%, for stocks that are not traded in the derivative segment and are not part of any derivative Index. For the stocks excluded from daily trading price limits, the exchanges apply dynamic price bands with the objective of preventing fat finger errors ie errors in punching order prices during trading.

In daily trading price limit, the exchange specifies the upper and lower price bands for the stocks based on the previous days closing prices of the stock. On the trading day if the last traded price of the stock reaches this upper or lower price band it said to be in upper or lower circuit respectively. Once the stock prices hit the price limits, trading is not halted like in Market wide circuit breaker. Trading is permitted at prices within the specified bands for the day. Unlike this in stock based circuit breaker, when the prices of stock reach the upper or lower limit, trading is halted. News related to the stock is generally disseminated to the investing public. It is expected that such halt will prevent panic and help effective price discovery (Kim and Yang, 2004). Research studies point out many events when **price limits prevented the further price crash**. Most of the Asian stock exchanges adopted the price band mechanism to **curb the volatility and give cooling of period** (Rosita, 1992). **Price limits are also used to prevent stock price manipulation**. Allen and Gale (1992) point out three methods of stock price manipulation. First, **Action based manipulation**, is based on actions that change the actual or perceived value of the assets. Second, **Information based manipulation**, where

false information and rumors about the stock prices are spread across multiple participants which impact share prices. The regulators have largely controlled these manipulations through insider trading regulations, suspension of members spreading false rumors etc. The third type of stock price manipulation is **trade based manipulation**. Here, the trader manipulates prices by simply buying the stock and then selling without taking any publicly observable action or spreading false rumors. This happens because uninformed traders observe sudden changes in volumes and prices of the shares and assume that the same is caused by informed traders and take suitable profitable action based on trade data. Eg: an uninformed trader observes increase in volumes and prices of shares of a specific company, assumes that large trader is informed and is expecting some good news about stock and decides to buy the stock. When sufficiently large number of uninformed traders takes the above action, it will drive the prices up facilitating the exit of the manipulator. When surveillance department of exchanges suspect price manipulation in any of the stocks, they tend to respond to it by imposing additional margins and reducing the price limit bands from 20% to 10% and 5%. Further, the exchange may also transfer the stock to trade to trade segment. In the trade to trade segment, only delivery type transactions are allowed and there is no netting settlement available. The trader will have to pay the full value of the stock bought and also provide delivery for the stock sold. This when applied with price band restrictions tends to increase the capital investment and locks up the same for a longer period of time. It is felt that such regulatory response will help protect market from price manipulations and preserve market integrity.

Empirical study of the impact of imposition of price limits will help in understanding its utility to exchanges and market participants.

3. Review of Literature

Price limits and trading halts are essentially policy responses to curtail extreme stock price volatility, act as a disincentive to stock price manipulation and protect investor confidence in the markets. (Chang and Hsieh, 2008) Empirical investigations of the impact of price limits conducted by Friday and Ikoku (2014) conclude that introduction of price limits in the Nigerian stock exchange create informational inefficiency. Further, some authors have attempted to address the question of what could be an optimal price band for liquid and illiquid stocks. (Chen, Kim, & Rui, 2005) studied the China stock market, Shanghai stock exchange and Shenzhen stock exchange and selected two types of A and B set of shares as per liquidity. For calculating liquidity it has been considered the bid and ask spread of order book prices and event study had been performed. It has been concluded that less liquid stocks are more susceptible to hitting the price limit. So it has been suggested that price limit should be wider for illiquid stocks as compared to liquid stocks.

(Rhee, 1997) studied the Tokyo stock exchange daily price limits and concluded that it delayed price discovery and price limits are ineffective. The study considered the time period of 1989 to 1992 daily price limit data. Event study and volatility spillover is calculated. The study also finds trading interference because of price limit and concludes that the volume for stock increases abnormally after price band hit.

(Frag, 2013) the paper studied the Egyptian (EGX), Korean (KRX) and Thai (SET) stock exchanges. The objective of the study to evaluate the effect of narrow price limits to wider price limits. They used the EGARCH model used for volatility study. It has been concluded that price discovery is disrupted due to the switch from narrow to wide price limit and closing prices cannot reflect the full price information to investors.

(Cho, Russell, Tiao, & Tsay, 2003) used high frequency data of Taiwan stock Exchange to study effects of daily price limits. The study used GARCH model for the 5 min return of each individual stock and find out the magnet effect. The study concluded that asset prices take momentum towards the limits and accelerate as it approaches the limits. So as per this observation it is concluded that price limits are ineffective in controlling overreaction.

