



The Significance of Market-Wide Circuit Breaker in Indian Stock Market

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Abstract

The study reviews the history of the circuit breaker and examines the significance of the market-wide circuit breaker in India. This study considers daily Nifty 50 index data of closing price and volume from Bloomberg on 12 different windows like pre and post circuit breaker of respective six times as market-wide circuit breaker applied in Indian Stock market. The study finds the difference in return and volatility measure based on the mean and standard deviation between pre and post circuit breaker period. In most of the cases, the impact of circuit breaker persists up to 10 days, and in some case, it is 20 days, however, less impact is up to 30 days of post-event. This study depicts no significant difference by employing paired T-Test in pre and post-market-wide circuit breaker.

Key words: Volatility, Circuit Breaker, Liquidity

JEL Codes: G10, G18, G19

Paper Classification: Research Paper

Introduction

The circuit breaker is an innovative concept applicable to curtail quick movements in security prices on any trading day in the stock market. The uncertainty regarding unexpected rise or fall affects the markets, investors as well as the whole nation. Stock markets play a vital role in the growth and development of the economy by facilitating fund raising for projects and capital formation. Efficient functioning of stock markets with adequate transparency, liquidity, price efficiency and resilience to shocks is a pre-requisite. Recent developments across the globe like Chinese currency devaluation, Greece economic woes have resulted in market crashes and extreme market movements in the indices of different markets across the globe. Circuit breakers (CB)¹ were first introduced in the American exchanges in the year 1988 based on the Brady Commission report (1988) to subdue the market swings and prevent panic.

¹The electricity department widely uses the term 'circuit breaker.' Circuit breaker "is an automatic device for stopping the flow of current in an electric circuit as a safety measure." In a stock market, it is referred to "An automatic halt or suspension in the trading on a stock exchange that takes effect in response to a specified amount of loss."

The question of whether the circuit breaker contributes to market resilience or not is widely debated by researchers and market practitioners.

Circuit breakers are applied in different forms across different exchanges globally. Those are – (i) price limits, i.e., stock wise trading halts, (ii) firm-specific trading halts and (iii) market-wide circuit breakers. In each of the cases, the circuit breaker is applicable for both upper and lower movements. Market wide circuit breaker and stock wise price limits are two popular circuit breakers applied in all stock exchanges. If index (broad-based) breaches a predetermined level, the trading is halted across the cash and derivative segments of the exchange or across all exchanges operating in the country, for a specified time. This is known as the market-wide circuit breaker. Trading may resume the same day or next day depending upon the time at which the original breach on the level of the index takes place in the market. As against this in stock-based price limits, price levels are fixed (upper and lower) and once the last traded price reaches this level, the stock is supposed to be in the upper circuit or lower circuit. Unlike the circuit breaker, the trading in the stock is not halted. A trade can be performed within the boundaries of the price limits if there are willing buyers and sellers with matching prices in the stock. Circuit breakers and price limits affect trading in different ways, even though both aim at reducing market volatility and bringing in market stability by reducing information asymmetry.

“Stock Markets whether American or Chinese are volatile and often are very unstable. Circuit Breakers can provide stability to financial markets provided they are designed correctly; otherwise, they can create more instability. China has to learn, and they have to design correctly.” (Joseph Stiglitz, Nobel Laureate and Professor, Columbia University, ET-12/Jan/2016)

The Rationale For and Against Circuit Breakers/Market Halts

An unexpected movement in stock prices/ index affects liquidity and increases volatility in the market. They may create panic conditions by triggering widespread margin calls and trading disruptions. There are different schools of thought on the significance of the circuit breaker in the stock market. The school of thought that accepts the benefits of circuit breakers are as follows. For short-term investors and traders, bringing the market to halt will provide time to understand and gauge the impact of news on the prices (Kim et al. 2008). Such a halt will minimize instability, reduce volatility, aid efficient price discovery and protect value (Kim et al. 2007). Greenwald & Stein (1991) depict that when uninformed traders move prices away from fundamentals (based on the news) informed traders feel uncertain about prices and tend to withdraw their positions from the market to avoid ‘transaction risk.’ In dealer driven markets, where firm quotes are made by dealers, the circuit breaker mechanism, not only brings trading to halt but also allows cancellation of all orders and helps to improve liquidity by providing time to traders to reposition their trade. It protects liquidity providers from huge losses. From a broker perspective, trading halts provide time to brokers to interact with their clients, provide information to them, collect margins if required, distribute risk and help in reducing the possibility of defaults. (IOSCO, 2002). Regulators believe that by simulating liquidity, halting free fall, they can protect clearing houses from clearing and settlement defaults and ensure that there is no systemic threat to markets. Kobayashi & Hashimoto (2011) used an artificial market simulator “U-Mart” and concluded that circuit breaker plays an important role to reduce volatility, price fluctuations and the trading volume.

