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IMPACT OF POLITICAL INSTABILITY AND TERRORISM ON STOCK RETURNS: EVIDENCE FROM PAKISTAN

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ABSTRACT

This study examines the impact of terrorist activities and regime in Pakistan on the return and volatility dynamics of the financial markets in Pakistan between year 2000 and 2010. The study constructs two dummy variables that quantify political instability and terror and examine the effect on stock market volatility. An ARCH and GARCH model to discover evidence that terrorism and regime has a significant impact on both the return and volatility dynamics of stock markets. To capture the asymmetries in terms of negative and positive shocks, this study also uses threshold GARCH (TGARCH) and an exponential GARCH (EGARCH) model. From both of the TGARCH and EGARCH results, it can be reveal that for the return of KSE-100, there are asymmetries in the news that shows bad news has a larger effect on the volatility of return than good news. Finally study of the reaction of the stock market to terrorist events may also provide indication to investors and speculators to adjust their positions when such events transpire.

INTRODUCTION

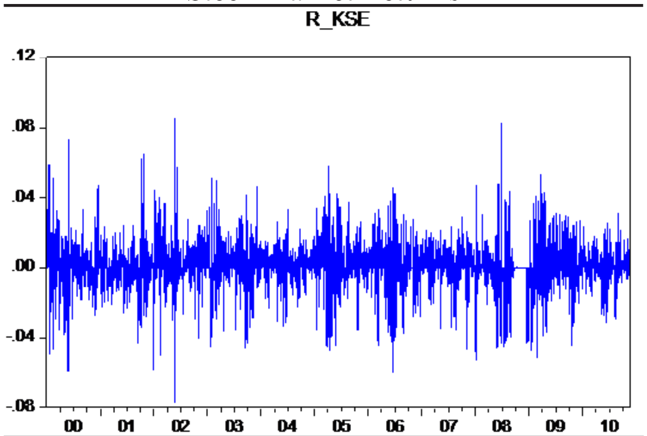
Stock market acts as a barometer for a country's economy. In today's information-oriented world, news travels very fast and contagion can spread quickly and capital markets become more flexible and are absorb shocks brought on different news such as terrorism, political instability etc. Stock market of Pakistan is going through quite rough patch from many years. The change of political government and later on the terrorists' attacks have badly affected the stock market and make the Pakistan Stock Market unreliable place for investment. As by seeing the overall scenario of Pakistan's stock market during that time period it was not difficult for prices to follow certain patterns that support the rejection of Random Walk Hypothesis.

This study examines the impact of change in government and terrorism in Pakistan on the country financial market volatility. Pakistan is one of those episodic-democratic countries who are facing continuous upheavals and socio-political disruptions since their inception. Military interventions could be witnessed in the political history of Pakistan. More over intervallic wars with India, strikes, antigovernment demonstrations and most importantly the ongoing war on terror have popped Pakistan to prominence on the socio-political platform. Such sociopolitical flux, terrorist attacks and other disruptions can have serious implications for stock price movement because stock prices reflect investors' expectations about the future and these stock price movements on aggregate can generate a surged wave of activity.

There has been an extensive work on study of stock market returns and volatility with respect to the fundamental variables and the macroeconomic variables but a diminutive work has been done so far to study the impact of socio-political factors on the stock market volatility in Pakistan. The existing literature on impact of socio-political factors on stock returns volatility is quite inadequate especially if we talk in context of Pakistani market. Masood, & Sergi (2008) analyzed Pakistan's political risks and events that have affected the Pakistani stock market since its independence but their study chiefly covers the political events. Terrorism and strikes which have recently become the matters of intense interest and the source of unrest in the economy are the missing part there.

The Karachi stock market is rapidly converting into a volatile market. If we see figure below it showed that there are high volatility during year 2000 to 2010. This cannot be viewed as a positive sign for this emerging market like Stock market of Pakistan. Though heavy fluctuations in stock prices are not an unusual phenomena and it has been observed at almost all big and small exchanges of the world. But focusing on the reasons for such fluctuations is instructive and likely to have important policy implications. The efficient market hypothesis argues that changes in stock prices are mainly dependent on the dissemination of information regarding the expected returns from the stock and risk associated with that stock.

