



Impact of Terrorism on Indian Capital Market: An Empirical Study

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Abstract

Stock markets are one of the important investment avenues for investors. The performance of stock markets depends on occurrence of external and internal events. Socio-political events such as terrorist attacks have been found to disturb the flow of financial resources among nations and affect income of business, profits and stock prices. Many studies have confirmed that terrorist attacks have adversely affected stock markets. This paper proposes to test the impact of terrorist attacks and their effects on stock markets of India, with special reference to Bombay Stock Exchange of India Limited. The five major terrorist attack events, over the period 2005 to 2009 were taken for the sample, on the basis of the severity of damages it caused to the economy. They are S&P BSE Auto, Bankex, Consumer Durables, Consumer Goods, Metal, Oil & Gas and S&P BSE Sensex. Various statistical techniques are used including unit root Augmented Dickey Fuller Test (ADF) and GARCH (1, 1). The findings of the study show that the short term investors can make predictions about the reactions of the markets after a terrorist attack and they could find possible investment solutions like, S&P BSE Auto and S&P BSE Consumer Durables which recorded low volatility, on both during pre and post attack periods. The results of the analysis and their implications are discussed in the paper, which could provide important insights to investors, for crafting their investment strategies, against any risk.

Key Words: Terrorism, Indices, Capital Market, Investor

JEL Codes: G1, G11, G14, Z23

Paper Classification: Research Paper

Introduction

Terrorism in India

Terrorism is a universal threat. Terrorists have access to free flow of information, communication and information technology. The magnitude of destruction due to terrorist attacks spreads panic among the population that slowdowns human activities including investments.

The rise in terrorist attacks has been phenomenal and is often tied to diverse ideological, religious and political goals. The terrorists with their digital networking abilities have expanded their reach beyond international borders. Their unpredictable attacks with high casualty rate puts immense psychological pressure on the society targeted leading to their success in:



- Creating a sense of vulnerability across the world.
- Gaining attention and publicity, by acts of violence and by the use of the media, to enhance the effectiveness of their violence.
- Gaining support from similar groups around the world.¹

List of Terrorism Organization in India

- Indian Mujahedeen (IM).
- Hizb -Ul- Mujahedeen.
- Jammu and Kashmir Liberation Front.
- Jamiat -ul- Mujahedeen.
- Muslim Janbaz Force.
- Tehrik -ul- Mujahedeen.
- Lashkar-e-Jabbar.
- Al Umar Mujahedeen.
- Communist Party of India-Maoist.²

Impact of Terrorism on Capital Market

The potential of terrorist attacks to shock the capital markets is limited to a short period of time. In today's information-oriented world, news travel very fast and capital markets, indirectly or directly, suffer from the panic triggered by terrorist attacks. It has been found that attacks in countries, which are better off and more independent, are linked with larger negative share price returns. Similarly, human capital loss, such as kidnappings of company officials, is also related to more negative stock returns than physical loss such as bombings on buildings. The reason, for the negative return in the stock price of affected firm, is because stakeholders consider tangible and intangible losses as well as increased cost of doing business in a new terrorism- infested background. It similarly leads to a decision such as when to reopen the market, taking into consideration factors like safety of personnel returning to work and feasibility of set-up and communication in systems.

Impact of a terrorist attack is worldwide and not confined to India in the global market scenario. The terrorist attack, even on a foreign person, will have infinite impact on the investment environment and the economic market of India.³

Review of Literature

Aysegul Corakci Eruygur and Tolga Omay(2014), investigated the effects of terrorism activities, by employing nonlinear models. The results showed that terrorism had statistically significant negative effect on the stock index when the intensity of terrorist activities passed a certain threshold level⁴. The study entitled, "The Impact and Cost of International Terrorism on the Economies of the United States and the European Union", by Inga Grote, examined the

¹Vandana Asthana (2010),"Cross- Border Terrorism in India: Counterterrorism Strategies and Challenges", pp.01-21, www.ideals.illinois.edu.

²Surinder K Sharma and AnshumanBehera (2014), "Militant Groups in South Asia, Institute for Defense Studies & Analyses, pp.01-291.

³Poonam (2011), "Impact of terror attacks on Indian stock prices", <http://www.indianmba.com>.

⁴AysegulCorakciEruygur and TolgaOmay (2014), "Terrorism and the Stock Market: A Case Study for Turkey Using STR Models", Journal of Reviews on Global Economics-3, pp.220 – 227.