The school of thought opposing the benefits of circuit breaker argues that “trading halts create uncertainty about the size of order imbalance and slow down the speed of price adjustment process” (Grossman, 1990). It causes a “delay in price adjustment, increases trading opportunity

cost, increases post-halt volatility" (Kim and Rhee, 1997). When markets re-open after the halt, the post-halt volatility also increases (Fong 1996).

Haris (1998) used a different parameter like psychological, economical and statistical which shows that circuit breaker policy in US stock exchanges does not have a large effect on volatility. S&P 500 stock (TASE) shows trading halts and price limits had no significant impact on the overall decline (Lauterbach & Ben-Zion, 1993). Gerety & Mullehrin (1992) depict pre-open and end session usually has high volatility as it is a market phenomenon but halting ownership to sell to those who are willing to buy creates a negative environment.

The ex-ante effect of the circuit breaker is studied by Subrahmanyam (1994) and concluded the circuit breaker yields the opposite result which regulator wants from the circuit breaker. Circuit breaker prevents the bad market quality to become the worst market quality. It is a useful tool for promoting market wide stability (Brugler & Linton, 2014). Christie et al. (2002) find post-trading halts follow the unusually high volatility even when the halting mechanism allows for information transmission during the halt.

Research Gap

The study finds most of the existing studies have been conducted on the developed market that is the quote-driven markets. Indian markets are order driven markets. Here, no market participant is under obligation to provide liquidity. Hence, it is possible that under conditions of price uncertainty, all the market participants can withdraw simultaneously, and this may affect market quality adversely and lead to systemic failures. Previous researches that have attempted to study the impact of stock-specific trading halt in order driven markets include Kim et.al (2008), A Frino et. al. (2011), Engelen and Kabir (2006), Kim and Rhee (1997) using the data of Spanish, Australian, Euro-next Brussels, Japan respectively. Christie et al. (2002) find both sharing volume and the numbers of trades are over six times than normal level during the 30 minutes after the halt. It remains unusually high for up to two hours.

There are no studies assessing the impact of market-wide circuit breakers and trading halt on the market quality in India. This may also be because there are only six such occasions in the past when the Indian exchanges have halted trading since 2001. In the light of latest developments in emerging markets like China, it is felt that a study of the effectiveness of market-wide circuit breakers and its impact on market quality will provide necessary inputs to regulators and exchanges for policy decisions. With the above motivation, the objective of this study is to understand the current regulations related to market-wide circuit breakers in India and to measure the impact of market-wide circuit breakers on liquidity and volatility.

Methodology and Data Sources

Methodology:

First, all data series has been converted into natural logarithm by formula $\ln (pt/pt-1)*100$

Where $-p_t$ is current day price

p_{t-1} is the previous day price

For analysis, the study first presents descriptive statistics to know the nature of data series, especially to measure volatility regarding standard deviation and to measure the mean of different

periods. Further, this study applied paired T-test to know the significant difference between the mean value of two series like pre and post circuit breaker period. By applying these tests, liquidity and volatility has been measured for pre and post circuit breaker.

The study considers both volume and closing price of the Nifty index in six different events of market-wide circuit breaker applied in Indian markets. The dates, causes, and types of circuit breaker have been given in Table-1.

Table-1: Market Wide Circuit Breaker applied in Indian Stock Market

Date	Event	Circuit Type
May 17, 2004, Monday	NDA Government lost. UPA returned to power with the help of left parties.	Lower circuit breaker
May 22, 2006, Monday	Concerns about margin pressure and taxation issues.	Lower circuit breaker
October 17, 2007, Wednesday	On 16th October 2007 night, SEBI proposed to clamp down on participatory notes (PNs) to restrict foreign inflows	Lower circuit breaker
January 22, 2008, Tuesday	The subprime crisis and Global financial meltdown	Lower circuit breaker
May 18, 2009, Monday	UPA own the 15th Lok Sabha election	Upper circuit breaker
October 05, 2012, Friday	NSE System problem and trading halted due to erroneous orders entered on behalf of an institutional client.	Lower circuit breaker

Data Sources- The data of closing price and volume of Nifty 50 index for before ten days and after ten days, before 20 days and after 20 days & before 30 days and after 30 days has been considered of all the six times of market-wide circuit breakers that has been applied in India. All data are sourced from Bloomberg.