FIGURE 1
Stock Market Returns



So the purpose of study is to examine empirically the impact of socio-political instability on Pakistani stock market.

LITERATURE REVIEW

A number of theoretical and empirical articles argue that these factors hinder economic growth of a country. Cutler, Poterba and Summers (1989) claimed that the stock prices move in response to the information other than about the fundamental values. They estimate the fraction of stock returns that can be accredited to various kinds of economic and non-economic events including assassinations of important political or national figures, war, invasions, raids and major policy change but their findings suggests a very small effect of non-economic news on the share price.

Most of the studies have found a significant impact of political news or events on the stock market behavior. Chan and Wei (1996) studied the impact of political news on the stock market volatility in Hong Kong and using GARCH-M model they found the strong evidence of the impact of political news on stock market volatility inferring that unfavorable political news is correlated to negative returns for the Hang Seng Index and vice versa. Mei and Guo (1999) examined the impact of political insecurity on the financial crises in emerging markets and they observe that market volatility increased during political election and transition periods and political uncertainty could be a major contributory factor to financial crisis.

Similarly Kim and Mei (2001) infered through empirical analysis using GARCH(1,1) filter that the political risk affect the stock market volatility but this impact of political events or news is asymmetric, with bad news having a greater influence on volatility relative to good news. However Voth (2001) have argued that the impact of political factors in studies on German market has been over stated. He argued that the majority of events escalating political uncertainty had a minute or no effect on the value of German assets and the volatility of their returns. Instead, it was inflation that is mainly responsible for most of the variability in stock returns. He suggests that there is no direct linkage between the political factors and the stock market, however through channel it impacts. But Voth (2002) in a panel study of a set of 10 countries using panel regression confess that during great depression political risks changed dramatically over the period, and are adequate to account for a large part of the boost in stock price volatility.

Beaulieu, Cosset, and Essaddam (2002) examined the impact of political risk in Canada on the volatility of stock returns, covering important political events in the country. Their study suggested that political news performs a significant role in the volatility of stock returns. Moreover the volatility of stock returns also depends on the degree of how much a firm is exposed to political risk i.e. the structure of its assets and the level to which there is foreign involvement. Kutan and Perez (2002) also found a significant impact of social and political factors on stock return volatility in their study conducted on Colombian stock market.

Bautista (2003) applied Regime-switching-ARCH regression on Philippine stock returns to estimate its conditional variance and the estimated volatility was then related to major political and economic events. Their study revealed that the Philippine stock market is sensitive to radical changes in the political situation. Moreover the series of military takeover attempts during late 1980s in Philippines lead to hefty fluctuations in stock market index.

Masood and Sergi (2008) analyzed political risks and events that have affected the Pakistan's stock markets since its foundation. They have found that Pakistan's political risk carries a significant risk premium of between 7.5% and 12%. They made forecasts using Bayesian hierarchical modeling and Markov Chain Monte Carlo (MCMC) techniques and found that there is relatively high probability of occurrence of events with an average arrival rate of approximately 1.5 events per year.

Many others also wrote that political instability warped the future path of investment decisions (Calvo & Drazen 1997), lessened public investment leading to a shift of government budgets from capital spending to government consumption (Darby, Li & Muscatelli (1998), and makes governments less inclined to make improvements to the legal system (Svensson (1993)

Wars and unrest at the borders creates instability and panic among the investors that could affect the stock market movement at large. The effect of war has been analyzed in many studies including Cutler, Poterba, and Summers (1989), Aggarwal, Incaln and Leal (1999), and in Pakistan, Masood and Sergi (2008).

Aggarwal, Incaln, & Leal (1999) examined the sort of events that cause large swings in volatility of emerging stock markets. For this purpose they examine various social, political and economic events both at global and domestic level to find out their explanatory power in context of the returns volatility in the emerging markets including the impact of gulf war. Though at small scale but the impact of gulf war was felt in those emerging markets. Similarly Masood and Sergi (2008) found that among other factors that they studied, wars with India, 1948, 1965, 1971 and 1999 kargil war negatively influenced the Pakistani stock market.

Evia et al. (2008) examined the effect of socio-political conflict in Bolivia on economic performance. Factors studied widespread during the conflicts as strikes, demonstrations, road blockades, and conventional rent-seeking. Their results showed that economic growth due to external factors is positively related to conflict while growth due to productive investment is negatively related to conflict.