(Arak & Cook, 1997) the study examine the US Treasury bond future market between 1980 to 1987. The purpose of the study to evaluate behavior of prices as it nears the price band. The author first theoretically explained the reason for acceleration in prices when it approaches to price band is that, trader think it is like confirmation call for direction of stock price and takes action accordingly. The study further evaluate the daily prices of Treasury bills of US treasury market and concluded that limits act as a stabilizing force and it can calm the market.

The above review shows that in past decade many studies have been conducted to evaluate the impact of price limits on multiple market quality parameters. However exchanges across Asia, Europe and US differ in many ways with respect to their trading architecture and regulations. While Europe and US exchanges have dealer driven markets with market makers who are obliged to provide liquidity throughout the trading period, Asian markets are largely quote driven markets. There is no obligation on any market participant to provide liquidity. Hence, in times of crisis all the participants can withdraw from the markets and liquidity and trading volumes can shrink. Further order matching rules, regulations, presence or absence of call auctions and continuous order matching platforms, cross market arrangement across exchanges and permission for trading after market hours differ widely from country to country. These differences affect market quality parameters differently across different

markets. Hence, it is felt that there is a need to specifically study the impact of price limits on market performance in India. Price limit are imposed by exchanges and set on the basis of previous days closing prices. Price limit event is triggered if the last traded price of the stock hits the upper or lower price limit anytime during the trading hours in the exchange. However, successive upper price limit hit by stocks by itself cannot be construed as stock price manipulation. Hence, we refrain from making any such assumption and limit the objectives of study of this paper to the following:

- a. To understand the impact of price limits on price discovery and stock returns
- b. To understand how price limits affect trading volumes and trading participation in the markets.

4. Research Methodology and Data:

Most of literature reviewed use two main methods to capture the effectiveness of Price band. One is GARCH/ARCH models to test the impact of price limits on volatility (Friday and Ikoku, 2014) and second is standard event study methodology (Rhee, 1997). It is felt that the volatility measure is not logical in case of price band because stock price movements are artificially restricted with price limits to control the excessive volatility. So most of the measure of volatility may go undetected or may be ambiguous. Hence, we use event study for this paper.

The data on upper price band hitters is collected from the website of national stock exchange for a sample of 176 companies, spread across 5 days of trading. The sample size of the companies included in this study is small, as the historical data of price band hitters is not available on the website of the stock exchange and has to be downloaded on a daily basis. The pre and post event data on share price, volume traded and number of trades in the price

band hitting stock is obtained from the daily bhavcopy provided by the National stock exchange.

4.1 Impact of price limits on price discovery and stock returns:

Once the prices of stock hit the price band for the day, then the event is triggered. The prices of the stock are not permitted to move above the band specified by the exchange. This is likely to restrict trading activity and is taken as the event day. To test the impact of price limits on price discovery, we take into account the number of stocks that have continued to hit the upper price band on each of the days following the event day. The number of consecutive days of such occurrences is taken as price discovery delay. This is done across event window of (-10, +10) days.

Stock prices can hit the upper price band either because of performance that results in fundamental change in value perceived or due to price manipulation. The reason for upper price band hit is indistinguishable from the trade data. In order to understand the relationship between upper band price limit hits and stock returns we use event window of (-10, +10) days. We calculate the returns on the stock on the above days as per equation below:

$$R_{st} = (\text{Price}_{st} / \text{Price}_{st-1}) - 1 \quad \dots (1)$$

The Abnormal Return (AR) for the stock is calculated as the excess of stock returns over the returns of Nifty 500 index for the day which is taken as the benchmark returns. Nifty 500 index covers 94% of the free float market capitalization and 73 different . Hence Nifty 500 returns captures the impact of all political and macro economic events affecting stock returns. The excess over Nifty 500 returns can be attributed to stock specific reasons. Thus the AR of the stock is calculated as below:

$$AR_{st} = R_{st} - ((\text{Closing value of Nifty 500}_t / \text{Closing value of Nifty 500}_{t-1}) - 1) \dots (2)$$

We calculate the Average Abnormal Return (AAR) of all the stock for given time t using the equation below

$$AAR_t = \frac{1}{n} \sum_{s=1}^n AR_{st} \dots (3)$$

We also calculate the Cumulative Average abnormal return (CAAR) as the aggregate of AAR_t around the event period of (-10,+10).