Regulation Related to the Market-Wide Circuit Breaker

The regulations related to market-wide circuit breakers vary from country to country. The survey report of World Federation of Exchanges, 2008 highlights the differences in circuit breaker rules across the globe. Out of 40 exchanges that have participated in the survey, 16 exchanges do not have any circuit breaker mechanism in place.

In India, the regulation related to the application of market-wide circuit breaker was introduced on 28th June 2001² by Securities Exchange Board of India (SEBI). The objective was to provide time to market participants to absorb and evaluate the information causing steep price fluctuations and react on that basis thereby prevent a panic reaction. Further, it was also felt that the halt will help to preserve market stability, manage default risks as brokers and clients will have time to arrange and provide funds to meet margin calls which may be triggered due to steep price movements. Based on the market experience and reactions, the regulations initiated by SEBI in 2001, have been modified and changed and the current regulations related to the application of market-wide circuit breakers are as given below:

²SEBI circular no. SMDRPD/Policy/Cir-37/2001 dated 28th June 2001.

The regulation provides for the implementation of the trading halt at three different levels of index movements. Movement of SENSEX or NIFTY index in either direction by 10%, 15% and 20% concerning the previous days close, shall trigger the market-wide circuit breaker, upon which both the stock exchanges are required to halt trading in all equity and equity derivative market segments in a coordinated manner. The duration of the halt in case of a 10% movement of either of these indices, shall be 1-hour market halt if the movement takes place before 1 pm. In case the movement takes place at or after 1 pm but before 2:30 pm, then there will be a trading halt for ½ hour. In case the movement takes place at or after 2:30 pm, then there will be no trading halt at the 10% level, and the market will continue trading.

In the case of a 15% movement of either index, there will be a 2-hour halt if the movement takes place before 1 pm. If the 15% trigger is reached on or after 1 pm but before 2 pm, then there will be a 1-hour halt. If the 15% trigger is reached on or after 2 pm, then the trading will halt for the remainder of the day.

In case of a 20% movement of the index, the trading will be halted for the remainder of the day. The exchanges shall also purge the unmatched orders present in the electronic order book. The market shall further open after the specified time, with a 15-minute pre-market call auction session in the equity cash segment to facilitate price discovery.

Empirical Results

Descriptive statistics are designed to know the information about the variables. Before applying the T-test, the study starts with the presentation of descriptive statistics of stock returns and volume returns for pre and post circuit breaker period. The mean in the descriptive statistics shows the average of the series (mean is the sum of the values of a variable divided by the number of observation), the standard deviation (SD) is the variance of the series (SD is the positive square root of the variance). Variance is the sum of the squared deviations of each value from the mean divided by the number of observations. Max and Min present the maximum and minimum movement of a data series over a period. Skewness measures the distribution is positively skewed or negatively skewed. Kurtosis measures the peaked or flat distribution. For a normal distribution Skewness should be zero, kurtosis is 3, and the Jarque-Bera (J-B) statistics should be zero. If J-B is more than zero, than the series is non-normal (Gaur et al. 2006). Paired sample T-Test is done to measure whether the mean value of two different periods is significantly different from each other or not.

The descriptive statistics have been presented in Table-2 for the year 2004, Table-3 for the year 2006, Table-4 for the year 2007, Table-5 for the year 2008, Table-6 for the year 2009 and Table- 7 for the year 2012. The paired T-test is presented in the Table-8.