impact of September 11th attacks and other terrorism-related problems which were being felt by the airline and the tourism industry. The study period was 2001-2004. The terrorist attacks of 9/11, however, did not only produce a negative impact on the economy, but also adversely affected the airline and tourism industry. The airline industry, together with the tourism industry, obviously suffered the most from the terrorist attacks⁵. Randall Valentine and Carol Bishop (2010) found that terrorist attacks had direct and severe implications for financial market but there was no long-term impact on security prices⁶. Tavor (2011) concluded that the location of the event, the intensity of the event and the response after it, determined the intensity of the effect of the event taking place on the capital market⁷. Poonam (2011) established that unexpected events like terror attacks alone did not impact the stock prices of the securities⁸. Bilal et al, (2012), examined the impact of relationship between terrorism and macroeconomic factors (Interest Rate and Inflation) on Karachi Stock Exchange (KSE-100 Index), by using daily basis data for terrorism and monthly basis data for macro-economic factors, from 1st July 2005 to 31st June 2010. The findings of the study revealed co-integration between macroeconomic factors and KSE stock returns⁹. Aurangzeb and Tasfoura Dilawer (2012) showed that stock return reacted negatively to terrorist activities¹⁰. Yildirim (2012) showed that there was no significant impact of terrorism on the stock market¹¹. Keitany K. Wesley and Baras, J.Lumumba (2012) in their study indicated that there was significant short term negative stock returns around the terrorist event dates, as evidenced by the decline in the NSE 20 share index and Abnormal Return (AR) and Cumulative Abnormal Return (CAR) around the terrorist event dates¹². Suleman (2012) examined the effect of terrorist attack news on returns and volatility of Karachi Stock Exchange (KSE). The EGARCH results indicated that the terrorist attack news had negative impact on the returns of all the sector indices¹³. Syeda Abeeda Hassan and Maryam Saeed Hashmi (2015), in their article entitled, "Terrorism and the Response of investors at capital market: A case of Pakistan", investigated the impact of terrorism on capital market of Pakistan, by using the ten biggest attacks of the last decade, out of a total 941 attacks during the period of 2003 to 2012. Event study methodology was applied, using one way ANOVA post-hoc and multivariate regression analysis, to examine the impact of terrorist attack on Karachi Stock Exchange. The results pointed out that KSE had become insensitive to terrorist attacks. The assaults, which target some important political figure and create countrywide violence, can only disturb the functioning of KSE¹⁴. An article entitled, "Effect of Terrorism on the International Business in Pakistan", by Rabia Najaf (2017), examined the impact of terrorism on the international business in Pakistan. The analysis showed that there was association between terrorism and

⁵Inga Grote, "The Impact and Cost of International Terrorism on the Economies of the United States and the European Union", pp. 01-38, www.rit.edu.

⁶Randall Valentine and Carol Bishop (2010), "An examination of risk adjusted returns and catastrophic events caused by terrorist attacks", *Insurance Markets and Companies: Analyses and Actuarial Computations*, Vol. 1, No. 1.

⁷TchaiTavor (2011), "The Impact of Terrorist Attacks on the Capital Market in the Last Decade", *International Journal of Business and Social Science*, Vol. 2 No. 12, pp.70 – 80.

⁸Poonam (2011), "Impact terror attacks on Indian stock prices", <http://www.indianmba.com>

⁹Ahmad Raza Bilal, Noraini Bt. Abu Talib, Inam Ui Haq, Mohd Noor Azli Ali Khan and Talat Islam (2012), "How Terrorism and Macroeconomic Factors Impact on Returns: A Case Study of Karachi Stock Exchange", *World Applied Sciences Journal* 19 (11), pp.1575 – 1584.

¹⁰Aurangzeb and TasfouraDilawer(2012), "Impact of Terrorism on Stock returns: Evidence from Pakistan", *Universal Journal of Management and Social Sciences*, Vol. 2, No.8, pp.73 – 85.

¹¹Mustafa Yildirim(2012) "The Effect of Terrorism on Stock Market: Turkish Experience", <http://www.atlantic-community.org>.

¹²Keitany K. Wesley and Baras, J.Lumumba (2012), "The Effect of Terrorism on Kenya's Securities Market (The Case of the Nairobi Securities Exchange)", pp. 01-29, <http://erepository.uonbi.ac.ke>

¹³Muhammad Tahir Suleman (2012), "Stock Market Reaction to Terrorist Attacks: Empirical Evidence from a Front Line State", *Australasian Accounting Business and Finance*. Volume 6, Issue 1, pp. 97 – 110.

¹⁴Syeda Abeeda Hassan and Maryam Saeed Hashmi (2015), in their article entitled, "Terrorism and the Response of investors at capital market: A case of Pakistan", *Pakistan Journal of commerce and social sciences*, Vol. 9(1), pp. 218-277.

international business in Pakistan. Terrorism not only affected the stock market of Pakistan but also other sectors like education, banking sector, finance sector, Foreign Direct Investment (FDI). Terrorism activities did affect the economy of the country and due to this reason the economy of Pakistan was declining.¹⁵

Thus the literature documented the effects of terrorist attack on stock markets, at the national and global levels. The study considered different terrorist attacks and the outcome was found to be different for each study. In other words, different events have different effects on stock markets. Therefore, it becomes essential to study any unlikely events and their effects on stock markets to understand the reaction of investors from time-to-time. Hence the present study considered five major terrorist attacks in India during the study period, based on the number of people injured and fatalities, evaluated their effects on the index movements of Bombay Stock Exchange of India Limited. The results of the study provided useful understanding of investors, response to terrorist attacks in India, which could facilitate the technical analysts in stock price prediction.

