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The impact of terrorism on Indian securities market

Imlak Shaikh

Management Development Institute Gurgaon, Gurugram, Haryana, India

ABSTRACT

The paper aims to examine the relationship between stock returns and terrorist attacks for the Indian securities market in last 30 years. The stock market returns have been modelled using conditional volatility framework, and there are good enough shreds of evidence to confirm that terrorist activity and cross-border tension has disrupted the investors' sentiment. The market response to the terrorist attack holds different facets like *Target*, *Location*, *Number-of-perpetrators*, and *Property-value* has produced a significant impact on the financial market. At the outset, attack day hold an adverse effect on the market and remains unstable till next few days followed by the recent terrorist attack. The results also imply that market participant considers the nature of terrorist attack in their portfolio selection and long-term investment strategy. The practical implications of the study are threefold: (i) investors do regard the terrorist attack in their investment proposal (ii) investors take the short position due to terrorist attack that result into the rise of general stock market volatility and (iii) the financial planning within short-horizon gets postponed followed by the recent terrorist attack.

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1. Introduction

The 9/11 terrorist attack in the U.S.A. manifested as one of the most significant terrorist events in the history of the United States and around the world. The media and politics have paid much attention to the terrorist threat and terrorist activity after 2001. The phenomenon of terrorist events challenged the present security system and functioning of an economic system. The researcher, policymaker, and political system attended to examine the global terrorism and, the literature is booming at a rapid rate in the area of finance, economics and peace studies. The state and non-state driven terrorist activities are increasing at an exponential rate and are the biggest threat to human civilisation and the market economy.

The state-owned political conflicts and group ideology plays a significant impact on the market economy. The economist calls this effect 'fleeting effect' on the securities market and markets' fundamental. The September 11 attacks on the U.S.A. and

CONTACT Imlak Shaikh imlak786@gmail.com; imlak.shaikh@mdi.ac.in

the London Transport Bombings disturbed the functioning of the U.S and the London Stock Exchange to such an extent that it took the markets almost a month to recover completely. The 11/26, Mumbai attack disrupted the human life in Bombay and posed uncertainty in financial markets, and it took at least one week to rebound. The economics of terrorism speaks that terrorist attack may cause short-term disturbance to the economic system; the people may decide to postpone their economic activity due to such events. This kind of behaviour impacts the future of public consumption and investment.

The positive side of the terrorism is: A terrorist attack has shown a positive impact concerning economic effects on the military and national security market. The terrorist attacks aim to cause economic loss and financial and economic damages. Regardless of the negative impact of terrorism, some actual foreign terror attacks have shown limited cause to the stock markets. Let's say the S&P500 returns drifted between 0.90% and 31.5% and, on the average positive 14.2% on the global terrorist attacks.[1] The Frankfurt and London market were rallying in the positive direction, and U.S. market recovered within a one-month horizon based on recent terrorist attack. The attack on London, the market attained its normal level within one day, and British GDP gained 0.8% in that quarter. At this point one can say that terrorist attacks majorly affect in short-run on the economic growth, household consumption, and turnover. Albeit, it has shown a positive impact on the state policy, security and fiscal deficit expansion, etc.

If we look at the worst side of the economic damages due to terrorism, the tourism market and holiday markets, airport security, Schengen area visa, surveillance have been affected majorly. On the other hand, loss of job market and sharp fall in the tourism and discouraged FDI is the recent adverse impact of terrorism. The resilience, surveillance, international awareness, market regulation, and state authorities' concerns have raised much attention on the part of global terrorism. Since, the inception of ISIL (the Islamic State of Iraq and the Levant) and other Islamic state groups, the market became more alert and states have drawn their consideration on the above issues.

This article aims to study the growth of the Indian Securities Market and also to determine the impact of Terrorist attack on the Stock Markets in the last three decades. The stock market returns have been modelled using conditional volatility framework. The study attempts to estimate the conditional variance by modelling the conditional volatility of Stock Market returns. It provides evidence towards the claim that terrorist activity and cross-border tension has disrupted the investors' sentiment. The finance city Bombay (Mumbai) has suffered significantly regarding human and monetary losses. The market response to the Terror attacks hold different facets: like *Target*, *Location*, *Number of perpetrators*, and *Property-value* has produced a significant impact on financial markets. The current study contributes in a three-fold manner: (i) This is the first formal empirical attempt on terrorism studies in the emerging market like India. (ii) The study takes a more extended sample period (i.e., 30 years) into consideration and deliberates multiple factors of terrorist attacks. (iii) A separate analysis of stock market performance has also been presented for *Mumbai attack*.

The empirical attempt has been organised as Section 2 describes the literature evidences on stock market response followed by the terrorist attacks. Section 3 demonstrates the data sources and composition. Section 4 devotes to the empirical design and hypothesis building. Section 5 offers the detailed discussions and findings and Section 6 ends with the summary and conclusion.

2. Literature evidences

Terrorist attacks result in many economic and social consequences. It damages to the infrastructure, biological loss, environmental damages, loss of confidence in the market and government, social disruption, failure of banking, trade and supply system.

2.1. Terrorism and economic growth

Enders et al. (2006) explore the impact of transnational terrorism on the flow of FDI stock and found that such terrorist events hold a significant, but small, impact on the stock of OECD nations. More specifically Turkey and Greece experienced substantial fall in the FDI stocks. Koh (2007) demonstrates the relationship between terrorism and economic growth. In his review, he argues that terrorist events have a short-lived impact on the global tourism, airlines industries, and financial markets. Moreover, the assets market demands a higher-risk premium for volatile assets. Whereas, the long-lived effect of terrorism is the development in the R&D, Nuclear energy and the new technologies to combat terrorism. Greenbaum et al. (2007) examine the terrorism and employment and business operations. The study uncovers the facts that terrorist attack reduces the number of business operations and hampers the employment followed by the terrorist attacks in the long-run. Mainly terrorism disrupted the business formation and diversification. Hazam and Felsenstein (2007) address the behaviour of the housing market in Jerusalem driven by terrorist events. The study reveals that terrorism has the sharpest effect on the residential property prices higher in the short-term while lesser in long-term.

Jackson (2008) examines the September 9/11 attack on the U.S. economy. He explores the various facets of the economy, higher the catastrophic nature of such attack. After the events, U.S. economy became more resilient. The financial market remained closed for four days and corrected for such events. The consumer confidence index (CCI) declined significantly and resulted in one more crisis (2007–08). Overall, the terrorist attack has made U.S. economy stronger to meet the future unwanted events. Krieger and Meierrieks (2010) argue that unemployment, poverty, inequality, and dissatisfaction in term of social spending and welfare regimes result in less domestic terrorism and vice versa. The directional causality is of two ways higher the spending and generous welfare regimes. Sandler (2011) comprehensively elaborate the sources and cause of world terrorism. He discusses the counter-terrorism, domestic and transnational terrorism and preset the empirical evidence on the short and long-run impact of terrorism on the income, legislative system, international relation, economic growth, and financial development.

Singh (2013) evidence the apparent impact of terrorism using the micro-level data in the Punjab state of India. The study confirms that terrorism has disrupted the agriculture technology in long-term. Reduced the long-term fixed investment at the district level. The wealthy farmer is more affected than the poor one living in terror suspected area. Powers and Choi (2012) and Meierrieks and Gries (2013) studies the impact of terrorism on business and economic growth. The study finds that terrorism harms business activity, disrupts the flow of foreign investment, and raises the cost of counter-terrorism. Hence, terrorism is seen to be detrimental to the flow of international fund and economic growth in African and middle-east nations.

2.2. Terrorism and financial markets

The literature presented in the previous section clearly evidence that terrorism is the biggest threat for the human civilisation and economic growth. Terrorism causes not only the consumption pattern but also the future finance and investment strategy of the economy. Here we present some of the recent literature that uncovers the effects of terrorism on financial markets such as equity, defence/airline/hospitality stock, stock capitalisation, global stock market integration and international portfolio selection.

Kim and Gu (2004) examine the impact of 9/11 terrorist attacks on the airline stocks. The study conducted in the window of 60 weeks pre and post 9/11 events. The findings of the work reveal that average weekly returns do not change significantly post the event of 9/11. The market risk and total risk increased irrespective of the firms' size. Unlike the previous studies, Schneider and Troeger (2006) study the impact of terror and war between Israel and Palestinians on the global financial market such as CAC, Dow Jones, and FTSE specifically from the years 1990 to 2000. The work evidenced that conflict and war affect the financial market with negative returns. They presented the work under the *rational expectation* of *fiscal liberalism*. Lin et al. (2007) describe the consequences of the terrorist phenomenon concerning 9/11, Bali Bombing, Madrid Bombing, and London Bombing. The author argues that terrorism creates more opportunities rather than a short-term disruption in the financial market. Nguyen & Enomoto (2009) study the impact of terrorism on the stock returns and volatility-behaviour. The study administered on the KSE and TSE of Pakistan and Iran. They observed significant, stock shifts and fluctuation in volatility among these two markets. Kollias et al. (2011) examine the impact of terrorism on large and small capitalised stocks. They find that size, maturity and some other factors of Terror attack are the primary determinants of markets.