4.2 Impact of price limits on trading activity:

Both the volume of shares traded and number of trades for the day for each of the above stocks has been obtained from the website of the national stock exchange for the event period (-10,+10). The average volume of shares (AV) and the average number of trades (AT) across the above period is calculated as given below:

$$AV_t = \frac{1}{n} \sum_{s=1}^n \text{Volume}_{st} \dots (4)$$

$$AT_t = \frac{1}{n} \sum_{s=1}^n \text{No. of Trades}_{st} \dots (5)$$

It is expected that the volume of shares traded and the number of trades will fall if price limits deter stock price manipulation.

5. Results and discussions:

The descriptive statistics for the event day, 10 days before and 10 days after the event day is given in table 1 below:

Table 1: Descriptive statistics of price, volume and trades

Statistic	Event - 10 days			Event day			Event - 10 days		
	LTP	Volume (Shares)	Total trades	LTP	Volume (Shares)	Total trades	LTP	Volume (Shares)	Total trades
Mean	41.51	250233.8	774.47	52.32	970369.7	2765.2	55.25	540006.8	1023.754
Minimum	0	0	0	0.15	1	1	0	0	0
Maximum	485.75	6120735	36984	528.8	24768364	49358	608.7	26262508	17216

From the above table it can be seen that there is a significant increase in the average price of the upper circuit band hitting stocks on the event day which is expected. However, 10 days after the event also the average price of stocks is higher than the event day prices which is indicative of delay in price discovery. The average volume of shares traded has fallen from the event day levels.

5.1 Impact of price limits on price discovery:

Out of the 176 stocks that hit the upper price band, the delay in price discovery was found to be as follows:

Table 2: Evidence of delay in price discovery

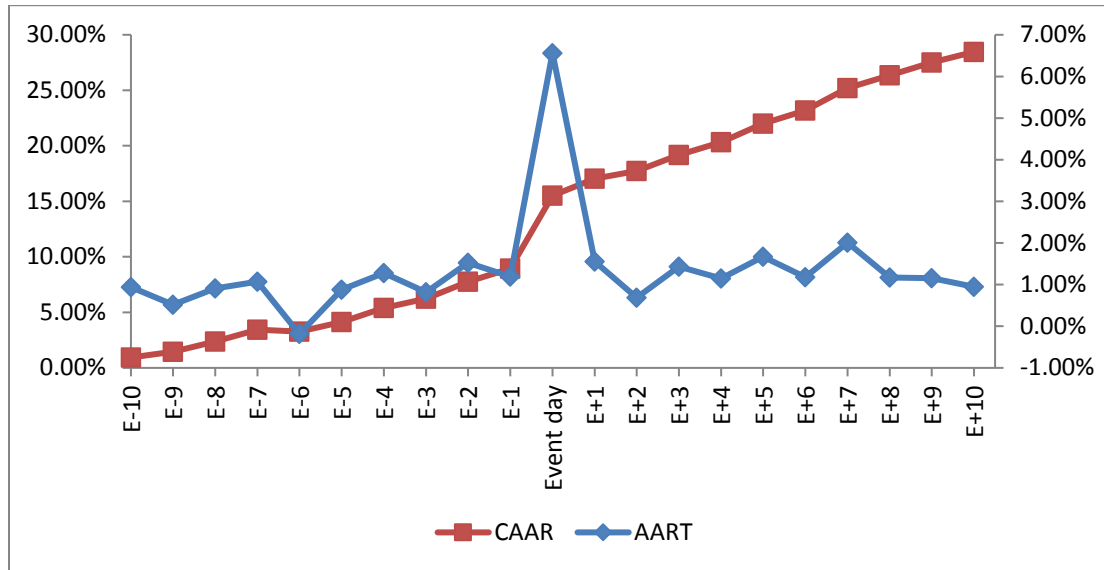
Days of delay	Number of stocks
2	16
3	2
4	3
5	3

Out of the total of 176 stocks delay in price discovery was found to prevail in 24 stocks which forms 14% of the total sample. The delay in price discovery is limited to 2 days in majority of the stocks and beyond 2 days these stocks trade within the price bands applicable to them. Our findings are consistent with the findings of Kim and Rhee (1997)

5.2 Impact on Returns:

The AAR and the CAAR graphs for the event period (-10,+10) are shown in Figure 1.