Design of the Study

Statement of the Problem

The review of literature gives the impression that a terrorist attack would have a likely negative impact on any capital market. Unlike the market information, the investor cannot react to terrorist attack. Investors may lose their investment if immediate decision was not taken during terrorist attack. Hence the present study took into account major events, based on high death rate for every year, over a period from 2005 to 2009. The result will provide a comprehensive picture of any shock in the Indian market and its impact on investment.

Need of the Study

The study proposes to analyze the effect of terrorist attack on Indian capital market. The existing studies prove that the terrorist attack could affect the capital market. Terrorist attacks are significant events which could affect the capital market. The study will provide insight to investors, regarding their reaction towards unforeseen events in the Indian capital market. Hence the results of studying the effect of terrorist attack on stock market sectoral indices can help diversification of investment by the investors.

Objectives of the Study

- To test the normality and stationarity, in the daily sectoral indices return of BSE, during pre and post terrorist attack.
- To analyze the volatility pattern of the sample index return, during pre and post terrorist attack.

Null Hypotheses of the study

NH01: There is no stationarity in the daily sectoral indices returns of BSE during the study period.

NH02: There is no volatility during pre and post terrorist attack in the sample indices during the study period.

¹⁵Najaf R(2017), "Effect of Terrorism on the International Business in Pakistan", Journal of Accounting and Marketing, Vol. 6, Issue 1, pp 1-3.

Methodology of the Study

a) Sample Selection

The data, for terrorist attacks were acquired from the Global Terrorism Database (GTD). The major five terrorist attack events, over the period 2005 to 2009, were taken for the sample, based on the high level of death rate and injured during the attack. BSE sectoral indices were considered for studying the impact of terrorism.

Table 1. List of Major Terrorist attacks during 2005-2009

Date	City	Perpetrator	Fatalities	Injured	Target Type
29-10-2005	New Delhi	Mahaz-e-Inquilab	20	Unknown	Business, Private Citizens & Property
08-09-2006	Malegaon	Unknown	24	Unknown	Private Citizens & Property
25-08-2007	Hyderabad	Unknown	40	100	Private Citizens & Property, Private Citizens & Property
26-11-2008	Mumbai	Deccan Mujahedeen, Lashkar-e-Taiba (LeT)	32	22	Business
12-07-2009	Raj Nandgaon	Communist Party of India - Maoist (CPI-Maoist)	23	0	Police

Source: www.start.umd.edu/ugt

b) Period of the study

On the basis of high number of injured and death rate, the study covered a period of five years, from 2005 to 2009, for analyzing the effects of terrorist attack on Indian capital market.

c) Methods of Data Collection

This study was mainly based on secondary data. The daily closing prices of BSE sectoral indices like Auto, Bankex, Consumer Durables, Consumer Goods, Metal, Oil & Gas and BSE Sensex were collected from BSE official website and other data were obtained from various magazines, books and websites.

d) Statistical Tools Used

The following tools were used for the study.

1. Descriptive Statistics:
 - a) Mean
 - b) Std Deviation
 - c) Skewness
 - d) Kurtosis
 - e) Jarque-Bera
2. Augmented Dickey Fuller Test (ADF)
3. GARCH (1, 1)

Data Analysis and Interpretation

Table 2. Result of Descriptive Statistics Analysis of BSE Indices during Pre and Post Terrorist Attack, New Delhi Bomb Blast, 2005

Pre Attack Period							
Statistics	Auto	Bankex	Consumer Durables	Consumer Goods	Metal	Oil & Gas	Sensex
Mean	-0.0069	-0.0081	-0.0119	-0.0064	-0.0137	-0.0056	-0.0068
Std. Dev.	0.0140	0.0166	0.0207	0.0137	0.0154	0.0128	0.0120
Skewness	0.4161	-0.1147	1.2312	0.2455	0.1462	0.9440	0.3641
Kurtosis	2.4924	2.6726	5.3754	2.4108	2.2701	3.2481	2.0790
Jarque-Bera	0.5939	0.0998	7.3167	0.3677	0.3864	2.2664	0.8615
Post Attack Period							
Mean	0.0099	0.0054	0.0122	0.0079	0.0036	0.0068	0.0068
Std. Dev.	0.0104	0.0128	0.0120	0.0090	0.0148	0.0084	0.0088
Skewness	0.0513	-0.5647	0.6236	0.3376	0.1469	-0.9075	-0.4461
Kurtosis	1.8001	2.6528	2.3469	2.8632	2.8361	3.2088	2.1758
Jarque-Bera	0.9063	0.8725	1.2390	0.29677	0.0707	2.0861	0.9222