Chang and Zeng (2011) explore the comprehensive dataset on the terrorist events and study the behaviour of hospitality stock. The study reveals that market returns are between 10% and 15% per annum. The *nature of the attack*, *number of fatalities*, *location*, has shown a significant impact on the average daily rates of room demanded. The findings explain that sentiment playing a substantial role in volatility of hospitality stocks. Bilson et al. (2012) investigate the impact of terrorism on the global stock market integration. The study resolves that terror induces substantial

contagion in short-term and market integration effect on the domestic stock markets. The market participant becomes more risk averse associated with the terrorist events.

Ramiah and Graham (2013) examine the September 11 and Bali bombing on the London, Madrid and Mumbai stock exchange using the CAPM framework. The findings show that stock portfolios were adversely affected due to domestic and transnational terrorist events. Kumar and Liu (2013) investigate the impact of terrorism on the international stock markets. They find spill over effects among the trading partners such as −2.5% reductions in the domestic equity indices. White et al. (2013) explore the patterns of terrorist activity in South Asian countries; the study aims to measure the *risk*, *resilience*, and *volatility* in these markets. They find that all these three measures vary across the markets.

Aslam and Kang (2015) analyze the Asian stock markets using daily data on the 410 terrorist attacks between 1997 and 2011. The results indicate that terrorist events are destructive for the equity market, more explicitly *bombing* and *suicide attack* generate significant downward movement in the market. Apergis and Apergis (2016) recently reported the impact of Paris 11/3 terrorist attack on the stock prices in the defense industry. The study shows the positive effect on the defence stock followed by the recent Paris attack.

The stock market returns and volatility behaviour documented earlier regarding international portfolio selection, stock-volume relation (e.g., Adler & Dumas, 1983; Tauchen & Pitts, 1983), global asset pricing and contagion effects (e.g., Errunza & Losq, 1985; Fields & Janjigian, 1989). More specifically, the performance of equity market, political and macroeconomy under the shadow of global terrorism has been explored by Enders and Sandler (1991; 1993; 1996). Additionally, Enders et al. (1992; 2006) describes the impact of terrorism on the tourism market and flow foreign direct investment.

There is quite a good number of empirical evidences that explore the impact of terrorism to the domestic and transnational equity market (e.g., Carter & Simkins, 2004; Chen & Siems, 2004; Drakos, 2004; Glaser & Weber, 2005; Hon et al., 2004; Mun, 2005). The study shows that contagion impact exists on the equity market, negative abnormal return, high volatility, the rise in the idiosyncratic risk. In recent decades, the political events and terrorist attacks (ISIS) has shown negative impact on the stock market, macroeconomy, global equity market linkages, defence and airline business, regional economy (e.g., Abadie & Gardeazabal, 2008; Amihud & Woh, 2004; Chen & Siems, 2004; Drakos, 2004; Drakos & Kutan, 2003; Eckstein & Tsiddon, 2004; Hon et al., 2004; Khan & Estrada, 2016; Nikkinen et al., 2008; Enders & Sandler, 2002).

Some of the recent pioneering works (e.g., Akerman & Seim, 2014; Apergis & Apergis, 2016; Aslam & Kang, 2015; Karolyi & Martell, 2010; Kis-Katos et al., 2011; Kollias et al., 2011; Larocque et al., 2010; Nikkinen & Vähämaa, 2010; Tahir Suleman, 2012) discusses the impact of terrorism and investor sentiment, stock market volatility and returns, global arms business. At this point, one can say that no study models the investors' sentiment and terrorism in the emerging markets like India. Our research is novel and contributing to the literature on asset pricing and event studies. More specifically, present work takes a more comprehensive approach in modelling

the stock market volatility under various facets of terrorist attacks which are missing in the previous studies.

3. Data sources and description

The study documents the stock market behaviour on the terrorist events for a more extended period. The present work acquires the data openly available from Global Terrorism Database (GTD), the database is maintained and disseminated via START (Study of Terrorism and Response to Terrorism). The database collections headquarter of GTD and START is at the University of Maryland, the database spans from 1970 to 2014.

> GTD-Definition of Terrorism: *The GTD defines a terrorist attack as the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation. In practice this means in order to consider an incident for inclusion in the GTD, all three of the following attributes must be present: 1. The incident must be intentional – the result of a conscious calculation on the part of a perpetrator. 2. The incident must entail some level of violence or immediate threat of violence -including property violence, as well as violence against people. 3. The perpetrators of the incidents must be sub-national actors. The database does not include acts of state terrorism*[2].[START, 2014 pp.9]

There are mainly two equity markets in India namely NSE and BSE located in Mumbai (Bombay). First, according to World Federation of Exchanges (WFE), NSE India is not only India's leading stock exchange but also the world's 4th largest exchange based on trading volume in the capital market segment. Why Indian capital markets are remaining first preference for the global investment in Asia is that India's FDI (US$44 billion) stood around 2% of India's GDP. Second, BSE is the worlds' fastest growing stock exchange and the largest stock exchange regarding the number of stock listings. BSE has been ranked 2nd in currency options and 3rd in futures trading, and 10th as per market capitalisation among global stock exchanges[3].

We have collected the daily data of stock price index from BSE. BSE is one of the leading stock markets of India. The sample period ranges from 1972 to 2014. Moreover, the data on NSE Nifty 50 and India's volatility index (NVIX) are also collected from the National Stock Exchange (NSE) of India Ltd. The information on equity and the terrorist attacks and responses has been organised and filtered for the quantitative analysis. The GTD database encompasses many indicators of terrorist attacks. For the present work, we screened only, the *total number of terrorist events*, the *total number of people killed*, *wounded*, *success*, *multiple*, *suicide*, *guncertain*, and *property value*. In additions, we have filtered major terrorist attacks during 1980–2014 took over the Mumbai city, a city of financial system and business hub of the nation. In which we classified the events majorly in nine terrorist attacks (see Table 4). The impact of such nine terrorist attacks on the Bombay stock exchange has also been presented. When we extracted a dataset from the START database, there were terrorist attacks on the weekend, e.g., on Friday/Saturday/Sunday. To address the effects of such terrorist attack on the weekend, we sifted the event date on next opening working day. The reason for shifting the event is that an attack on the weekend will show the effects on the next working day of the stock exchange.

4. Empirical model building

We examine the impact of terrorist events during the period 1980–2014 on the Indian securities market. For the analysis of stock market returns a daily closing price of the stock index has been considered. The BSE is one of the oldest and leading stock markets in India, and Sensex 30 is the benchmark broader index. The Sensex 30 is the representation of 90% of the Indian economy.

Let P_t be the closing price of BSE Sensex 30 at time t and $r_t = lnP_t - lnP_{t-1}$, is the contemporaneous log-transformed return on the stock index over the period t to $t-1$. The empirical model has been presented in conditional volatility framework; let us define the conditional mean and variance as,

$$m_t = E_{t-1}[r_t] \tag{1}$$

$$\sigma_t = E_{t-1}[r_t - m_t]^2 \tag{2}$$

Where $E_{t-1}[u]$ signifies the expectation of particular factor u for the given information at time $t-1$, very often is also written as $\mathrm{E}\{u|\Psi_{t-1}\}$. For our empirical model the stock return r_t is expressed through following process:

$$r_t = m_t + \sqrt{\sigma_t}\epsilon_t + r_{t-1} \tag{3}$$

Where $E_{t-1}[\epsilon_t] = 0$ and $V_{t-1}[\epsilon_t] = 1$, r_{t-1} = lagged returns, in order to control autocorrelation, $\{\epsilon_t\} \sim i.i.d.F(.)$, where F is the cumulative distribution function of ϵ. More specifically we have structured the ARCH and GARCH framework for eq. (3) as follows;

The mean equation is as follows:

$$\begin{aligned} r_t = \omega_0 + \omega_1 r_{t-1} + \delta_1 nkill_t + \delta_2 nwound_t + \delta_3 success_t + \delta_4 property_t \\ + \delta_5 suicide_t + \delta_6 multiple_t + \delta_7 guncertain_t + \epsilon_t \end{aligned} \tag{4}$$