Figure 1: AAR and CAAR of the stocks

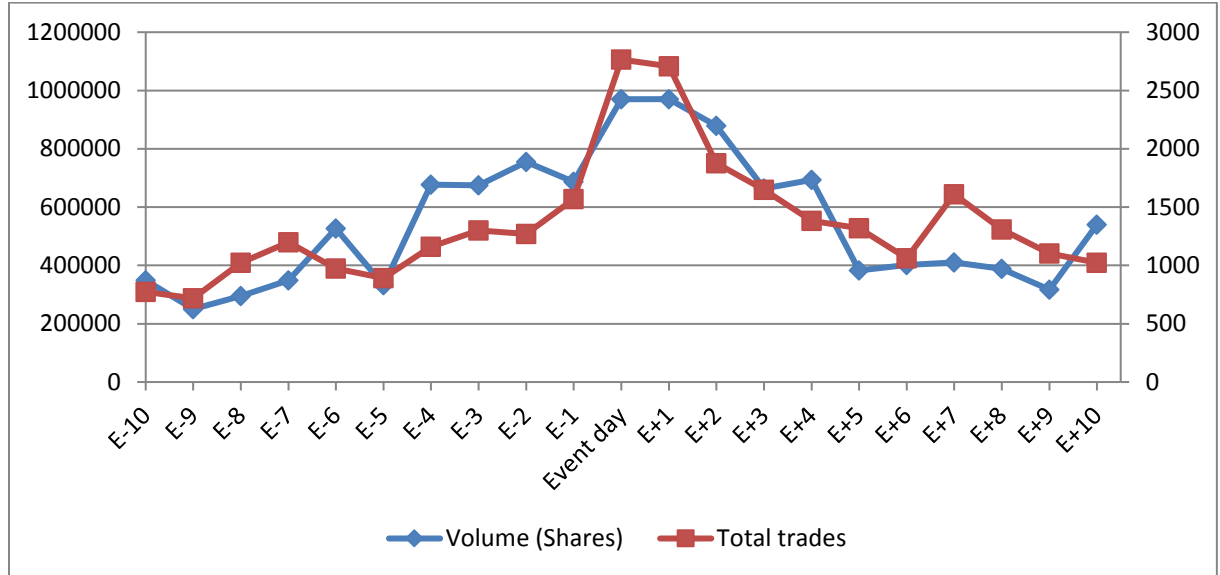


From the graph it can be seen that the AAR on the stocks increases drastically on the event day and on the subsequent day falls to levels as seen before. However, there is no evidence of reversal of returns after the event day as seen by CAAR curve. The prices of stocks continue to raise within the price limits specified by the exchange. Triggering of the upper price band may help in capping the profits or losses on a single trading day. Thus, fixing of price limits does not seem to curtail price increase in stocks hitting the upper price band. Hence, there is very little evidence to say that imposition of price limits help curtail price manipulation.

5.3 Impact on trading activity:

The quantity of share traded and the number of trades for the pre and post event days are plotted on a line graph as shown in Figure 2.

Figure 2: Volume of shares and Total trades



From the figure, it can be seen that the total number of trades and volume of trades on the stocks, show a raising trend from upto 5 days before the event day. The volumes and number of trades remain high on the day subsequent to the event day and fall back to normal levels 5 days after the event day. Kim and Rhee (1997) also report extended high levels of trading activity post the event day. They conclude that price limits delay rational trading activity.

6. Conclusion and scope for further research:

This study was conducted with the objective of assessing the impact of price limits on stock returns, trading volume and number of trades. Our analysis shows that price limits contribute to delay in price discovery. The level of trading activity in the stocks also does not reduce, after upper price band hits. Our results are consistent with the findings of others like Kim and Rhee (1997).

There is a fall in the abnormal average returns of the stock back to pre event levels on the subsequent day of the event day. However the uptrend in the prices of the stock is not

reversed after stock hits upper price band. Price limits only help to curtail the single day momentum in price of stock and thereby control the profits and losses of single trading days. Imposition of price limits contributes to extending the trading activity across many days both in terms of price discovery and volume of trade and number of trades. As the cumulative average abnormal returns in the stocks continues to increase after the price band hit, it can be said that imposition of price bands by itself does not arrest price manipulation present if any. It is essential to look at price limits along with other measures like trade for trade, graded surveillance measures introduced by the exchanges to meaningfully conclude on whether they help curtail stock price manipulation.

It is felt that preserving market integrity and investor confidence is of supreme importance for efficient functioning of the markets and exchanges. Imposition of price limits contributes to delay in price discovery and thereby reduce market efficiency. However, as the volume of trade continues to be high, there is no evidence of market participants refraining from trading in the stock within the limits on the days subsequent to upper price limit hits. Hence, it is felt that the costs of such delay may not be significant. As price limits do serve the larger interest of risk management and preventing systemic failure of the markets, their benefits outweigh costs.

Future research in this area can look into upper and lower price band hits. A comparative study of price limit hits with other more stringent measures like transfer of stocks into trade to trade segment and graded surveillance measures, introduced by the exchanges in the recent past, can help in ascertaining the relative effectiveness of these methods on stock price manipulation.

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