Table-2: Descriptive Statistics for the year 2004

10 Days	Mean	Median	Max	Min	SD	Skewness	Kurtosis	JB
Nifty Return Pre CB	-1.224	0.373	1.483	-8.193	3.189	-1.244	3.469	2.405
Nifty Return post-CB	6.711	10.626	47.544	-17.9	19.921	0.7316	2.989	0.803
Volume Pre CB	-0.151	-0.492	4.161	-5.018	2.713	-0.042	2.662	0.045
Volume Post CB	-2.579	-3.28	42.323	-24.591	19.645	1.288	4.166	3.000
20 Days								
Nifty Return Pre CB	-0.873	-0.038	1.565	-8.192	2.416	-1.622	5.485	13.221*
Nifty Return post-CB	-0.079	-0.145	4.161	-5.018	2.186	-0.177	2.940	0.102
Volume Pre CB	9.2875	4.840	109.643	-19.291	28.560	2.447	9.274	50.135*
Volume Post CB	-2.789	-3.28	42.323	-24.591	16.511	1.093	4.076	4.703
30 Days								
Nifty Return Pre CB	-0.488	-0.038	2.166	-8.193	2.082	-2.009	7.819	47.576*
Nifty Return Post CB	0.023	-0.145	4.161	-5.018	1.918	-0.286	3.297	0.503
Volume Pre CB	2.137	4.840	109.643	-97.212	32.779	0.291	7.660	26.653*
Volume Post CB	-1.018	-0.608	42.323	-27.723	16.487	0.585	3.029	1.657

* represents 1% level of significance

Table-2 presents the descriptive statistics of the Nifty return and return of Nifty volume for the year 2004. Based on mean, Nifty return reduces in the post circuit breaker period and volumes are also reduced more than nifty returns in case of 10, 20 and 30 observations. The volatility of both Nifty return and return of Nifty volume as measured by standard deviation has increased in case of 10 trading days' observations and 20 trading days' observations; however is decreased in case of 30 trading days'. This indicates as one moves from circuit breaker day, there is an increase in volatility up to 20 trading day and after that, it starts to decrease. Skewness here indicates all data series are positively and negatively skewed means asymmetrically distributed. All value of Kurtosis in three different windows are positive, indicates that data series are leptokurtic, implying a more peaked distribution than the normal distribution. The value of Jarque-Bera statistics indicates that data are normal in some cases and non-normal in some cases.

Table-3: Descriptive Statistics for the year 2006

10 Days	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	JB
Nifty Return Pre CB	-1.43	-1.387	3.123	-7.013	3.190	-0.371	2.155	0.474
Nifty Return Post CB	-0.653	-0.924	4.265	-3.652	2.727	0.494	2.095	0.674
Volume Pre CB	7.920	10.878	31.614	-33.573	21.396	-0.882	2.669	1.209
Volume Post CB	-2.937	-5.587	54.303	-37.959	28.541	0.648	2.924	0.632
20 Days								
Nifty Return Pre CB	-0.468	0.425	3.123	-7.013	2.537	-1.028	3.588	3.623
Nifty Return Post CB	-0.486	-1.151	6.114	-4.874	3.332	0.593	2.132	1.709
Volume Pre CB	-2.302	-5.143	54.303	-46.097	25.741	0.128	2.573	0.196
Volume Post CB	2.404	6.421	110.907	-111.34	43.693	-0.151	5.138	3.693
30 Days								
Nifty Return Pre CB	-0.269	0.425	3.123	-7.013	2.274	-1.04	4.112	6.724**
Nifty Return Post CB	-0.078	0.165	6.114	-4.874	3.012	0.272	2.089	1.358
Volume Pre CB	2.038	6.421	110.907	-111.34	38.441	-0.101	5.614	8.310*
Volume Post CB	-0.525	-3.848	197.993	-197.35	57.731	0.036	10.242	63.383*

* represents 1% level of significance

Table-3 presents the descriptive statistics of the Nifty return and return of Nifty volume for the year 2006. Based on mean, Nifty return increases in the post circuit breaker period and volumes reduce in case of 10 trading days' observations, 30 trading days' observations and increase in case of 20 observations. The volatility of both Nifty return and return of Nifty volume as measured by standard deviation has increased in all cases except in ten observations, where it has been decreased. This indicates that the volatility increases after application of market wide circuit breaker. Skewness here indicates, all data series are asymmetrically distributed. All value of Kurtosis in three different windows are positive and indicates that data series are leptokurtic, implying a more peaked distribution than the normal distribution. The value of Jarque-Bera statistics indicates data are normal in maximum cases and non-normal in some cases.