Where $nkill_t$ and $nwound_t$are the two quantitative variables, while rest of the factors are dummy variables:e.g.,

$success_t$	$= 1$	Successful attacks
	$= 0$	Otherwise
$property_t$	$= 1$	Property attacks
	$= 0$	Otherwise
$suicide_t$	$= 1$	Suicide attacks
	$= 0$	Otherwise
$multiple_t$	$= 1$	More than one day
	$= 0$	Otherwise
$guncertain_t$	$= 1$	Group suspected
	$= 0$	Otherwise

The variance equation is calculated as;

$$\sigma_t = \pi_0 + \sum_{i=1}^{p} \pi_i \{r_{t-i} - \omega_0 - \omega_1 r_{t-1} - \delta_i x_t\}^2 + \sum_{j=1}^{q} \pi_j \sigma_{t-j} \quad (5)$$

Based on the SIC criterion when GARCH (p, q) employed for p Є [1,5] and q Є [1,2], GARCH (1,1) best suited in most of the cases (e.g., Smolović, Lipovina-Božović, & Vujošević, 2017 and Wu et al., 2018), hence we calculated the parameters using ARCH(1) and GARCH(1) model. A model with exogenous variance regressors: the stock market volatility not only inflamed by its past but some other factors may also contain the information to explain the market volatility (e.g., Bollerslev & Melvin, 1994; Mezrich & Engle, 1996 and Engle et al., 1990).

Hence, the variance equation with the exogenous terrorist events: such *as i-day, nprs, nkill, nwound, location:*

$$\sigma_t = \varphi_0 + \sum_{i=1}^{p} \varphi_i \in_{t-1}^2 + \sum_{j=1}^{q} \varphi_j \sigma_{t-j} + \sum_{l=k}^{10} \rho_{k1} x_{1t} + \rho_{k2} x_{2t} \quad (6)$$

Where,

$$\begin{gathered} i-day = event\ day, \\ T-attack = terrorist\ attack\ on\ i-day \\ x1t = is\ the\ dummyv\ ariables,\ for\ i-day\ and\ k = -10\ to \\ +10\ days\ from\ the\ T-attacks \\ x2t = nkill,\ nwound,\ location,\ perpetrators \end{gathered}$$

The framework explained above is based on the efficient market hypothesis (Fama et al., 1969). The market participants evaluate the new information available publicly and stunning from some unpredictable, political, environmental, economic and social changes, which is reflected in the fair stock price (Schwert, 1981).

4.1. Hypotheses of the models

i. *The intercept* ω_0*;* the intercept term can assume either of the sign during the non-terrorist attacks days. The present work takes into account the START events hence during non-T-attacks days, if other macroeconomic, social and political indicators play influencing role to explain the stock market performance. Consequently, the intercept term should be different from zero and statistically significant.

ii. *The slope coefficient* (δ_i *&* ρ_k)*:* in our empirical model δ_s and ρ_s measures the intensity of the impact of T-attacks on the Indian securities market. If those START events encompass some information to explain the future activity of the stock market, then those slopes coefficient should remain different from zero and statistically significant. The most recent studies (e.g., Akerman & Seim, 2014; Apergis & Apergis, 2016; Aslam & Kang, 2015) revealed that investors regard the T-attacks in their market participation, due to terrorist events the investors redefine their investment strategy in short-run and postpone their financial consumption for future. The significant negative slope implies that due

to the recent T-attacks stock market participation of investors has been disrupted.

iii. *i-day and pre-post T-attacks:* T-attack dummies capture the impact of terrorist events the day it took place, e.g., Mumbai 11/26, U.S. 9/11, etc. and surround the i-days. If T-attack contains the information that impacts the behaviour of investors' sentiment than on the day of terrorist attacks the stock market will adjust the events and stock price will reflect its fair value (Schwert, 1981). Some of the empirical evidence (e.g., Aslam & Kang, 2015; Chen & Siems, 2004; Jackson, 2008) state that T-attack has a short-run impact on the stock markets, hence if T-attacks disrupt the short-run investment proposals then post events dummies should be different from zero and negative, and statistically significant.

4.2. Descriptive statistics

Table 1 shows the summary of terrorist attacks happened during 1972–2014. One can see that till 1986 there was no significant movement of terrorist activities, but from 1987 to 2014 the T-attacks become very abnormal to a large number of attacks. More specifically, the T-attacks ranged from 150 to 800 between 2006 and 2014. There were total 9096 T-attacks recorded according to GTD database in India for the given sample period. It is seen that over a decade as there is an increased T-attacks resulted in a high rate of fatalities and more perpetrators and terrorist gangs in India. There

Table 1. Summary of terrorist attack in India (1972–**2014**).

No.	1	2	3	4	5	6	7	8	9	10
Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
tevents	1	N/A	N/A	1	1	1	N/A	20	10	16
nperps	5	N/A	N/A	N/A	N/A	5	N/A	78	N/A	9
nkill	0	N/A	N/A	4	0	0	N/A	31	17	24
nwound	0	N/A	N/A	0	0	0	N/A	19	13	12
No.	11	12	13	14	15	16	17	18	19	20
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
tevents	13	47	159	39	96	166	362	324	349	339
nperps	7	24	162	34	72	146	603	65	95	479
nkill	64	59	195	51	340	506	971	874	907	1113
nwound	102	217	364	79	163	429	1,033	769	1042	1326
No.	21	22	23	24	25	26	27	28	29	30
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
tevents	239	N/A	107	179	211	193	61	112	179	234
nperps	1,626	N/A	1,504	113	232	564	12	166	656	601
nkill	1,154	N/A	389	361	569	853	398	464	671	658
nwound	917	N/A	405	616	937	1416	411	591	760	1144
No.	31	32	33	34	35	36	37	38	39	40
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
tevents	183	196	108	145	166	154	517	673	662	642
nperps	418	177	62	270	1,061	675	3,856	6,317	8060	8264
nkill	595	472	334	463	721	635	765	784	812	484
nwound	1,182	1,183	949	1,216	2,137	1,210	1,559	935	673	725
No.	41	42	43							
Year	2012	2013	2014							
tevents	611	694	859	tevents = total terrorist attacks = 9,096 nperps = number						
nperps	1,905	7,107	2,672	of terrorist participation in attack =48,092 nkill = number						
nkill	264	467	488	of people killed = 17,953 nwound = number						
nwound	651	771	776	of people wounded = 26,732						

Table 2. Descriptive statistics.

	NPERPS	NKILL	NWOUND	KW	PROPVALUE($)	SENSEX	Returns
Mean	1414	513	764	1277	4014071	7333.43	0.0635
Maximum	8264	1154	2137	2858	30340000	29681.77	15.98
Minimum	7	17	12	30	1250	113.28	−13.66
Std. Dev.	–	–	–	–	–	7982.69	1.64
Skewness	1.9839	0.1015	0.3821	−0.0822	2.3388	1.11	0.000
Kurtosis	5.5354	2.2948	3.0989	2.2235	7.0910	2.96	8.98
Sum	48092	17953	26732	44685	52182921	–	–
ARCH(1)							517.42*
ARCH(2)							322.06*
Observations	34	35	35	35	13	8459	8458

*Significant at 1% level of significance; NPERPS = Number of perpetrators; NKILL = Number of people killed; NWOUND = Number of people wounded; KW = Total fatality. Table presents the summary of descriptive statistics followed by the number of T-attacks in India and BSE Index and stock returns.

was a loss of human for 17,953 and people wounded around 20,732. We present empirical evidence on T-attacks and stock market activity in the next section.

Table 2 reports the descriptive statistics on various indicators of terrorist activities and its response and stock market behavior for the last three decades. The table shows that there was a loss of U.S.$5.2 million due to terrorist attacks in India and total human fatality resulted into 44,685 peoples. The BSE Sensex 30 calculated average 7333.74 with 0.06 percentage returns for the sample period. We tested for the ARCH effects up to six lags and found the presence of heteroskedasticity hence the empirical framework is presented in the conditional volatility framework.

Figure 1 is the time series plot of BSE Sensex index and NSE Nifty index along with NVIX volatility index followed by terrorist attacks for the period 1980–2014. The stock market and T-attacks moving in the forward direction while the expected stock market volatility (NVIX) was highest during 2005–2010 and found lowest after 2011. The second part of Figure 1 shows the plot of stock market volatility followed by T-attacks and total fatalities. It is seen clearly that due to a high level of human loss the stock market volatility remains high. For the given sample the market volatility was higher from 1990 to 1994 and 2006 to 2009. Figure 2 also presents the market uncertainty due to T-attacks in the forms of crude stock market returns. Figure 3 explains the types of T-attacks occurred over the last three decades in India in various ways. The graph demonstrates that majority of the attack was in the form of *Bombing* and *explosion*, second highest was observed for *Armed* Assault.