Terrorism is another as put that has been studied in relation to economic activity. Many studied in this distance; produced conflicting results as Becker and Murphy (2001) argue that economic performance are not much affected, because terrorist attacks usually devastate only a small portion of the overall stock of capital in a country. By contrast, Abadie and Gardeazabal (2005) repeated that terrorism shape overall economic risk in a country and lead to the economic shakiness in the country. They also conclude their study that higher level of terrorism risks results into the lower levels of foreign direct investment (FDI). Almost all studies on terrorism and its influence on stock prices limited to only on a single or few events, such as the 11 September 2001 attacks, as considered by Hon et al. (2004) and Chen, and Siems (2003) study.

Chen and Siems (2003), used event study methodology to capture the aftermath of terrorism on global capital markets. They studied on the reaction of U.S. capital markets in response to terrorist attacks. Their results showed that capital markets of US are more resilient & flexible than in the past and recover quicker from terrorist attacks than other global capital markets. Their study suggests this increased market resilience to be partially explained by a stable financial sector in US that provides adequate liquidity to support market stability and reduce the spread panic.

METHODOLOGY AND DATA DESCRIPTION

Stock index data is taken from Karachi Stock Exchange which is a well-known and reliable source of stock market information in Pakistan. The daily closing value of KSE-100 index is used for calculating the daily returns.

The closing prices of KSE-100 index for Karachi Stock Exchange are taken for the period January 1 2000 to December 31, 2010. Study used Terrorism in Pakistan as dummy variable of terrorist incidents during this period; Regime, a dummy variable for government changes from fully democratic government to Marshal Law or democratic under such condition. Study has applied ARCH/GARCH technique to capture the results.

ARCH/GARCH Study Models

This section presents the methodology of the paper. Daily data for Karachi stock markets were obtained from Karachi stock exchange and data for terrorism, and regime were obtained from South East Asia Terrorism Portal, and Different News Paper of Pakistan. Study apply ARCH/GARCH tools to see the long term relationship of these variable taking stock return as dependent variable and terror, regime and kargal war as independent variables.

The first ARCH model was presented by Engle (1982). The model suggests that the variance of the residuals at time t depends on the squared error terms from the past periods. Engle simply suggested that it is better to simultaneously model the mean and the variance of a series when we suspect that the conditional variance is not constant.

Consider the simple model:

$$Y_t = \alpha + \beta X_t + \mu_t$$

Where X_t is an n*k vector of explanatory variables and β is a k*1 vector of coefficients.

Normally, it is assume that μ_t is ideally, independently distributed with a zero mean and a constant variance σ^2, or in mathematical notation:

$$\mu_t \sim \text{iid } N(0,\sigma^2)$$

Robert F. Engle (1982) idea starts from the fact that he allows the variance of the residuals (σ^2) to depend on past history or to have heteroskedasticity because the variance will change over time. One way if allowing for this is to have the variances depend on one lagged period of the squared error terms as follows:

$$\sigma^2 = h_t = \gamma_0 + \gamma_1 \mu_{(t-1)}^2$$

Which is basic ARCH (1) process.

Engle ARCH (1) model simultaneously models the mean and variance of the series with the following specification:

$$Y_t = \alpha + \beta X_t + \mu_t \quad \text{(A)}$$

$$\mu_t \sim \text{iid } N(0,\sigma^2)$$

$$\sigma_t^2 = h_t = \gamma_0 + \gamma_1 \mu_{(t-1)}^2 \quad \text{(B)}$$

In ARCH (q) model, the variance equation has the following form:

$$\sigma_t^2 = \gamma_0 + \gamma_1 \mu_{t-1}^2 + \gamma_2 \mu_{t-2}^2 + \ldots\ldots\ldots\ldots + \gamma_q \mu_{t-q}^2$$

In summation form, the above equation can be written as:

$$\sigma_t^2 = \gamma_0 + \sum_{j=1}^{q} \gamma_j \mu_{t-j}^2$$

Also

$\gamma_i \geq 0 \forall i = 0,1,2,3,\ldots,q$

Where:

X_t = Set of Explanatory Variables

σ_t^2 = Conditional variance at time t

iid $N(0,\sigma^2)$ = Ideally, independently distributed with a zero mean and constant variance σ^2

Y_t = Set of Dependant Variables

μ_t = Disturbance term

Where equation (A) is called the mean equation and equation (B) is called the variance equation. The ARCH (1) model says that when a big shock happen in period t-1, it is more likely that the value of μ_t will be bigger as well. That is, when μ_{t-1}^2 is small, the variance of the next innovation μ_tis also small. The estimated coefficient of γ_1 has to be positive for positive variance.