Table-4: Descriptive Statistics for the year 2007

10 Days	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	JB
Nifty Return Pre CB	0.935	-0.041	4.652	-1.961	2.419	0.423	1.891	0.730
Nifty Return Post CB	1.086	0.542	5.437	-2.567	2.409	0.376	2.471	0.316
Volume Pre CB	-0.836	7.834	28.774	-38.833	26.295	-0.286	1.582	0.876
Volume Post CB	-2.288	1.853	13.481	-31.728	15.078	-0.731	2.497	0.896
20 Days								
Nifty Return Pre CB	1.160	0.943	4.652	-1.961	1.866	0.332	2.467	0.575
Nifty Return Post CB	0.005	0.000	0.054	-0.025	0.020	0.865	3.003	2.373
Volume Pre CB	5.933	0.949	65.459	-38.833	29.822	0.369	2.150	1.004
Volume Post CB	-0.927	2.499	186.929	-188.82	66.834	-0.003	7.369	15.114*
30 Days								
Nifty Return Pre CB	0.811	0.320	4.652	-1.961	1.607	0.848	3.424	3.691
Nifty Return PostCB	0.167	-0.435	5.438	-3.878	2.015	0.698	3.549	2.678
Volume Pre CB	3.024	0.949	65.459	-38.833	26.267	0.410	2.651	1.354
Volume Post CB	-2.586	1.853	186.929	-188.82	54.893	0.075	10.230	63.207*

* represents 1% level of significance

Table 4 presents the descriptive statistics of Nifty return and return of Nifty volume for the year 2007. Based on mean, Nifty return decreases in the post circuit breaker period except it increases for 10 observations. The Nifty volume reduces in case of all trading days. Volatility of both Nifty return and return of Nifty volume as measured by standard deviation has increased in all cases except for 10 observations and in Nifty return for 20 observations decreased. This indicates that volatility starts increasing from circuit breaker day. Skewness here indicates, all data series are asymmetrically distributed. Value of Kurtosis in three different windows is positive indicates, data series are leptokurtic implying a more peaked distribution than normal distribution. The value of Jarque-Bera statistics indicates data to be normal in maximum cases and non-normal in two cases.

Table-5: Descriptive Statistics for the Year 2008

10 Days	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	JB
Nifty Pre CB	-2.092	-1.851	0.698	-9.105	2.968	-1.546	4.585	4.525
Nifty Post CB	0.584	0.127	6.721	-3.321	3.196	0.665	2.487	0.762
Volume Pre CB	2.915	5.923	44.273	-29.649	22.727	0.398	2.419	0.364
Volume Post CB	-6.464	-9.137	61.602	-56.366	31.889	0.719	3.822	1.028
20 days								
Nifty Pre CB	-0.731	0.076	1.537	-9.104	2.419	-2.348	8.660	42.834*
Nifty Post CB	0.077	-0.251	6.720	-5.28	3.083	0.421	2.733	0.619
Volume Pre CB	3.916	5.923	50.160	-63.386	26.935	-0.403	3.460	0.684
Volume Post CB	-3.506	1.925	61.602	-56.366	24.139	0.325	4.800	2.900
30 Days								
Nifty Pre CB	-0.473	0.076	3.721	-9.104	2.339	-1.809	7.850	44.237*
Nifty Post CB	-0.232	-0.251	6.720	-5.317	2.780	0.406	3.286	0.895
Volume Pre CB	-0.465	1.925	61.602	-56.366	22.050	0.207	4.878	4.467
Volume Post CB	1.863	1.154	50.160	-63.386	24.710	-0.245	3.320	0.413

* represents 1% level of significance

Table 5 presents the descriptive statistics of the Nifty return and return of Nifty volume for the year 2008. Based on mean, Nifty return decreases in the post circuit breaker period except for 30 observations. The volatility of both Nifty return and return of Nifty volume as measured by standard deviation has increased in all cases excluding 20 observations, where the only volume of nifty return has decreased. This indicates, as one moves from circuit breaker day, volatility starts increasing. Skewness here indicates, all data series are asymmetrically distributed. All values of Kurtosis in three different windows are positive and that indicates data series are leptokurtic, implying a more peaked distribution than the normal distribution. The value of Jarque-Bera statistics indicates data are normal in maximum cases and non-normal in two cases.