5. Results and discussion

In this section, we present the empirical evidence on the terrorist attacks and its impact on the Indian securities market. The entire estimation has been classified into two parts. The first part describes the effects of the START on the India stock markets for the whole sample period 1980–2014. The assumption underlying quantitative analysis is that T-attacks in any part of the country hold an impact on the Indian financial markets. On the other hand, the T-attacks located in Mumbai only might be showing higher incidence as compared to any other places, e.g., Delhi, Kolkata, Chennai, etc. and Jammu & Kashmir. To consider this difference the analysis on Mumbai T-attacks has been presented separately. Moreover, Appendix A has been

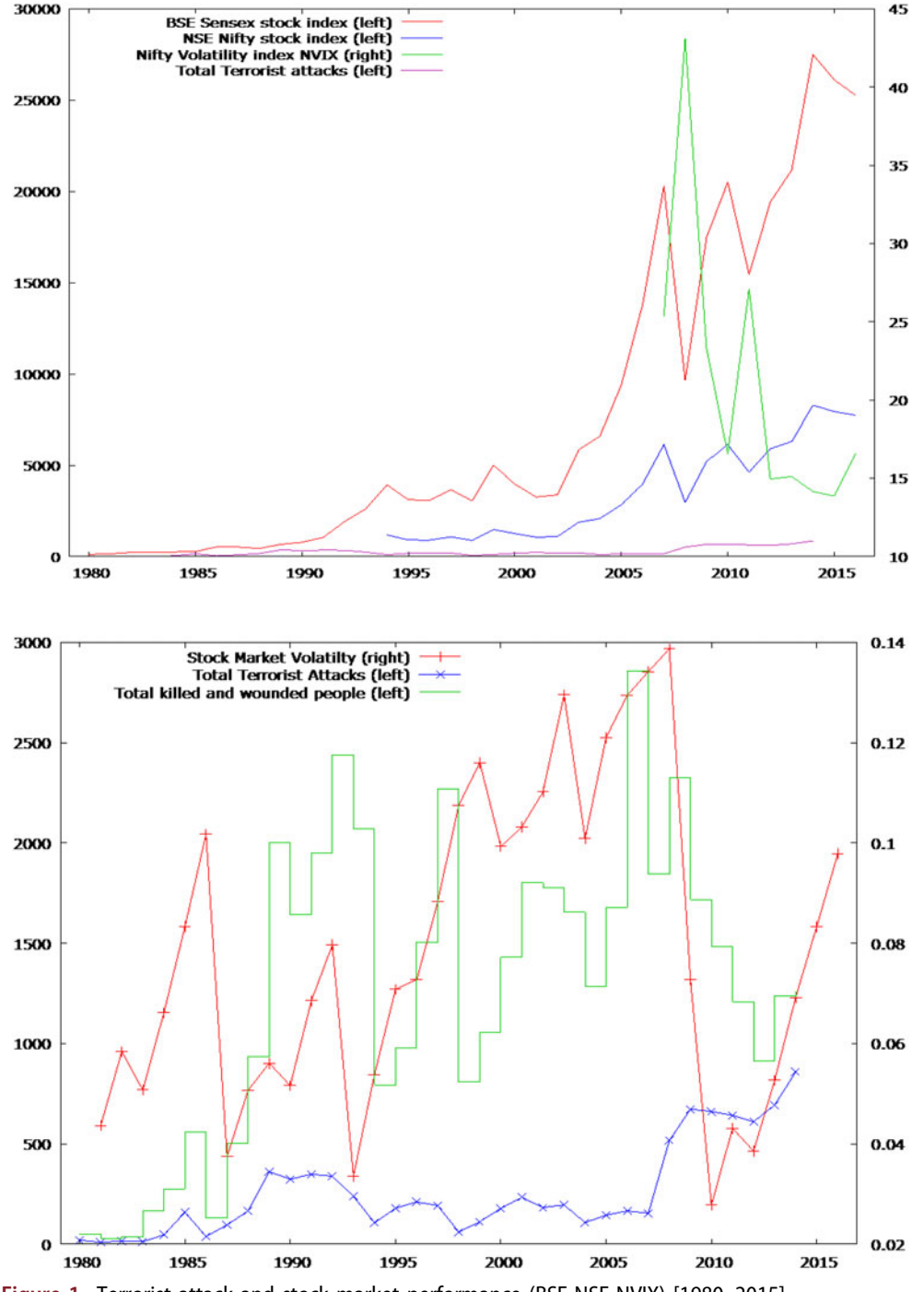

Figure 1. Terrorist attack and stock market performance (BSE-NSE-NVIX) [1980–2015].

appended at the end showing variance inflation factor (VIF) to account for multicollinearity. Since all values of VIF appears to be less than the threshold value, implies that there is no issue of multicollinearity.

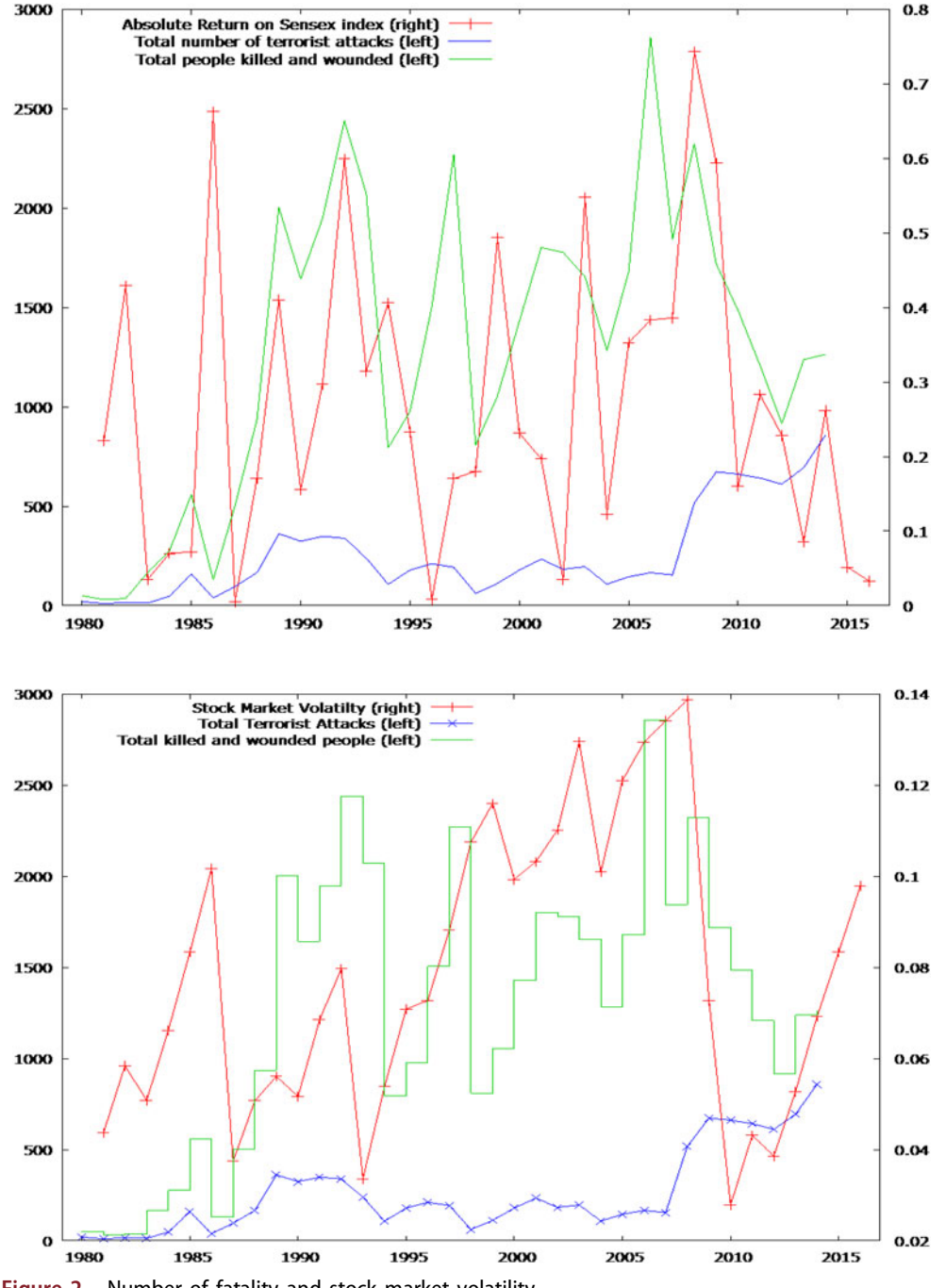

Figure 2. Number of fatality and stock market volatility.