The GARCH model

ARCH provided a framework for the analysis and development of time series models of volatility. However the ARCH model is only the starting point of the empirical study and relies on a wide range of specification tests. One of the drawbacks of ARCH specification, according to Engle (1995), was that it looked like a moving average specification than an auto regression. The GARCH (1, 1) model can be generalized to a GARCH (p, q) model that is, a model with additional lag terms.

From this, a new idea was born which was to include the lagged conditional variance term as autoregressive terms. This idea was worked out by Tim Bollerslev, who in 1986 published a paper entitled 'Generalised Autoregressive Conditional Heteroskedasticity' in Journal of Econometrics, starting a new family of GARCH models.

A high ARCH order is needed to capture the dynamic behaviour of conditional variance. The Generalized ARCH (GARCH) model of Bollerslev (1986) fulfils this requirement as it is based on an infinite ARCH specification which reduces the number of estimated parameters from infinity to two. The general GARCH (p, q) model has the following form:

$$Y_t = \alpha + \beta X_t + \mu_t$$

$$\mu_t \sim \text{iid } N(0,\sigma^2)$$

In that case, the GARCH (p, q) model (where p is the order of the GARCH terms σ_t^2 and q is the order of the ARCH terms μ^2 is given by:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \ldots\ldots\ldots + \alpha_q \mu_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \ldots\ldots\ldots + \beta_p \sigma_{t-p}^2$$

In summation form, the above equation can be written as:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \mu_{t-i}^2 + \sum_{i=1}^{p} \beta_i \sigma_{t-i}^2$$

Where:

σ_t^2 = Conditional variance at time t

iid $N(0,\sigma^2)$ = Ideally, independently distributed with a zero mean and constant variance σ^2

μ_t = Disturbance term

The above can be describe as, the value of the variance scaling parameter σ^2 now depends both on the past values of the shocks (the q MA terms), which are captured by the lagged squared residual terms, and on past values of itself (the p AR terms), which are captured by lagged σ^2 terms.

It is clear from the last equation that forp=0, the model reduces to ARCH (q). The simplest form of GARCH (p, q) is the GARCH (1, 1) model, which has the following form:

$$Y_t = \alpha + \beta X_t + \mu_t \quad \text{(C)}$$

$$\mu_t \sim \text{iid } N(0,\sigma^2)$$

$$\sigma_t^2 = h_t = \gamma_0 + \gamma_1 \mu_{(t-1)}^2 + \gamma_2 \mu_{t-1}^2 \quad \text{(D)}$$

Where equation (C) is called the mean equation and equation (D) is called the variance equation. This model specification usually performs very well and is easy to estimate because it has only three unknown parameters.

RESEARCH ANALYSIS

The data regarding financial market consists of daily closing price, expressed in local currency (rupees), of the KSE-100 index from January 1, 2000 to December 31, 2010. The daily return series has been generated by using the following equation:

$$R_t = \ln\left(\frac{KSE_t}{KSE_{t-1}}\right)$$

Where R_t is the return for day 't' and KSE_t and KSE_{t-1} represents the closing value of the KSE-100 index for day 't' and 't-1' respectively and 'In' stands for Natural Log.

Descriptive Statistics

Table 1 show the average daily returns in percentage terms in the KSE 100 index are 0.05%. The maximum daily return in the Karachi stock market is 8.5% whereas the maximum loss in one day is 7.7%. Study use two independent dummy variable to capturing the impact of regime and terrorism in Pakistan on the volatility of Pakistani stock returns.

