



## Influence of Terrorist Activities on Financial Markets: Evidence from Karachi Stock Exchange

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### ABSTRACT

This paper investigates the influence of terrorist activities taking place in Pakistan on KSE (Karachi Stock Exchange) for the period of 01/2005 to 12/2010 using the GARCH & GARCH- EVT to identify the relationship between these two variables, the study establishes that the terrorist activities adversely affect the financial markets and in case of KSE, it is highly significant relation. Reason for the negative relationship exists because of the foremost increase in number of terrorism attacks in Pakistan.

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### Introduction

Terrorism is the major cause affecting economy of Pakistan and a curse affecting international trade, investments and financial institutions. Terrorism is political issue now-a-days, Stock exchange can be directly or indirectly affected by the terrorism activity (IMF 2005). This study is about the terrorism attack and its negative effect on Karachi stock exchange (KSE), unfortunately since 2005 to 2010 there has been increase in terrorist activity in different areas of Pakistan. Although there have not been much relevant studies on this topic but however some studies have been done on impact of terrorism on financial market after 9/11. New York 9/11 terrorist attack has introduced the definition of terrorist before then it was not major topic and prominent issue Wilkinson and Jenkins (2003). Terrorist attack whether happened in anywhere in world specially Asia pacific or any other countries in outer rims of the world affects the stock exchange of every country directly or indirectly. Chen and Siems (2004) put lights that global financial market are strongly inter connected so news from any event flew like a fire across countries (particularly shocking news). However unfortunately terrorist activity in Pakistan since 2001 have been increased so far, so this study's main concern is how the terrorist attack in Pakistan affects the stock exchange but volatility of stock exchange is a result many other factors but terrorism activity can affect stock severely. Further (Karolyi 2006) illustrates after 9/11 attack, terrorism became a major geopolitical threat for the global financial markets as well as for stability of stock markets. Our study differs from the extant literature on two main points, I) Prior studies are confined to the extent of 9/11 attack Madrid bombing or London bombing or other attacks, but our study is purely about the major and critical terrorist attack in Pakistan affecting our stock market. II) No prior study on the attacks of Pakistan affecting its stock market. We are doing it on the bomb blasts in Pakistan and its impact on stock exchange KSE, though

stocks show a negative trend after the major bomb blast as studied before by many scholars.

### Literature Review

Terrorist attacks in the past few years has shown a increasing trend and so as increase the importance of its existence and need for the study to conducted in this field. It is a main issue affecting every economy now-a-days. Sandler and Enders (2002) define terrorism as it is a premeditated use, threat of violence to obtain political objectives through fear directed at public or civilians". Literature in this field of study is still emerging as Karolyi and Martell (2006) stated that "Not every theory has an intuition behind it for conducting an exercise but a synthesis of research in different areas of this field".

Chen and Siems (2004), investigate the effects of 9/11 catastrophe and other 14 major terrorist assault's impact on the global and US stock prices and compare its impact on the political and economic activities with the help event study method. After the tests their conclusion is that, after that event of 9/11 financial markets were severely or ruthlessly crashed and stock prices showed a negative down fall but prior that event it was in better condition.

Berrebi and Klor (2005) conducted a similar study to evaluate the impact of terrorism on the stock market prices of Israeli companies, the same event method study. Conclusion and results of the study shows that, companies which have involvement or deals in stock of defense or security or antiterrorism security company measurers show a positive outcome but other companies show negative trend. So it was concluded that terrorism attacks do have a negative impact on stocks and equity markets.

Further Carter and Simkins (2004), also examined the catastrophic 9/11 event and their impact on airline stocks by the help multivariate regression model. As the market was closed for about six days so they evaluate the stock prices on the first trading day after the major event and their results were stated

that it has different effect on different airline firms because the congress of US passed the Air transport safety and System stabilization Act (Sep 18,2001).

### Terrorism Activity

The effect of terrible catastrophe of 9/11 was also studied by Darkos (2004). In his study he studied the impact of various airline stock listed in different stock markets with the help of

Market Model and his study concluded that measuring with market Beta ( $\beta$ ) shows that systematic risks have more value than it is on average. Market risk of the airline stocks in different stock market showed a rising trend after the event.

Eldor and Melnick (2004) analyzed the Palestine terrorism attacks and their impact on stock prices and exchange rates with the help of time series analysis from 1990 to 2003. The result shows that the suicide bomb blast attacks have impact on both variables stocks and foreign exchange rates. However terror suicide attacks on other targets other than civilian transport have effect on the markets. Nevertheless financial markets are coping up with these terror attacks.