Table 3 describes the regression results on the terrorist attacks for the period 1980–2014. Table 3 has been classified into three different Models, Model 1: explains the stock market volatility due to number of people killed and wounded, Model 2: explores the *nkill*, *nwound* followed by dummies whether the events were successful, and it was a suicide attack, Model 3: is holistic view of T-attacks and its response.

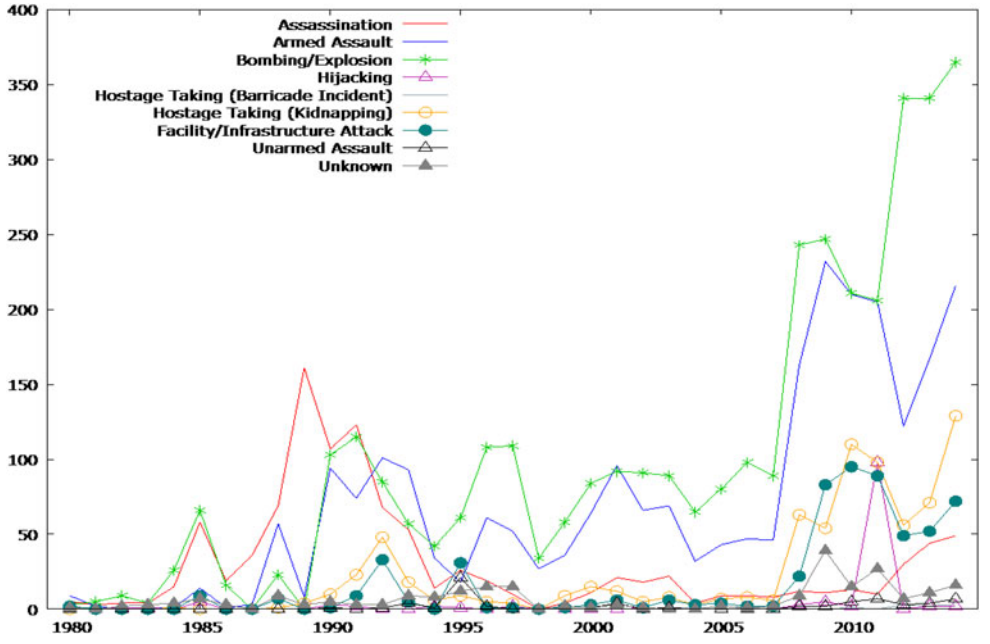

Figure 3. Type of terrorist attacks in India [1980–2014].

Table 3. Stock market returns and terrorist attacks [1980–**2014**].

Predictor: Stock market returns	Model-1		Model-2		Model-3	
	Estimate	z-stat	Estimate	z-stat	Estimate	z-stat
ω_0	0.0278	3.42[a]	0.0487	2.07[b]	0.0465	1.96[b]
ω_1	0.4868	68.52[a]	0.4870	68.49[a]	0.4869	68.26[a]
δ_1^{nkill}	−0.0078§	−3.66[a]	−0.0076§	−3.53[a]	−0.0073§	−3.34[a]
δ_2^{nwound}	0.0019	2.14[b]	0.0022	2.43[b]	0.0021	2.40[b]
$\delta_3^{success}$			−0.0081§	−0.32	−0.0093§	−0.36
$\delta_4^{suicide}$			−0.1045§	−0.87	−0.1043§	−0.86
$\delta_5^{property}$			−0.0363§	−2.26[b]	−0.0391§	−2.44[b]
$\delta_6^{multiple}$					0.0281	1.01
$\delta_7^{guncertain}$					0.0015	0.08
π_0	0.0080	25.37[a]	0.0079	24.66[a]	0.0079	24.39[a]
π_{ARCH}	0.0597	36.79[a]	0.0599	36.65[a]	0.0599	36.57[a]
π_{GARCH}	0.9384	781.93[a]	0.9383	778.30[a]	0.9383	775.54[a]
$Adj.\ R^2$	0.22		0.22		0.22	
LL	−12462.2		−12459.5		−12458.8	
$DW-stat$	2.04		2.04		2.04	
Joint Hypothesis test						
$Wald\ F-stat$			2.12[c]			
$p-value$			0.0949			
$Ho:\ \delta_3^{success}=\delta_4^{suicide}=\delta_5^{property}=0$						
Joint Hypothesis test						
$Wald\ F-stat$					1.92[c]	
$p-value$					0.1014	
$Ho:\ \delta_3^{success}=\delta_4^{suicide}=\delta_5^{property}=\delta_6^{multiple}=\delta_7^{guncertain}=0$						

[The mean equation is as follows:$r_t = \omega_0 + \omega_1 r_{t-1} + \delta_1 nkill_t + \delta_2 nwound_t + \delta_3 success_t + \delta_4\ property_t + \delta_5 suicide_t + \delta_6 multiple_t + \delta_7 guncertain_t + \epsilon_t$ The variance equation is calculated as;.
$\sigma_t = \pi_0 + \sum_{i=1}^{p} \pi_i \{r_{t-i} - \omega_0 - \omega_1 r_{t-1} - \delta_i x_t\}^2 + \sum_{j=1}^{q} \pi_j \sigma_{t-j}$].
Significant at[a]1%,[b]5%,[c]10%.
§- indicates expected sign as hypothesised.

Table 3, Model 1 looking at the estimates all coefficients appears to be statistically significant at 1% and 5% level. The Model 1 explains the stock market behavior on the counterpart of fatality that caused due to terrorist attacks. The slope of the number of people killed in the various T-attacks shows a negative and statistically significant impact on the stock returns. This also implies that human fatalities occurred due to recent T-attack holds an adverse effect on the short-run calculation of the market portfolio. About 0.78% value of the stocks are lost due to the human loss occurred during this sample period. The similar kind of results noticed in the other models of Table 3. The coefficient on the people wounded due to T-attacks shows a positive impact on the market, its plausible explanation is, due to the survival of the people who survived and became more resilient on the T-attacks. Now moving on the Model 2, by including the dummies based on the T-attacks classified as a success, property damage and multiple. The slope of all three factors appears to be negative and statistically significant for multiples events. At this point, one can say that due to success in the target followed by suicide attacks and T-attacks in the form of properties (e.g., Government property, Public property, etc.) shows a negative impact on the performance of overall securities market. Among these three factors if T-attacks target the property that causes more to the financial system. When we consider the impact of T-attacks in the form of success, suicide and property jointly the Wald F-statistic appears to be 2.12 and statistically significant at 10% level. This also makes sense that the investor together considers the nature of T-attacks while formulating their short-term investment proposal. Model 3 is more comprehensive that takes into consideration of T-attacks those results into more than one-day events, and the terrorist gang/group identified for such attacks. The estimates do not appear statistically significant. This implies that these factors do not contribute to the stock market investment proposal for the given horizon.

Moreover, the joint impact of all five dummies on the stock market volatility appears to be significant at the 10% level. The intercept coefficient in the entire model seems to be positive and statistically significant. This connotes that during the non-T-attacks day there are some other economic and political events that influence the stock market behaviour. The coefficient of all ARCH and GARCH parameters appears to be positive and significant, indicates that stock market volatility persists in the portfolio selection and investment strategies. The log likelihood of Model 2 calculated highest; hence Model 2 best explains the returns behavior on the eve of T-attacks in the Indian securities market. Figure 4 shows the volatility in the Indian stock market during the T-attacks, the volatility was exceeded for the year 1986, 1991, 2000, 2006, and 2008–09.