Source: Collected from www.bseindia.com and Work out using E-Views 7

The Table 2 indicates the descriptive statistics results for BSE Sectoral indices like Auto, Bankex, Consumer Durables, Consumer Goods, Metal, Oil & Gas and BSE Sensex, during pre and post New Delhi Bomb Blast, on 29th October 2005. The mean values for pre attack period showed that all the sample sectoral indices witnessed negative returns. The standard deviation, which measures the volatility of indices, was found to be higher for consumer durables, during the pre-attack period. Similarly, during the post-attack period, BSE Bankex experienced higher volatility when compared to other indices. Skewness was positive for all indices during the pre-attack period except for BSE Bankex. With respect to Kurtosis, the distribution was Leptokurtic for Consumer Durables and other sample indices recorded platykurtic distribution. The Jarque-Bera of sample indices indicated that Consumer Durables witnessed normal distribution during the pre-attack period and other sample indices recorded a value less than three, which indicated non normal distribution. It is clear from the Table that during the post attacks period, the sample indices of Consumer Durables and BSE Sensex earned high mean value. The standard deviations of Consumer Durables and Metal indicated high risk, in the post attack period. Skewness was negative for Bankex, Oil & Gas and BSE Sensex and other selected indices were positive during the post attack period. With respect to Kurtosis, the distribution was platykurtic for all selected sample indices, except Oil & Gas. The Jarque-Bera of selected sample indices recorded a value less than three, which indicated non-normal distribution of the data. In other words, after the terrorist attack, markets witnessed more volatility.

Table 3. Result of Descriptive Statistics Analysis of BSE Indices during Pre and Post Terrorist Attack, Malegaon Bomb Blast, 2006

Pre Attack Period							
Statistics	Auto	Bankex	Consumer Durables	Consumer Goods	Metal	Oil & Gas	Sensex
Mean	0.0036	0.0025	0.0027	0.0024	0.0030	0.0033	0.0021
Std. Dev.	0.0096	0.0076	0.0135	0.0075	0.0148	0.0093	0.0057
Skewness	0.1181	-0.1309	-0.2742	0.3872	-0.3838	0.5185	-0.0914
Kurtosis	2.5168	1.8232	2.4075	1.9180	1.6687	3.5673	2.4145
Jarque-Bera	0.1807	0.9084	0.4073	1.1065	1.4759	0.8734	0.2351
Post Attack Period							
Mean	0.0020	0.0080	-6.16E-0	0.0010	-0.0007	0.0007	0.0030
Std. Dev.	0.0137	0.0172	0.0121	0.0135	0.0164	0.0111	0.0119
Skewness	-0.9709	0.1980	-0.3210	-1.0179	-1.8674	-1.5807	-1.4291
Kurtosis	3.8943	2.5158	2.5014	3.7698	6.6812	5.2374	5.3791
Jarque-Bera	2.8567	0.2445	0.4130	2.9608	17.1880	9.3756	8.6438

Source: Collected from www.bseindia.com and Work out using E-Views 7

The Table 3 displays the Descriptive statistics results for BSE sectoral indices during pre and post attack period of the Malegaon Bomb Blast, on 08th September, 2006. During the period of pre-attack the BSE Auto (0.0036) and Oil & Gas (0.0033) earned high mean values, followed by Metal (0.0030), Consumer Durables (0.0027), Bankex (0.0025), Consumer Goods (0.0024) and BSE Sensex (0.0021). The standard deviation, which measures the volatility, was found high for BSE Metal (0.0148), followed by Consumer Durables (0.0135), Auto (0.0096), Oil & Gas (0.0093), Bankex (0.0076), Consumer Goods (0.0075) and BSE Sensex (0.0057). The Skewness indicated that values for all sample indices, except Oil & Gas (0.5185), Consumer Goods (0.3872) and Auto (0.1181), were negative. The Kurtosis values of the selected indices were less than three, which implied Platykurtic distribution. Further, the Jarque-Bera values implied that all the sample indices existed non-normally distributed. During the post attack period, mean values of (0.0080) for BSE Bankex and BSE Sensex were higher when compared to other indices, which recorded low return values. The standard deviation for BSE Bankex (0.0172) and Metal (0.0164) assumed the highest risk value, followed by BSE Auto (0.0137), Consumer Goods (0.0135), Consumer Durables (0.0121), BSE Sensex (0.0119) and Oil & Gas (0.0111). The Skewness indicated that values for all sample indices, excepting Bankex (0.1980), were negative. The values of Kurtosis of the selected sample BSE indices were less than three, for Bankex (2.5158), Consumer durables (2.5014), which rendered them platykurtic while other indices reported values higher than three and hence Metal (6.6812), Oil & Gas (5.2374) and BSE Sensex (5.3791), were leptokurtic. Further, the Jarque-Bera values implied that all sample indices were non-normally distributed except the Metal (17.1880), Oil & Gas (9.3756) and BSE Sensex (8.6438). In other words, the market was efficient in absorbing the shocks of terrorist attacks.