Glaser and Weber (2005) also conducted a study on level of disagreement of different investors on the stock return and volatility of stocks after the event of 9/11. Result of the study showed that after ten days of event 9/11, there was major drop in the stock prices and investor's unexpected trend. Volatility forecast after the attack was elevated or increased.

Further Panagiotis Liargovas (2010) conducted a study on the impact of terrorism on Greek bank's stock with the help of event study method. The study includes the three major terrorist attack New York USA terrorist attack (Sep 9, 2001), Madrid train bombing (March 11, 2004) and London train bombing (July 7, 2005). Nevertheless result of the study indicated that 9/11 attack, London bombing and Madrid bombing shows an abnormal, negative and no effect on Greek bank's stock respectively. 9/11 attack shows a huge and abnormal effect because of the dominancy of US economy over the world's economy. Our study's main concern is to identify the impact of the terrorism activity (Bomb B lasts) on the KSE 100 index.

### Data and Methods

#### The GARCH Model

Bollerslev (1986) introduced GARCH model. GARCH model is a generalized form of ARCH as defined by Engle in 1982. As the ARCH model narrates variance as being dependent on the previous values of squared shocks and ARCH model can break its non-negative constraints. Moreover it entails a greater number of lags to be included in order to catch most of the variations in the variance. The GARCH provides a better fit because it deals in good manner with non-negativity constraints and requires few numbers of lags to be included in the econometric model. Moreover, GARCH model is differentiated from ARCH because it permits the conditional variance to be modeled by previous values of itself in addition to the historic shock. The GARCH model contains an ARCH segment and indicates an element where today's variance can be expressed by previous variances. General GARCH (q, p) model is defined as follows:

$$\sigma_t^2 = \psi_0 + \sum_{i=1}^q \psi_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \phi_j \sigma_{t-j}^2$$

Whereas (p,q) are order of the GARCH and ARCH term respectively. The variance term  $\sigma_t^2$  is the conditional variance at time "t" and  $\psi_0$  indicates constant, whereas  $\psi_i$  and  $\phi_j$  are the parameters,  $\varepsilon_{t-i}^2$  is the indicator of previous squared

shocks and  $\sigma_{t-j}^2$  reflects prior variances. Various studies employed GARCH (1, 1). Brooks (2008) indicates that a GARCH (1, 1), in most cases is enough to grasp the volatility clustering and that higher order is very rare used in the field of finance. Negative variance possibility is very rare; limitations have to be generally specified for these parameters particularly. Therefore GARCH model successfully capture various number of features of financial time series, such as volatility clustering and thick tailed returns. GARCH model becomes stationary when the total of alpha and beta are less than one ( $\alpha + \beta < 1$ ). On the other hand if  $\alpha + \beta = 1$  still the process is stationary because the variance is infinite. The GARCH models applicable in this study will estimate according to maximum likelihood criteria. The  $\varepsilon_t$  is assumed to be normally distributed approximately with an average value of zero and time-varying variance is expressed in this manner ( $\varepsilon_t \sim N(0, \sigma_t^2)$ ).

#### The EGARCH Model

Nelson (1991) introduced the Exponential GARCH model. This model is quite purposeful and useful in comparison to the GARCH because it permits good news and bad news to have a different impact on the volatility. Moreover it also permits big news to have higher impact on volatility. Particularly this model works in two stages, Firstly it takes into consideration the mean and secondly the variance component. EGARCH (p, q) model can be defined in this manner:

$$\log(\sigma_t^2) = \phi + \sum_{j=1}^p \phi_j \left| \frac{\varepsilon_{t-j}}{\sigma_{t-j}} \right| + \sum_{i=1}^q \lambda_i \log(\sigma_{t-i}^2) + \sum_{k=1}^k \omega_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}}$$