TABLE 1
Descriptive Statistics

	RETURN	REGIME	TERROR
Mean	0.0005	0.7467	0.3937
Median	0.0000	1.0000	0.0000
Max	0.0851	1.0000	1.0000
Min	-0.0774	0.0000	0.0000

Testing of ARCH Effect

Table 2 show AR (1) model or one can say for simplicity as the mean equation for KSE-100 index using simple OLS. The results of table 2 do not interest by themselves because these just show the presence of auto regression in the data, not the ARCH effects. The significant AR (1) coefficient in table 2 indicates the presence of significant correlation in returns of the markets, suggesting that future returns could be predicted based on the past returns.

TABLE 2
A simple AR (1) model for the KSE-100

Dependent Variable: R_KSE
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000498	0.000204	2.446672	0.0145
R_KSE(-1)	0.034959	0.015853	2.205171	0.0275

TABLE 3
Testing for ARCH (1) effects in the KSE-100

Heteroskedasticity Test: ARCH

F-statistic	189.2076	Prob. F(1,3973)	0.000
Obs*R-squared	180.6974	Prob. Chi-Square(1)	0.000

The result of table 3 show the presence of ARCH effects in the data or more specifically to check the conditional heteroskedasticity. The Obs*R-squared is 180.6974 and has the probability limit of 0.000. This clearly suggests that we reject the null hypothesis of homoskedasticity or can say that the ARCH (1) effects are present.

The ARCH (1) model

TABLE 4
ARCH (1) model

Dependent Variable: $RESID^2$
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000129	7.31E-06	17.66385	0.000
$RESID^2(-1)$	0.213094	0.015492	13.75528	0.000

Table 4 shows the results of the ARCH (1) model with explanatory variable (Terrorism and Regime in Pakistan) in the variance equation. From table 4, the result shows that terror has significantly impact on volatility of stock market. In ARCH (1), mean equation show that current return can be predicted by past prices.

TABLE 5
An ARCH (1) with explanatory variable in the Variance equation

Method: ML - ARCH (Marquardt) - Normal distribution

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000701	0.000188	3.72453	0.0002
R_KSE(-1)	0.042357	0.019028	2.226	0.0260

Variance Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000128	1.54E-06	83.01755	0.0000
$RESID(-1)^2$	0.214855	0.017348	12.38496	0.0000

The GARCH (1,1) model

Table 6 present the results for a GARCH (1, 1) model. The results of GARCH are presented in Table 1.3. The insignificant value of R_KSE(-1) show that in GARCH (1,1) the current returns cannot be predicted by past prices. From the variance equation, it is seen that current volatility can significantly predicted by past price behaviors and GARCH(-1) term show that phenomena of predicting past volatility is persistent over the period of time. It is also seen that explanatory variables terrorism and political instability both have significant impact of the price volatility.

TABLE 6
A GARCH (1, 1) model with explanatory variable in the Variance equation

Dependent Variable: R_KSE
Method: ML - ARCH (Marquardt) - Normal distribution
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) + C(6)*REGIME + C(7)*TERROR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000852	0.00017	4.995829	0.0000
R_KSE(-1)	0.020403	0.016793	1.214957	0.2244

Variance Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.30E-06	3.64E-07	11.79342	0.00000
RESID(-1)^2	0.093076	0.005121	18.17363	0.00000
GARCH(-1)	0.876677	0.005362	163.4854	0.00000
REGIME	1.51E-06	2.38E-07	6.351193	0.00000
TERROR	-1.25E-06	4.23E-07	-2.957655	0.00310

A TGARCH model

TGARCH (Threshold GARCH) model is used to capture asymmetric behavior in the stock market in terms of negative and positive shocks. For this purpose, it simply adds multiplicative dummy variable into the variance equation to check whether there is statistically significant difference in the behavior of bad and good news.

Table 7 represents TGARCH (1,1) model for the KSE-100. The results of the TGARCH (1,1) showed that the coefficient of RESID(-1)^2*(RESID (-1) <0) term is highly statistically significant (significance level is 5%) and positive which indicate that bad news are creating more volatility in stock market than good news.

The significant value of R_KSE(-1) show that in TGARCH (1,1) the current returns can be predicted by past stock prices. From the variance equation, it is seen that current volatility can significantly predicted by past price behaviors and GARCH(-1) term show that phenomena of predicting past volatility is persistent over the period of time. It is also seen that explanatory variables terrorism and political instability both have significant impact of the price volatility.