Table 4. Result of Descriptive Statistics Analysis of BSE Indices during Pre and Post Terrorist Attack, Hyderabad Bomb Blast, 2007

Pre Attack Period							
Statistics	Auto	Bankex	Consumer Durables	Consumer Goods	Metal	Oil & Gas	Sensex
Mean	-0.0014	-0.0029	4.83E-0	0.0007	-0.0037	-0.0004	-0.0011
Std. Dev.	0.0172	0.0278	0.0196	0.0231	0.0306	0.0223	0.0212
Skewness	-0.0673	0.0216	0.3663	-0.0984	-0.3779	-0.2314	-0.2860
Kurtosis	2.1324	2.6320	3.0933	2.2592	2.3150	2.0386	2.1408
Jarque-Bera	0.4817	0.0857	0.3410	0.3671	0.6503	0.7115	0.6658
Post Attack Period							
Mean	0.0034	0.0055	0.0074	0.0037	0.0079	0.0054	0.0032
Std. Dev.	0.0092	0.0095	0.0111	0.0055	0.0122	0.0079	0.0060
Skewness	0.1305	0.2972	0.7556	-0.0281	1.5677	0.5017	0.1108
Kurtosis	2.2872	2.1629	2.9939	1.8831	5.3729	2.7366	1.7438
Jarque-Bera	0.3601	0.6587	1.4275	0.7815	9.6640	0.6726	1.0169

Source: Collected from www.bseindia.com and Work out using E-Views 7

The results of Descriptive Statistics, for selected BSE sectoral indices, during Pre and Post period of Hyderabad Bomb Blast Attack, on 25th August, 2007, are presented in Table 4. During the pre-attack period, the indices of Consumer Goods (0.0007) and Consumer Durables (4.83E-0) earned high mean return values while the other indices recorded negative mean value returns. With respect to the measurement of standard deviation of daily returns of indices, only one sample recorded the uppermost risk value which was BSE Metal (0.030602) and followed by Bankex (0.0278). The Skewness indicated that values for all sample indices, except BSE Bankex (0.0216) and Consumer Durables (0.366388), were negative. The Kurtosis was less than three, and they were platykurtic. The Jarque-bera values implied that the sample BSE sectoral indices were non-normally distributed. The post attack period witnessed high return mean values for Metal (0.0079) and Consumer durables (0.0074). Regarding the standard deviation of daily returns of BSE sectoral indices, the highest risk was recorded for BSE Metal (0.0122). The Skewness indicated that values for all sample BSE indices, except Consumer Goods (-0.0281) were positive. The analysis of Kurtosis of BSE sample indices made them less than three, which revealed that values were Platykurtic, except BSE Metal (5.3729). According to the Jarque-bera values, all the sample BSE sectoral indices were non-normally distributed, except for BSE Metal (9.6640).

Table 5. Result of Descriptive Statistics Analysis of BSE Indices during Pre and Post Terrorist Attack, Mumbai Bomb Blast, 2008

Pre Attack Period							
Statistics	Auto	Bankex	Consumer Durables	Consumer Goods	Metal	Oil & Gas	Sensex
Mean	-0.012	-0.0132	-0.0109	-0.0107	-0.0170	-0.0116	-0.0108
Std. Dev.	0.0235	0.0387	0.0245	0.0398	0.0519	0.0452	0.0368
Skewness	0.2201	0.8716	-0.0489	0.6369	0.8608	-0.0036	0.6121
Kurtosis	1.6776	2.4620	1.8734	2.3744	3.4026	2.2299	2.3663
Jarque-Bera	1.2140	2.0803	0.7992	1.2586	1.9541	0.3706	1.1878
Post Attack Period							
Mean	0.0075	0.0135	0.0075	0.0082	0.0144	0.0092	0.0078
Std. Dev.	0.0230	0.0274	0.0348	0.0304	0.0366	0.0307	0.0264
Skewness	-0.8773	0.2992	0.0235	0.2597	0.4712	0.4515	0.3569
Kurtosis	3.4316	3.1266	2.1673	2.4832	2.5671	2.3266	2.3604
Jarque-Bera	2.0408	0.2339	0.4346	0.3355	0.6721	0.7931	0.5741

Source: Collected from www.bseindia.com and Work out using E-Views

Table 5 displays the results of Descriptive Statistics, for BSE sectoral indices, during pre and post Mumbai Bomb Blast attack, on 25th November, 2008. The mean values for the pre attack period indicated that all the sample sectoral indices suffered negative returns. The analysis of standard deviation of daily returns of indices indicated that BSE Metal (0.0519) recorded the highest risk value, followed by Oil & Gas (0.0278). The investigation of Skewness during the pre-attack period, revealed that values for all sample indices, apart from BSE Consumer durables (-0.0489) and Oil& Gas (-0.0036), were positive. Kurtosis was less than three, which indicated platykurtic distribution. It is clear that the Jarque-Bera values evidenced that all sample indices were non-normally distributed. The Table also shows the summary statistics, during the post attack period, which indicated that BSE Metal (0.0144) and Bankex (0.0135) recorded high, mean value returns when compared with other indices. The analysis of Standard Deviation of daily returns of indices indicated that only BSE Metal (0.0366) recorded higher risk. The Skewness proved that prices for all sample indices, apart from BSE Auto (-0.8773), were positive. The Kurtosis, at less than three, indicated platykurtic distribution during the post attack period. Jarque-Bera values evidenced that all the sample BSE sectoral indices were non-normally distributed. In short, terrorist attacks did not affect all the indices in the market and some indices returns were positive during that period.