Table-6: Descriptive Statistics for the year 2009

10 Days	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	JB
Nifty Pre CB	0.053	-1.011	3.496	-1.842	1.929	0.667	1.979	1.057
Nifty Post CB	0.531	0.653	3.797	-2.893	2.110	-0.088	2.072	0.334
Volume Pre CB	-4.092	3.104	26.429	-35.315	20.886	-0.198	1.799	0.599
Volume Post CB	-2.112	-2.202	24.910	-22.386	16.493	0.367	2.084	0.516
20 Days								
Nifty Pre CB	0.451	-0.215	5.053	-3.151	2.160	0.466	2.375	0.996
Nifty Post CB	0.197	0.120	3.797	-3.482	1.961	-0.089	2.317	0.393
Volume Pre CB	-3.856	-3.392	26.429	-35.315	15.091	-0.234	2.864	0.188
Volume Post CB	-3.265	-3.609	52.127	-36.254	19.966	0.984	4.496	4.838***
30 Days								
Nifty Pre CB	0.573	0.441	5.053	-4.288	2.343	-0.068	2.473	0.356
Nifty Post CB	0.057	0.277	3.798	-3.643	1.960	-0.121	2.304	0.656
Volume Pre CB	-0.282	-3.076	52.127	-36.254	19.396	0.579	3.362	1.783
Volume Post CB	-2.853	-0.761	27.080	-36.025	16.539	-0.218	2.668	0.362

*** represents 10% level of significance

Table 6 presents the descriptive statistics of the Nifty return and return of Nifty volume for the year 2009. This is the only case where the upper circuit was applied. Based on mean, Nifty return increases in the post circuit breaker period up to 10 trading days but decreases in case of 20 and 30 trading days. The volatility of both Nifty return and return of Nifty volume as measured by standard deviation has decreased in maximum cases except in ten trading days' Nifty return and 20 trading day's volume of Nifty return; it has increased. This indicates that volatility starts decreasing from circuit breaker day. Negatively skewed means data series are asymmetrically distributed. All value of Kurtosis in three different windows are positive and that indicates, data series are leptokurtic implying a more peaked distribution than the normal distribution. The value of Jarque-Bera statistics indicates normal data except in one case.

Table-7: Descriptive Statistics for the year 2012

10 Days	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	JB
Nifty Pre CB	0.457	0.217	2.434	-0.379	0.885	1.284	3.747	2.685
Nifty Post CB	0.016	0.197	1.027	-0.923	0.739	0.148	1.540	0.831
Volume Pre CB	0.378	3.786	51.761	-69.269	43.068	-0.22	1.683	0.722
Volume Post CB	-1.507	5.435	22.569	-32.809	18.753	-0.284	1.806	0.656
20 Days								
Nifty Pre CB	0.524	0.271	2.584	-0.821	0.925	1.022	3.246	3.359
Nifty Post CB	0.026	0.197	1.027	-1.202	0.673	-0.191	1.916	1.045
Volume Pre CB	1.295	3.785	227.911	-259.01	88.882	-0.475	6.861	12.519*
Volume Post CB	-3.383	-4.267	66.414	-44.309	25.888	0.758	3.974	2.574
30 Days								
Nifty Pre CB	0.229	0.088	2.584	-1.069	0.910	1.057	3.923	6.434**
Nifty Post CB	-0.064	0.002	1.027	-1.202	0.628	-0.018	2.002	1.204
Volume Pre CB	1.006	3.785	227.911	-259.01	72.902	-0.54	9.563	53.469*
Volume Post CB	-0.968	-6.332	209.330	-172.5	56.276	0.912	10.526	72.473*

* & ** represents 1% & 5% level of significance

Table-7 presents the descriptive statistics of Nifty return and return of Nifty volume for the year 2012. Based on mean, the study observes nifty return decreases in the post circuit breaker period in all trading days. Volatility of both Nifty return and return of Nifty volume as measured by standard deviation has decreased in all cases. This indicates circuit breaker helps to decrease volatility. Negatively skewed means data series are asymmetrically distributed. Kurtosis in three different windows are positive indicates data series are leptokurtic implying a more peaked distribution than normal distribution. The value of Jarque-Bera statistics indicates data are normal except two cases.