Table 4 reports the major terrorist attacks on Mumbai (Bombay) and its impact on the Bombay Stock Exchange (BSE). The Mumbai is the finance hub-city of India, situated in the western part of province Maharashtra. For any terrorist group, Mumbai remained the primary target for terrorist attacks, like 26/11 of Taj Hotel attack on Mumbai. For the given sample period there were around 100 T-attacks happened in Mumbai. We shortlisted major nine events that occurred between 1980 and 2014 (See Table 4). The stock market returns on the significant nine T-attacks appears to be negative with average −0.41%, and volatility was about 3.73 (i.e.,

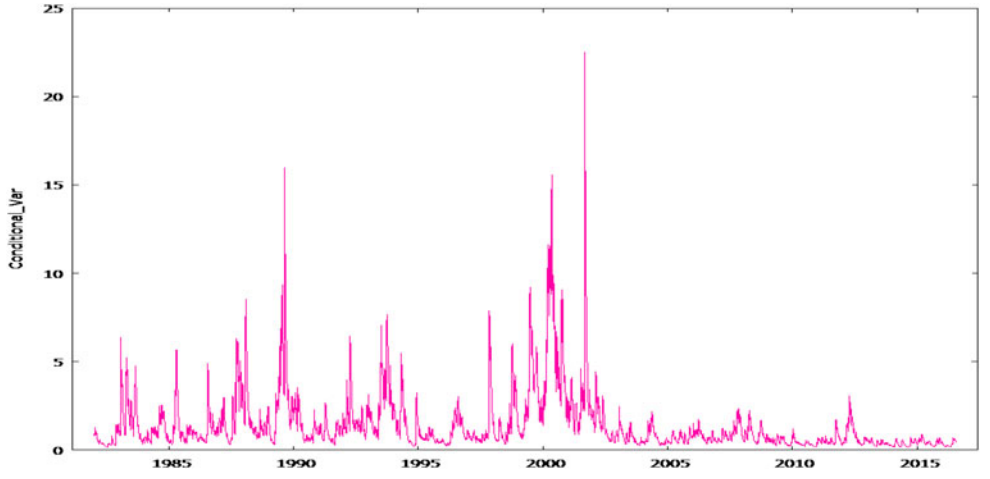

Figure 4. The Stock market volatility with regard to terrorist attacks during 1980–2014.

Table 4. Major terrorist attack on Mumbai (the Bombay Stock Exchange).

Sr No	Date	End date	Location no.	Perpetrators	Return (%)	Volatility	nkill	nwound	Attack type	Group
1	12-03-93	12-03-93	13	3	1.3242	8.9617	257	713	Car Bombing	LeT
2	02-12-02	02-12-02	1	1	1.2783	0.9479	2	50	Bombing	LeT
3	27-01-03	27-01-03	1	1	−1.2287	0.9113	1	28	Bombing	LeT
4	13-03-03	13-03-03	1	1	−0.0592	1.2867	10	70	Bombing	LeT
5	28-07-03	28-07-03	1	1	0.3563	1.8504	4	32	Bombing	LeT
6	25-08-03	25-08-03	3	3	−2.9644	1.1494	54	300	Car Bombing	LeT
7	11-07-06	11-07-06	7	1	−0.6569	4.8446	209	714	Train Bombing	LeT
8	26-11-08	29-11-08	6	10	−2.8202	12.1593	166	600	Bombing, Hostage, Shooting	LeT
9	13-07-11	13-07-11	3	3	0.9966	1.5391	26	130	Explosive	IM
Total	9		36	24	−3.7739	33.6504	729	2637		
Average			4	2.67	−0.4193	3.7389	81	293		

Source: GTD Database.

300.73%). The T-attacks resulted in the loss of civilians of 729 and 2637 people were wounded. The majority of the events were driven by the Lashkar-e-Taiba (LeT) a terrorist group. For one particular attack, on average four locations were targeted and in most of the cases attacks were in the form of Bombing. The empirical evidence is presented in Table 5.

Looking at Table 5, stock market and Mumbai T-attacks, we do have adequate evidence to say that T-attacks contain the critical information to explain the future stock market volatility. The empirical results reveal the facts that stock market has been disrupted due to major T-attacks in the form of Bombing, Assassination, Hostage, Car Bombing, at various locations of Mumbai. Such kind of terrorist events makes investors more resilient for the future events. The Mumbai a finance city of India feared and attacked several times in the history. The investors do consider this event in their financial planning in the form of short-run investment and become cautious about the long-term investments. We document the stock market behavior in terms of i-day, pre and post events of T-attacks. One can see from the Panels B, C and D of Table 5, the estimates on the

Table 5 Stock market return behavior with regard to Mumbai attacks [1980–**2014**].

Panel A : Stock market return behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{b10}	ρ_2^{i-day}	ρ_3^{a10}	LL	DW-stat
Estimate	0.07	0.10	0.04	0.10	0.89	0.03	0.59	−0.09[§]	−14889.23	2.01
Z-stat	5.45 [a]	8.65 [a]	13.56 [a]	22.35 [a]	197.83 [a]	0.65	0.98	−1.73 [c]		

Panel B : Stock market return behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{i-day}	ρ_2^{a1}	ρ_3^{nkill}	ρ_4^{nwound}	LL	DW-stat
Estimate	0.07	0.10	0.04	0.10	0.89	−0.68[§]	−0.27[§]	−0.08[§]	0.02	−14886.93	2.01
Z-stat	5.50 [a]	8.68 [a]	13.65 [a]	22.35 [a]	197.27 [a]	−0.51	−0.25	−1.69 [c]	1.54		

Panel C : Stock market return behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{i-day}	ρ_2^{a5}	ρ_3^{nkill}	ρ_4^{nwound}	LL	DW-stat
Estimate	0.07	0.10	0.04	0.10	0.89	−0.77[§]	−0.04[§]	−0.08[§]	0.02	−14886.98	2.01
Z-stat	5.49 [a]	8.69 [a]	13.64 [a]	22.35 [a]	197.46 [a]	−0.81	−0.27	−1.74 [c]	1.54		

Panel D : Stock market return behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{b5}	ρ_2^{i-day}	ρ_3^{a5}	ρ_4^{nkill}	ρ_5^{nwound}	LL	DW-stat
Estimate	0.07	0.10	0.04	0.10	0.89	0.06	−0.97[§]	−0.04[§]	−0.08[§]	0.02	−14886.81	2.01
Z-stat	5.49 [a]	8.68 [a]	13.64 [a]	22.35 [a]	197.46 [a]	0.31	−0.84	−0.28	−1.65 [c]	1.54		

Panel E: Stock market volatility behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{i-day}	ρ_2^{nkill}	ρ_3^{nwound}	ρ_4^{npers}	$\rho_5^{location}$	LL	DW-stat
Estimate	0.05	0.98	0.00	0.11	0.92	0.04	0.01	−0.001[§]	0.30	−0.39[§]	−5475.33	1.91
Z-stat	6.35 [a]	232.13 [a]	51.96 [a]	87.99 [a]	1140.63 [a]	2.02 [b]	22.74 [a]	−70.77 [a]	127.82 [a]	−38.99 [a]		

Panel F : Stock market volatility behavior

	$\emptyset_0$	$\emptyset_1$	φ_0	φ_{ARCH}	φ_{GARCH}	ρ_1^{i-day}	ρ_2^{a5}	LL	DW-stat
Estimate	0.04	0.98	0.00	0.11	0.92	0.02	−0.01[§]	−5438.98	1.92
Z-stat	6.38 [a]	251.94 [a]	61.10 [a]	99.61 [a]	1448.93 [a]	2.20 [b]	−5.55 [a]		

[The mean equation is as follows: $r_t = \emptyset_0 + \emptyset_1\ r_{t-1} + \in_t$; $\in_t \sim N(0,\ \sigma_t)$ And the variance specification with the exogenous factor is: $\sigma_t = \varphi_0 + \varphi_{ARCH}\ \in_{t-1}^2 + \varphi_{GARCH}\ \sigma_{t-1} + \rho_k^i Factors$ Where i = various exogenous factors such as T-events, events before and after, nkilll, nwound, location and perpetrator].
Significant at [a]1%,[b]5%,[c]10%.
§- indicates expected sign as hypothesised.

i-day appear to be negative as hypothesised in the econometric model. But do not explain the significant impact on the same day of the attacks. At this stage, one can say that a terrorist attack on the stock market plays a minimal effect on the day of T-attacks. However, when we look around the T-attack days, the results are speaking a different story. The information contained in the T-attacks hold negative impact for the next several days of the market sentiment. The market participant regards these events to take the right market position for the next trading cycle. The Panel F of Table 5 shows the slope −0.01 after the 5th day of the event and statistically significant, and the same is true for 1-day post from the T-attack. These are some of the prima facie evidence that speaks that T-attacks hold some impact on the investors' sentiment with a 5-day horizon.