Whereas  $\phi, \lambda$ , and  $\omega$  indicates parameters for conditional variance estimation and  $\lambda_i$  shows the effect of the previous period measures on the conditional variance. In case if  $\lambda_i$  is positive which means a positive change in the stock price is related with more positive change and vice versa.  $\phi_j$  coefficient measures the impact of last period information set and narrates the prior standardized residuals impact on the present volatility. Moreover,  $\omega_k$  indicates asymmetric effect in the variance and negative  $\omega_k$  interprets that bad news has greater impact on stock volatility rather than good one have equal magnitude. EGARCH models indicate the logarithmic time-varying conditional variance, where concerned parameters are permitted to be negative. So this element shows that the model does not require any non-negativity limits in the parameters. Therefore the lack of non-negativity limits makes the model more attract full than GARCH. There is however an important condition regarding to the model stationarity that requires particularly. The stationary constraint for an EGARCH (1, 1) model is that the beta should be less than one ( $\lambda < 1$ ). Hence in the case of symmetry, where the amount of positive and negative shocks is equally impacting on the variance,  $\omega$  will be equal to zero. On the other hand if  $\omega < 0$  the strength of a negative (positive) shock will reason the variance to increase (fall) and if  $\omega > 0$  positive and negative shocks will reason the variance to rise or fall respectively. The natural logarithm of the conditional variance is modeled in EGARCH(1,1), and it is calculated as,  $+\beta \ln(\sigma_{t-1}^2)$

Whereas the parameters  $a, \omega, \lambda$  and  $\beta$  are constant parameters, For studying the impact on KSE 100 index data of five years have been collected through Yahoo finance and Karachi Stock Exchange and the data is on the daily is collected on daily basis for analyzing the fact in depth. Collected 100 index data ranges

from January 2005 to December 2010 and indexes are taken in to account after converting them in to returns by using formula (index value on current day/ index value on previous day). EGARCH test are applied to study the negative impact on the KSE index value due to the bomb blasts taking place in any area of Pakistan but category is only the major bomb blast impacts. GARCH-EVT or EGARCH model presented by Nelson have been used to calculate the negative impact of the terrorism activity on the KSE 100 index. For proving the fact we take the day of bomb blast represented as "1" & when no activity has taken place we represented as "0". Resultant coefficient of the test can identify whether there is the negative relationship or positive relationship and as well as it reflects the past impact & present impact on the particular variable.

### Results

Result of test proves that there is negative relation between terrorism activity & Karachi Stock Exchange 100 index with the help of the ARCH approach (Autoregressive Conditional Heteroskedasticity). Two variables are studied to show the impact bomb blast "BB" & "RKSE" Return of KSE index and bomb blast variable was assigned as "0 & 1" or known as Dummy variables. 0 represents that no bomb blast have been taken place & 1 represents that terrorism activity has been taken place. Outcomes from the GARCH shows that there is negative relation, between Karachi Stock Exchange & Terrorism activity (bomb blasts) through coefficient  $-2.88E-03$  and they are highly significant. RESID  $(-1)^2$  signify that there was no effect of the bomb blast on the KSE with the coefficient of 0.327332 and GARCH  $(-1)$  represents that there has been a current relationship between KSE & Bomb blast.

### Econometric Model:

GARCH Equation =  $\lambda C + \lambda \text{RESID}(-1)^2 + \lambda \text{GRACH}(-1) - \text{BOMB BLAST}$

Table 1

	Coefficient	Std. Error	z-Statistic	Prob
<b>RKSE(-1)</b>	0.147478	0.068873	2.141285	0.0323
<b>Variance Equation</b>				
<b>C</b>	0.002972	3.04E-05	97.66242	0.00000
<b>RESID(-1)^2</b>	0.327332	0.004388	74.60118	0.00000
<b>GARCH(-1)</b>	0.001812	0.002169	0.83511	0.40370
<b>BB</b>	-2.88E-03	3.04E-05	-94.71174	0.00000

### Conclusions & Discussions

Our research's main focus is to study the impact of terrorism on KSE with the help of GARCH methodology, with the daily index value of past five years & major bomb blasts affecting the KSE market of Pakistan. Study finds out that there is negative relation between KSE (Karachi Stock Exchange) 100 index value & bomb blasts (Terrorism activity) with the help EGARCH model method dummy variable of (0, 1) of terrorism and daily data of KSE rating, the results are highly significant. Terrorism bomb blast events are taken on daily basis of past five years along with the KSE index ratings & the consequences or

the impact is proved to be negative. There could several other reasons for the change in the value of the KSE index but however terrorism in our country is one of them, terrorism is the key variable which is influencing the Stock exchange of Karachi. Instability in the economy and politics in another vital variable which can also influence the equity market of the country, so recommenced future research can be related to these factors to see the impact on stock exchange. Finally it is important to note that for future study on this topic, researchers should imply alternative methods & techniques to evaluate the impact of terrorism on Stock exchanges because event study methodology has received a lot of criticism.

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