Table-8: Paired T-Test Result for Pre and Post Circuit Breaker

Dates of CB	10 Days		20 Days		30 Days	
	Closing Price	Volume	Closing Price	Volume	Closing Price	Volume
May 17, 2004	-0.853 (0.42)	3.327 (0.01)	-1.147 (0.27)	1.652 (0.11)	0.979 (0.33)	-0.497 (0.62)
May 22, 2006	-0.445 (0.67)	1.014 (0.34)	0.018 (0.99)	0.489 (0.63)	0.257 (0.80)	-0.203 (0.84)
October 17, 2007	-0.112 (0.91)	0.257 (0.80)	2.697 (0.01)	0.876 (0.392)	1.220 (0.23)	-0.583 (0.57)
January 22 2008	-1.726 (0.12)	0.948 (0.37)	-0.847 (0.41)	0.908 (0.38)	0.399 (0.70)	-0.369 (0.71)
May 18, 2009	0.797 (0.44)	-0.220 (0.83)	0.376 (0.71)	0.119 (0.91)	-1.101 (0.28)	-0.544 (0.59)
October 05 2012	-1.227 (0.25)	-0.113 (0.91)	1.984 (0.06)	0.217 (0.82)	-1.590 (0.12)	0.099 (0.92)

NB: numbers in the parenthesis are p values

Table-8 tests the significant difference of mean between pre and post circuit breaker period for all six times of both Nifty return and Nifty volume return. The study employs paired T-test for the closing price and volume of six different dates for 10, 20 and 30 days. No significant mean difference is found between pre and post circuit breaker periods except for three cases- closing price for May 2006, October 2007 and October 2012. Based on the T-Test, the circuit breaker does not help to improve market quality.

Table-9 presents key movements of the market on the day of the circuit breaker for six different times.

Table-9: Key movements of the market on the day of Circuit Breaker/Circuit Breaker in Indian Market

Date	Open	High	Low	Close	Number of shares traded	Turnover (Rs. Cr.)
May 17, 2004, Monday	1582.5	1583.8	1292.2	1388.75	114,967,105.00	3253.17
May 22, 2006, Monday	3254.3	3313.9	2894.4	3018.35	148,001,127	6043.37
October 17, 2007, Wednesday	5658.9	5658.9	5107.3	5559.3	186,850,872	13394.73
January 22, 2008, Tuesday	5203.35	5203.35	4448.5	4899.3	200,603,284	11565.4
May 18, 2009, Monday	3673.15	4384.3	3673.15		2,768,292	113.99
October 05, 2012, Friday	5815	5815.35	4888.2	5746.95	255,569,804	12995.8

* Maximum circuit breaker was on May and Monday

Conclusion and Policy Implication

This study attempted to examine the impact of market wide circuit breaker on Indian stock market liquidity and volatility. The summary results of Table 2-7 have been presented in Table-10 and 11. So, Monday and May are more sensitive for Indian stock market. This study observes maximum circuit breakers were applied on Monday as well as in the month of May and October in Indian stock market. The Election result caused more fluctuation in prices and reached circuit breaker. Punching of false order also caused circuit breaker as it is evident from 17th October

2012. Volatility decreased during Pre and post circuit breaker period. Based on mean, there exist differences between pre and post circuit breaker and based on T-test, no significant difference in mean during pre and post circuit breaker is found except 2-3 cases. Difference and significance difference are two different things. Hence application of market-wide circuit breaker is not adding that much value to the market quality. If the circuit breaker can't reduce volatility in the market, then the exchange should adopt call auction for price discovery again at the time of circuit breaker. Indian Markets are stronger than other markets like China. The scope for further research is to find out the company wise impact based on event study during application of market wide circuit breakers in India. A comparison of several countries during market wide circuit breaker can be an interesting one to investigate.

The summary result of Table 2-7 has been given in Tables 10 and 11 below.

Table-10: Summary results of Return and Volatility of NIFTY in six different periods

Dates of CB	Return			Volatility		
	Ten days	20 days	30 days	Ten days	20 days	30 days
May 17, 2004	↑	↑	↑	↑	↓	↓
May 22, 2006	↑	↓	↓	↓	↑	↑
October 17, 2007	↑	↓	↓	↓	↓	↑
January 22, 2008	↑	↑	↑	↑	↑	↑
May 18, 2009	↑	↓	↓	↑	↓	↓
October 05, 2012	↓	↓	↓	↓	↓	↓

Table-11: Summary results of Return and Volatility of NIFTY Volume in six different periods

Dates of CB	Volume Return			Volume Volatility		
	Ten days	20 days	30 days	Ten days	20 days	30 days
May 17, 2004	↓	↓	↓	↑	↑	↑
May 22, 2006	↓	↑	↓	↑	↑	↑
October 17, 2007	↓	↓	↓	↓	↑	↑
January 22, 2008	↓	↓	↑	↑	↓	↑
May 18, 2009	↑	↑	↑	↓	↑	↑
October 05, 2012	↓	↓	↓	↓	↓	↓

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