The investors' sentiment and behavior are highly influenced by how many *fatalities* occurred due to T-attacks. Hence, for any T-attacks number of people killed and wounded is negatively associated with the stock market returns. It is seen clearly from the Table 5, the slope of *nkill* appears negative and statistically significant at 10% level of significance. The impact due to a number of people wounded shows minimal impact on the Bombay stock exchange. For a terrorist group,

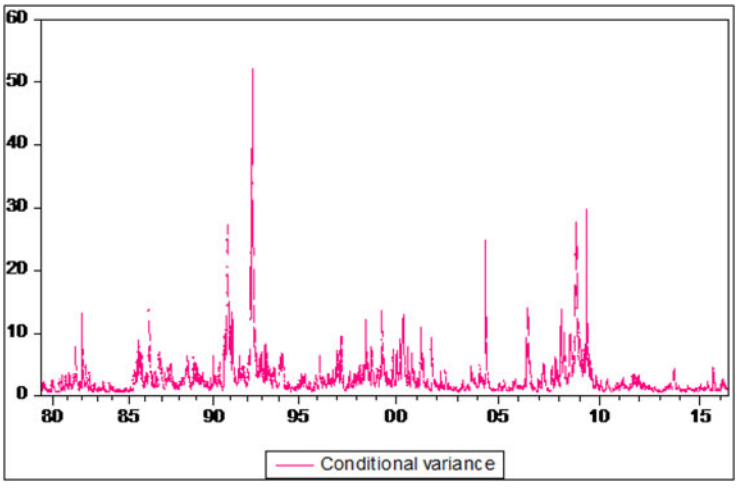

Figure 5. The stock market volatility with regard to Mumbai terrorist attack 1980–2014 on Bombay Stock Exchange (BSE).

location remains the main concern for T-attacks. Any T-attacks aim to disrupt the economic activity and create the situation of uncertainty. As we can see from Table 4, on average 4 locations were targeted in the Mumbai attack. The slope of the *location* appears to be −0.39 (Panel E) with significant adverse impact on the stock market returns. This implies that *location* causes more loss to investors in short-run due to T-attacks.

Moreover, we investigated the impact of a number of *perpetrators* participated in one particular T-attack. The results indicate that when it is known to the market participant that how many terrorists involved in the T-attack, which makes more clarity about the future events. In this case investors become more specific, consequently, number-of-perpetrators show a positive impact on the stock market behavior. The slope of the ARCH and GARCH parameters estimated as positive and statistically significant, this signifies that volatility persists in the stock market due to terrorist activity. The log likelihood was highest for Panel E that explains the stock market volatility.

The Panel E and F report the stock market volatility during T-attacks on the Bombay stock exchange. We calculated the stock market volatility using the GARCH model and generated the stock variance series for the sample period. The results represented in Panel E and F signifies that on the i-day, volatility rises significantly and it is positive when there is a high degree of fatality. The number of people participated in the terrorist activity also hold a positive impact on the future stock market volatility. Figure 5 is the time series plot of stock market volatility due to Mumbai attacks. One can see clearly that volatility was very high during 1990–1995, and second highest level was during 2005 and 2008–09, around these periods maximum T-attacks were took place.

6. Summary and conclusion

The study investigated the behavior of the stock market for the emerging economy like India. The sample period ranged from 1980 to 2014. We took the stock market

data and showed that how Terrorist attacks impound the important information that influences the stock market returns. For the given sample there were total 9069 Terrorist attacks that resulted in the total fatality of 17,953 and 26,732 people were wounded. The stock market functioning disrupted due to these events and more specifically those that occurred near the Bombay Stock Exchange (BSE). The information contained in the terrorist attacks hold negative impact for the next several days of the market sentiment. The empirical results show that the market remained more uncertain due to the *number of fatalities* that occurred and the *locations* that were targeted. In a successful terrorist attack the impact of *property* targeted and *suicide* attacks were more on the stock market in comparison to *multiple* and *gang suspected* in the attacks. The Mumbai, a finance city of India feared and attacked several times in the history. The investors do consider this event in their financial planning in the form of short-run investment and become cautious about the long-term investments. It is also clearly evidence that i-day holds a negative impact on the markets and the markets tend to remain unstable for next few days. The results also suggest that market participant considers the nature of terror attacks in their portfolio selection and long-term investment strategy.

According to global terrorism report (Miller & Kammerer, 2017), it is reported that around 10,900 terrorist attacks have happened across the world, and it has killed about 26,400 civilians. Till 2017 the number of terrorist attacks has been declining, and it is the outcome of proactive measures of the respective state. Looking at the geographical location of the attacks more than half of the attacks were located in Iraq, Afghanistan, India, and Pakistan. There is no reason to believe that terrorist activity effects the consumption and investment behavior. Hence, to reinforce the finance and investment flow locally and internationally a local government has to invest more concerning home security and surveillance. The practical implications of the study are threefold: (i) investors do regard the T-attacks in their investment proposal (ii) investors take the short position due to T-attacks that results into the rise of general stock market volatility and (iii) the financial planning within short-horizon gets postponed followed by recent T-attack.

Notes

1. 1. 04/11/1979, Iran hostage crisis; 2. 23/10/1983, Beirut Bombing; 3. 21/12/1988, Pan-Am 103 Bombing; 4. 07/08/1998, Kenya embassy; 5. 20/03/1995, Sarin gas Tokyo; 6. 12/10/2002, Bali Bombing, 7. 11/03/2004, Madrid Bombing
2. http://www.start.umd.edu/gtd/downloads/Codebook.pdf
3. https://www.bseindia.com/downloads1/BSE_Annual_Report_2016_2017.pdf

References

Abadie, A., & Gardeazabal, J. (2008). Terrorism and the world economy. *European Economic Review*, *52*(1), 1–27.

Adler, M., & Dumas, B. (1983). International portfolio choice and corporation finance: A synthesis. *The Journal of Finance*, *38*(3), 925–984. doi:10.2307/2328091

Akerman, A., & Seim, A. L. (2014). The global arms trade network 1950–2007. *Journal of Comparative Economics*, *42*(3), 535–551. doi:10.1016/j.jce.2014.03.001

Amihud, Y., & Woh, A. (2004). Political news and stock prices: The case of Saddam Hussein contracts. *Journal of Banking & Finance*, *28*(5), 1185–1200. doi:10.1016/j.jbankfin.2003.08.001

Apergis, E., & Apergis, N. (2016). The 11/13 Paris terrorist attacks and stock prices: The case of the international defense industry. *Finance Research Letters*, *17*, 186–192. doi:10.1016/j.frl.2016.03.002

Aslam, F., & Kang, H.-G. (2015). How different terrorist attacks affect stock markets. *Defence and Peace Economics*, *26*(6), 634–648.

Bilson, C., Brailsford, T., Hallett, A., & Shi, J. (2012). The impact of terrorism on global equity market integration. *Australian Journal of Management*, *37*(1), 47–60. doi:10.1177/0312896211423556

Bollerslev, T., & Melvin, M. (1994). Bid—ask spreads and volatility in the foreign exchange market: An empirical analysis. *Journal of International Economics*, *36*(3–4), 355–372. doi:10.1016/0022-1996(94)90008-6

Carter, D. A., & Simkins, B. J. (2004). The market's reaction to unexpected, catastrophic events: The case of airline stock returns and the September 11th attacks. *The Quarterly Review of Economics and Finance*, *44*(4), 539–558. doi:10.1016/j.qref.2003.10.001

Chang, C., & Zeng, Y. Y. (2011). Impact of terrorism on hospitality stocks and the role of investor sentiment. *Cornell Hospitality Quarterly*, *52*(2), 165–175.

Chen, A. H., & Siems, T. F. (2004). The effects of terrorism on global capital markets. *European Journal of Political Economy*, *20*(2), 349–366. doi:10.1016/j.ejpoleco.2003.12.005

Drakos, K. (2004). Terrorism-induced structural shifts in financial risk: Airline stocks in the aftermath of the September 11th terror attacks. *European Journal of Political Economy*, *20*(2), 435–446. doi:10.1016/j.ejpoleco.2003.12.010

Drakos, K., & Kutan, A. M. (2003). Regional effects of terrorism on tourism in three Mediterranean countries. *Journal of Conflict Resolution*, *47*(5), 621–641. doi:10.1177/0022002703258198

Eckstein, Z., & Tsiddon, D. (2004). Macroeconomic consequences of terror: Theory and the case of Israel. *Journal of Monetary Economics*, *51*(5), 971–1002. doi:10.1016/j.jmoneco.2004.05.001

Enders, W., Sachsida, A., & Sandler, T. (2006). The impact of transnational terrorism on US foreign direct investment. *Political Research Quarterly*, *59*(4), 517–531. doi:10.1177/106591290605900402

Enders, W., & Sandler, T. (1991). Causality between transnational terrorism and tourism: The case of Spain. *Studies in Conflict & Terrorism*, *14*(1), 49–58. doi:10.1080/10576109108435856

Enders, W., & Sandler, T. (1993). The effectiveness of antiterrorism policies: A vector-autoregression-intervention analysis. *American Political Science Review 87*(4), 829–844. doi:10.2307/2938817

Enders, W., & Sandler, T. (1996). Terrorism and foreign direct investment in Spain and Greece. *Kyklos*, *49*(3), 331–352. doi:10.1111/j.1467-6435.1996.tb01400.x

Enders, W., & Sandler, T. (1996). *The political economy of terrorism*. Cambridge, UK: Cambridge University Press.