TABLE 7
A TGARCH (1,1) model for the Returns of KSE-100 with an explanatory variable in the variance equation

Dependent Variable: R_KSE
Method: ML - ARCH (Marquardt) - Normal distribution
GARCH=C(3)+C(4)*RESID(-1)^2+C(5)*RESID(-1)^2*(RESID(-1)<0)+C(6)*GARCH(-1)+C(7)*TERROR + C(8)*REGIME

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000681	0.000171	3.984386	0.0001
R_KSE(-1)	0.032116	0.017003	1.888851	0.0500

Variance Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.96E-06	4.00E-07	12.40635	0.00000
RESID(-1)^2	0.05152	0.005218	9.873138	0.00000
RESID(-1)^2 *(RESID(-1)<0)	0.078549	0.007756	10.12775	0.00000
GARCH(-1)	0.872875	0.005623	155.2226	0.00000
TERROR	-1.76E-06	4.41E-07	-3.996234	0.00010
REGIME	1.79E-06	2.45E-07	7.326947	0.00000

An EGARCH model

The ARCH/GARCH model may not capture the volatility clustering observed in financial returns data when shocks to the volatility are not symmetric. Table 8 is showing the results of exponential general autoregressive conditional heteroskedastic (EGARCH specification which was firstly proposed by Nelson (1991).

The results of the EGARCH (1, 1) shows that the coefficient of RESID (-1)/@SQRT (GARCH (-1)) term is highly statistically significant (significance level is 5%) and negative. Therefore for the KSE-100 index bad news has larger effects on the volatility of the return of KSE-100. From both of the TGARCH and EGARCH results, it can be reveal that for the return of KSE-100 there are asymmetries in the news especially bad news has a larger effects on the volatility of series than good news.

TABLE 8
An EGARCH (1,1) model for the KSE-100 100 with an explanatory variable in the variance equation

Dependent Variable: R
Method: ML - ARCH (Marquardt) - Normal distribution
LOG(GARCH)=C(3)+C(4)*ABS(RESID(-1)/@SQRT(GARCH(-1)))+C(5)*RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG(GARCH(-1)) + C(7)*REGIME + C(8)*TERROR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001024	0.000131	7.795457	0.0000
R(-1)	0.033195	0.015826	2.097497	0.0359

Variance Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(3)	-0.565423	0.026895	-21.02359	0.0000
C(4)	0.197343	0.008141	24.24054	0.0000
C(5)	-0.075927	0.005518	-13.7608	0.0000
C(6)	0.950779	0.002801	339.4778	0.0000
C(7)	0.006068	0.003516	1.725906	0.0844
C(8)	-0.022481	0.004402	-5.107116	0.0000

CONCLUSIONS AND RECOMMENDATIONS

This study analyzed the impact of terrorist related activities and political instability on the return and volatility dynamics of Karachi Stock Exchange (KSE) in Pakistan using daily time series data from January 1, 2000 to December 31, 2010.

In order to find whether terrorist activities and political instability have a statistically significant effect ARCH family models were used. Since, in ARCH / GARCH model a positive shock will have exactly the same effect in the volatility of the series as a big negative shock of the same magnitude. However, for equities it has been observed that negative shocks (or bad news) in the market have a larger impact on the volatility than a positive shocks (or bad news) of the same magnitude. To capture the asymmetries in terms of negative and positive shocks, threshold GARCH (TGARCH) model was used. To confirm the results of TGARCH model, this study has analyzed the results of exponential GARCH (EGARCH) model which was firstly developed by Nelson (1991). Results of ARCH/GARCH family showed that current market return can be predicted significantly with the help of past stock prices. It also showed that current stock market volatility can be significantly predicted with the past price volatility and GARCH(1,1) model showed that predicted volatility in persistent in nature. It can also draw asymmetric price behavior pattern in the stock market through TGARCH and EGARCH reconfirms the results.

The antiphon of the equity market of Pakistan to terrorist activities and political instability provide clues to investors and speculators in Pakistan to adjust their positions when such events occur and help regulatory authorities take actions to ensure that adequate liquidity is provided to adjust market into normal conditions.

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