Table 6. Result of Descriptive Statistics Analysis of BSE Indices during Pre and Post Terrorist Attack, Chhattisgarh Bomb Blast, 2009

Pre Attack Period							
Statistics	Auto	Bankex	Consumer Durables	Consumer Goods	Metal	Oil & Gas	Sensex
Mean	-0.0021	-0.0064	-0.0023	-0.0050	-0.0054	-0.0060	-0.0046
Std. Dev.	0.0179	0.0291	0.0201	0.0293	0.0277	0.0253	0.02107
Skewness	0.4913	-0.9468	0.8964	-0.6901	-0.5711	-0.3369	-0.9280
Kurtosis	3.2143	4.3189	2.9279	3.0198	2.6320	2.2795	4.0239
Jarque-Bera	0.6321	3.3285	2.0124	1.1910	0.9001	0.6082	2.8084
Post Attack Period							
Mean	0.0200	0.0108	0.0115	0.0103	0.0187	0.0092	0.0117
Std. Dev.	0.0213	0.0214	0.0213	0.0199	0.0233	0.0194	0.0169
Skewness	0.0153	0.3368	0.0365	0.1656	-0.0393	-0.3037	-0.0858
Kurtosis	1.9244	1.7807	2.8024	2.2755	2.3250	2.2352	1.6106
Jarque-Bera	0.7236	1.2128	0.0277	0.3965	0.2885	0.5961	1.2249

Source: Collected from www.bseindia.com and Work out using E-Views 7

Table 6 represents the results of Descriptive Statistics, for daily returns of selected BSE sectoral indices like BSE Auto, Bankex, Consumer Durables, Consumer Goods, Metal, Oil & Gas and BSE Sensex, during pre and post Chhattisgarh bomb blast attack period, which occurred during 12th July, 2009, at Raj Nandgaon. The mean values, for the pre attack period, indicated that all the sample BSE sectoral indices like Auto (-0.0021), Bankex (-0.0064), Consumer Durables (-0.0023), Consumer Goods (-0.0050), Metal (-0.0054), Oil & Gas (-0.0060) and BSE Sensex (-0.0046), witnessed negative returns during the pre-attack period. According to the analysis of standard deviation of daily returns of indices, only one sample, BSE Consumer Goods (0.0293) recorded the highest risk value, followed by Bankex (0.0291), Metal (0.0277), Oil & Gas (0.0253), BSE Sensex (0.0210), Consumer durables (0.0201) and Auto (0.0179). The investigation of skewness revealed that values for all sample indices, apart from BSE Consumer durables (0.8964) and Auto (0.4913), were negative. All sample BSE sectoral indices values of kurtosis were less than three, which made it platykurtic, except BSE Bankex (4.3189) and BSE Sensex (4.0239), which made it leptokurtic. Jarque-Bera values indicated that all the sample BSE sectoral indices were non-normally distributed. The Table reveals that during the post attack period, the sample indices of BSE Auto (0.0200) and Metal (0.0187) recorded high mean value returns, compared to other indices like BSE Sensex (0.0117), Consumer durables (0.0115), Bankex (0.0108), Consumer Goods (0.0103) and Oil & Gas (0.0092). According to the standard deviation of daily returns of indices, only BSE Consumer Goods (0.0293) carried the highest risk value, followed by other indices. The examination of skewness showed that values for all sample indices, apart from BSE Metal (-0.0393), Oil & Gas (-0.3037) and BSE Sensex (-0.0858), were positive. All the BSE sectoral indices values of kurtosis were less than three, which made it platykurtic. The Jarque-Bera values indicated that all the sample BSE sectoral indices like BSE Auto, Bankex, Consumer Goods, Metal, Oil & Gas and BSE Sensex, were non-normally distributed, except Consumer Durables (6.3942). In other words, the indices returns were more volatile during terrorist attacks than during other events.

Table 7. Results of Stationarity Analysis for BSE Sectoral Indices Returns during Pre and Post Terrorist Attacks

BSE Indices	Pre Attack period									
	New Delhi, 2005		Malegaon, 2006		Hyderabad, 2007		Mumbai, 2008		Raj Nandgaon, 2009	
	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value
Auto	-5.4152	0.0013	-5.133	0.002	-4.84846	0.0027	-6.2119	0.0003	-3.3963	0.038
Bankex	-5.5592	0.0011	-4.8174	0.0028	-3.05215	0.0636	-5.2556	0.0017	-8.2623	0
Consumer Goods	-5.4567	0.001	-4.3304	0.0095	-4.86405	0.0031	-4.5518	0.0059	-3.3471	0.0409
Consumer Durables	-4.5888	0.0047	-6.0937	0.0005	-3.83469	0.016	-6.7566	0.0001	-4.4229	0.0061
Metal	-3.9339	0.0151	-4.1924	0.008	-4.34047	0.007	-6.0088	0.001	-5.8376	0.0005
Oil & Gas	-4.6953	0.004	-5.413	0.0011	-5.29644	0.0016	-5.0646	0.0028	-5.9295	0.0011
Sensex	-5.5634	0.0011	-5.2582	0.0014	-5.42979	0.0013	-4.76446	0.0043	-3.2242	0.0491
BSE Indices	Pre Attack period									
	New Delhi, 2005		Malegaon, 2006		Hyderabad, 2007		Mumbai, 2008		Raj Nandgaon, 2009	
	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value	Statistical Value	P - Value
Auto	-4.6758	0.0049	-6.1216	0.0005	-4.83477	0.0032	-5.46341	0.0012	-4.6154	0.0039
Bankex	-3.7185	0.0195	-3.7757	0.0163	-4.23761	0.0083	-4.02981	0.013	-5.5439	0.0011
Consumer Goods	-4.4781	0.0065	-6.7915	0.0002	-4.58408	0.0047	-5.38366	0.0014	-5.0029	0.0025
Consumer Durables	-9.3145	0	-6.9862	0.0001	-3.25393	0.047	-3.94164	0.015	-3.6589	0.0199
Metal	-5.4321	0.0016	-6.6639	0.0002	-3.2294	0.0436	-7.17162	0.0001	-5.0377	0.002
Oil & Gas	-5.4883	0.0009	-4.1939	0.0089	-8.85436	0	-5.59068	0.001	-5.0189	0.0024
Sensex	-4.4513	0.0051	-5.9929	0.0006	-4.55512	0.005	-4.06951	0.0123	-5.4449	0.0013