Enders, W., & Sandler, T. (2002). What do we know about the substitution effect in transnational terrorism. *Researching terrorism: Trends, achievements, failures* 1–22. http://www.utdallas.edu/~tms063000/website/substitution2ms.pdf.

Enders, W., Sandler, T., & Parise, G. F. (1992). An econometric analysis of the impact of terrorism on tourism. *Kyklos*, *45*(4), 531–554. doi:10.1111/j.1467-6435.1992.tb02758.x

Engle, R. F., Ng, V. K., & Rothschild, M. (1990). Asset pricing with a factor-ARCH covariance structure: Empirical estimates for treasury bills. *Journal of Econometrics*, *45*(1–2), 213–237.

Errunza, V., & Losq, E. (1985). International asset pricing under mild segmentation: Theory and test. *The Journal of Finance*, *40*(1), 105–124. doi:10.2307/2328050

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, *10*(1), 1–21. doi:10.2307/2525569

Fields, M. A., & Janjigian, V. (1989). The effect of Chernobyl on electric-utility stock prices. *Journal of Business Research*, *18*(1), 81–87. doi:10.1016/0148-2963(89)90053-2

Glaser, M., & Weber, M. (2005). September 11 and stock return expectations of individual investors. *Review of Finance*, *9*(2), 243–279. doi:10.1007/s10679-005-7592-4

Greenbaum, R. T., Dugan, L., & LaFree, G. (2007). The impact of terrorism on Italian employment and business activity. *Urban Studies*, *44*(5–6), 1093–1108. doi:10.1080/00420980701255999

Hazam, S., & Felsenstein, D. (2007). Terror, fear and behaviour in the Jerusalem housing market. *Urban Studies*, *44*(13), 2529–2546. doi:10.1080/00420980701558392

Hon, M. T., Strauss, J., & Yong, S. K. (2004). Contagion in financial markets after September 11: Myth or reality? *Journal of Financial Research*, *27*(1), 95–114. doi:10.1111/j.1475-6803.2004.00079.x

Jackson, O. A. (2008). The impact of the 9/11 terrorist attacks on the US economy. *Journal of 9/11 Studies*, *20*, 1–27.

Karolyi, G. A., & Martell, R. (2010). Terrorism and the stock market. *International Review of Applied Financial Issues and Economics*, *2*, 285–314.

Khan, A., & Estrada, M. A. (2016). The effects of terrorism on economic performance: The case of Islamic State in Iraq and Syria (ISIS). *Quality & Quantity*, *50*, 1645–1661. doi:10.1007/s11135-015-0226-9

Kim, H., & Gu, Z. (2004). Impact of the 9/11 terrorist attacks on the return and risk of airline stocks. *Tourism and Hospitality Research*, *5*(2), 150–163. doi:10.1057/palgrave.thr.6040013

Kis-Katos, K., Liebert, H., & Schulze, G. G. (2011). On the origin of domestic and international terrorism. *European Journal of Political Economy*, *27*, S17–S36. doi:10.1016/j.ejpoleco.2011.02.002

Koh, W. T. (2007). Terrorism and its impact on economic growth and technological innovation. *Technological Forecasting and Social Change*, *74*(2), 129–138. doi:10.1016/j.techfore.2006.01.005

Kollias, C., Manou, E., Papadamou, S., & Stagiannis, A. (2011). Stock markets and terrorist attacks: Comparative evidence from a large and a small capitalization market. *European Journal of Political Economy*, *27*, S64–S77. doi:10.1016/j.ejpoleco.2011.05.002

Krieger, T., & Meierrieks, D. (2010). Terrorism in the worlds of welfare capitalism. *Journal of Conflict Resolution*, *54*(6), 902–939. doi:10.1177/0022002710367885

Kumar, S., & Liu, J. (2013). Impact of terrorism on international stock markets. *The Journal of Applied Business and Economics*, *14*(4), 42.

Larocque, D., Lincourt, G., & Normandin, M. (2010). Macroeconomic effects of terrorist shocks in Israel. *Defence and Peace Economics*, *21*(4), 317–336.

Lin, C.-H., Liou, D.-Y., & Wu, K.-W. (2007). Opportunities and challenges created by terrorism. *Technological Forecasting and Social Change*, *74*(2), 148–164. doi:10.1016/j.techfore.2006.02.004

Meierrieks, D., & Gries, T. (2013). Causality between terrorism and economic growth. *Journal of Peace Research*, *50*(1), 91–104. doi:10.1177/0022343312445650

Mezrich, J., & Engle, R. F. (1996). *GARCH for groups*. *Risk*, *9*(8), 36–40.

Miller, E., & Kammerer, W. (2017). Global Terrorism in 2017: START Background Report. Maryland: University of Maryland. Retrieved from https://www.start.umd.edu/pubs/START_GTD_Overview2017_July2018.pdf.

Mun, K.-C. (2005). Contagion and impulse response of international stock markets around the 9–11 terrorist attacks. *Global Finance Journal*, *16*(1), 48–68. doi:10.1016/j.gfj.2005.05.002

Nguyen, A. P., & Enomoto, C. E. (2009). Acts of terrorism and their impacts on stock index returns and volatility: The cases of the Karachi and Tehran stock exchanges. *The International Business & Economics Research Journal*, *8*(12), 75–86.

Nikkinen, J., Omran, M. M., Sahlström, P., & Äijö, J. (2008). Stock returns and volatility following the September 11 attacks: Evidence from 53 equity markets. *International Review of Financial Analysis*, *17*(1), 27–46. doi:10.1016/j.irfa.2006.12.002

Nikkinen, J., & Vähämaa, S. (2010). Terrorism and stock market sentiment. *Financial Review*, *45*(2), 263–275. doi:10.1111/j.1540-6288.2010.00246.x

Powers, M., & Choi, S.-W. (2012). Does transnational terrorism reduce foreign direct investment? Business-related versus non-business-related terrorism. *Journal of Peace Research*, *49*(3), 407–422. doi:10.1177/0022343312436768

Ramiah, V., & Graham, M. (2013). The impact of domestic and international terrorism on equity markets: Evidence from Indonesia. *International Journal of Accounting & Information Management*, *21*(1), 91–107. doi:10.1108/18347641311299768

Sandler, T. (2011). New frontiers of terrorism research: An introduction. *Journal of Peace Research*, *48*(3), 279–286. doi:10.1177/0022343311399131

Schneider, G., & Troeger, V. E. (2006). War and the world economy stock market reactions to international conflicts. *Journal of Conflict Resolution*, *50*(5), 623–645. doi:10.1177/0022002706290430

Schwert, G. W. (1981). The adjustment of stock prices to information about inflation. *The Journal of Finance*, *36*(1), 15–29. doi:10.1111/j.1540-6261.1981.tb03531.x

Singh, P. (2013). Impact of terrorism on investment decisions of farmers evidence from the Punjab insurgency. *Journal of Conflict Resolution*, *57*(1), 143–168. doi:10.1177/0022002712464850

Smolović, J. C., Lipovina-Božović, M., & Vujošević, S. (2017). GARCH models in value at risk estimation: Empirical evidence from the Montenegrin stock exchange. *Economic research-Ekonomska Istraživanja*, *30*(1), 477–498. doi:10.1080/1331677X.2017.1305773

START. (2014). *GTD global terrorism database*. Maryland: University of Maryland.

Tahir Suleman, M. (2012). Stock market reaction to terrorist attacks: Empirical evidence from a front line state. *Australasian Accounting, Business and Finance Journal*, *6*(1), 97–110.

Tauchen, G. E., & Pitts, M. (1983). The price variability-volume relationship on speculative markets. *Econometrica: Journal of the Econometric Society*, *51*(2), 485–505. doi:10.2307/1912002

White, G., Porter, M. D., & Mazerolle, L. (2013). Terrorism risk, resilience and volatility: A comparison of terrorism patterns in three Southeast Asian countries. *Journal of Quantitative Criminology*, *29*(2), 295–320. doi:10.1007/s10940-012-9181-y

Wu, X., Zhou, H., & Wang, S. (2018). Estimation of market prices of risks in the GARCH diffusion model. *Economic Research-Ekonomska Istraživanja*, *31*(1), 15–36. doi:10.1080/1331677X.2017.1421989.