Source: Collected from www.bseindia.com and Work out using E-Views 7

Table 7 presents the results of Augmented Dickey Fuller Test (ADF), for examining the stationarity of selected BSE sectoral indices returns, for Pre and Post terrorist attacks, during the period of 2005 to 2009. The test critical values, for all sample indices were analyzed at significant levels of 1%, 5% and 10%. The results revealed that during pre terrorist attack period statistical values for 2005 BSE Metal (-3.9339), 2007 Bankex (-3.0521) and Consumer Durables (-3.8346), and 2009 BSE Auto (-3.3963), Consumer Goods (-3.3471) and BSE Sensex (-3.2242) were less than the critical values. During 2006 and 2008 attack periods, for all sample indices statistical values were greater than the critical values. The Augmented Dickey Fuller Test value, for the post attack period, indicated that all the sample sectoral indices were stationary during 2005 attack period only. During other periods, statistical values of 2006 BSE Bankex (-3.7757), 2007 BSE Consumer Durables (-3.2539) and BSE Metal (-3.2294), 2008 BSE Bankex (-4.0298), Consumer Durables (-3.9416) and BSE Sensex (-4.0695), and 2009 Consumer Durables (-3.6589) were less than the critical values, which indicated that these indices were not stationary during the post attack period. Thus the results proved that the BSE sectoral indices attained stationarity, during the pre and post attack periods, except for some indices. Hence the Null Hypothesis NH01: There is no stationarity in the daily sectoral indices returns of BSE during the study period, is rejected.

Table 8 shows the results of GARCH (1,1) model, for measuring the volatility of selected sectoral indices like BSE Auto, BSE Bankex, BSE Consumer Durables, BSE Consumer Goods, BSE Metal, BSE Oil & Gas and BSE Sensex return, during pre and post terrorist attacks, from

2005 to 2009. According to the sum of ARCH (1) and GARCH (1), for the pre attack period, 2006 BSE Bankex (-1.1597), 2007 BSE Oil & Gas (-0.0007) and 2009 BSE Auto (-0.0430) and Consumer Durables (-0.8628), indices recorded low volatility compared to other selected indices. Between 2005 and 2008, all sample indices experienced high volatility. In the post attack period, most of the indices experienced high volatility, while some indices like 2005 BSE Auto (-0.7952), Metal (-0.1907) and BSE Sensex (-0.2039) and 2007 BSE Consumer Durables (-0.6281) recorded low volatility. It is clear from the above analysis that high volatility was observed, during pre and post periods of the event. Hence the null hypothesis, H_0 : "There is no volatility during pre and post terrorist attack in the sample indices during the study period", is rejected.

Table 8. Results of Volatility Analysis for BSE Sectoral Indices Returns During Pre and Post Terrorist Attack, during the period of 2005 to 2009

Pre Attack period															
	New Delhi, 2005			Malegaon, 2006			Hyderabad, 2007			Mumbai, 2008			Raj Nandgaon, 2009		
	α	B	$\alpha+\beta$	A	B	$\alpha+\beta$	α	β	$\alpha+\beta$	α	β	$\alpha+\beta$	α	β	$\alpha+\beta$
Auto	-0.357	1.261	0.905	1.114	-0.24	0.874	-0.472	1.647	1.175	-0.864	1.558	0.693	0.379	-0.422	-0.04
Bankex	-0.353	1.058	0.705	-0.353	-0.807	-1.16	-0.271	1.49	1.219	-0.262	0.567	0.304	-0.247	1.155	0.908
Consumer Durables	0.833	0.007	0.84	-0.406	1.169	0.763	-0.538	1.333	0.795	-0.59	1.272	0.682	0.37	-1.233	-0.86
Consumer Goods	-0.331	1.314	0.983	0.088	0.995	1.082	-0.289	1.477	1.188	-0.271	1.194	0.923	-0.381	1.15	0.769
Metal	-0.526	1.477	0.951	-0.472	1.156	0.684	-0.205	1.346	1.141	-0.175	1.299	1.124	-0.308	0.766	0.457
Oil & Gas	-0.391	1.216	0.826	-0.518	1.283	0.765	-0.483	0.482	-8E-04	-0.279	1.186	0.907	-0.422	0.865	0.443
Sensex	-0.384	1.32	0.935	-0.523	1.268	0.744	-0.296	1.195	0.899	-0.424	1.381	0.957	-0.349	1.355	1.006
Post Attack period															
Auto	0.502	-1.298	-0.8	-0.255	1.073	0.819	-0.272	0.621	0.349	-0.291	1.237	0.946	-0.448	1.31	0.862
Bankex	1.136	-0.218	0.919	-0.424	1.368	0.944	-7E-04	1.215	1.214	-0.29	1.078	0.789	0.057	1.209	1.266
Consumer Durables	-0.132	1.045	0.913	-0.257	1.153	0.897	-0.551	-0.08	-0.628	-0.484	1.232	0.748	-0.177	1.084	0.907
Consumer Goods	-0.099	1.01	0.912	-0.486	1.467	0.98	0.963	-0.51	0.448	-0.492	1.229	0.737	-0.386	1.196	0.81
Metal	0.32	-0.511	-0.19	-0.202	0.86	0.658	0.107	0.685	0.792	-0.297	0.672	0.375	-0.449	1.361	0.912
Oil & Gas	-0.302	1.256	0.954	-0.323	1.135	0.812	-0.255	1.14	0.885	-0.33	0.809	0.479	-0.45	1.313	0.863
Sensex	0.9784	-1.182	-0.2	-0.168	1.015	0.847	-0.546	1.251	0.705	-0.261	1.018	0.757	0.078	1.018	1.097

Source: Collected from www.bseindia.com and Work out using E-Views 7

Findings of the Study

Major findings of the study are summarized below.

a) Descriptive Statistics

- It is found from the analysis that for all the events, BSE Auto recorded the highest mean returns, during terrorist attack and the lowest mean value was witnessed, in BSE Metal returns, during the study period.
- The highest value of standard deviation was witnessed for BSE Metal and BSE Bankex and the lowest value was observed for BSE Sensex, during the attack period, for all the events.

- The daily returns of all the samples of BSE sectoral indices were positively skewed except BSE Consumer Durables and BSE Oil & Gas, for all the events.
- For all the events, the selected BSE sectoral indices conformed to platykurtic distribution. The highest kurtosis value was observed in BSE Oil & Gas.
- The Jarque-Bera of all the sample BSE sectoral indices was non-normally distributed, for all the events, during the attack.

b) GARCH (1, 1) Model

- The sum of the ARCH and GARCH values, during the pre and post terrorist attack periods, was closer to one, which indicated persistence of high volatility.
- The results of BSE sectoral indices indicated that some indices like BSE Consumer goods and BSE Sensex, witnessed low volatility in the post period. Since those listed out indices were not much affected by terrorist attacks, the investor could consider investing on low risk indices.
- The results of BSE sectoral indices indicated that some indices like BSE Auto and BSE Bankex recorded high volatility in the post period. These listed indices were affected by terrorist attacks.

Suggestions of the Study

- Investors should consider the market movements before investing and this can help in gaining better returns.
- Some BSE indices like BSE Metal and Bankex, recorded low volatility during the post terrorist attack period. Hence the investor can consider investment in firms listed in BSE Metal and Bankex.
- Since the BSE indices are capable of recovering from this type of terrorist attack events and performing positively in a short period, investors should wait for the resilience of their investment for getting moderate return.
- The short term investors can make prediction about the reaction of the market after terrorist attack and they could find possible investment like, BSE Auto and BSE Consumer Durables which recorded low volatility, on both under pre and post attack period.
- Investors should not adjust their investment in the aftermath of a terrorist event to compensate the risk.

Conclusion

This study examined the effects of terrorist attacks on Indian capital market. Data were collected for BSE sectoral indices, namely, BSE Auto, BSE Bankex, BSE Consumer Durables, BSE Consumer Goods, BSE Metal, BSE Oil & Gas and BSE Sensex daily returns. Terrorist attacks caused economic losses across the countries. The results are applicable for short term and not to long term. The terrorist attacks played an important role because of their impact on capital market in the short term. Based on the results, it is clear that investors need to wait and should not take immediate decision on investment, during abnormal events in the market.

Limitations of the Study

1. This study was limited to a period of only five years 2005 to 2009.
2. The study was based purely on secondary data.

3. The study focused only on Terrorist Attack Event and its impact on stock prices.
4. All the limits, related to various tools like Descriptive Statistics, ADF and GARCH (1,1) model, are applicable to this study also.

Scope for Further Study

1. Future researchers can adopt alternative methods and new techniques for assessing the impact of terrorism on capital market.
2. Additional sample indices can be used for further studies.
3. Impact of terrorist attacks in other countries, on Indian market can be examined.
4. Further, researchers can investigate the impact of other events like economic, natural disasters, scams and military attacks on Indian capital market.
5. The study examined only one main attack of every year of study period, and therefore, further study can be made on all important terrorist attacks.

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