Time Varying Volatility of Stock Exchanges: Comparative Analysis of Pakistan with Newly Industrialized Countries

Safdar Husain Tahir[*], Rikza Sarosh[†], Asma Shoukat[‡], Gulzar Ahmad[§] and Muhammad Rizwan Ullah[**]

Abstract

The study aims to explore the nexus of clustering volatility due to time span and loaning effects of Pakistan Stock Exchange (PSX) with the financial markets of newly industrialized countries (NIC). The daily based time series data ranging from June3, 2003 to Dec 31, 2016 from some NIC countries like India, Philippines, South Africa, Brazil, Turkey, Mexico and Malaysia (Hossain, M. S., 2011) are taken for analysis of the study. Augmented Dickey–Fuller (ADF) test is used to check the stationarity of the data. ARCH test reveals volatility clustering in all indices except China. ARCH and GARCH coefficients remain significant, which indicates the inefficiency of these markets. EGARCH and TARCH model show the presence of lever´s effect. New information as arrived in the financial market influences the price volatility. Negative news creates more volatility as compared to positive in the markets that indicates asymmetrical response. Based on AIC & SC criteria GARCH Model is better fit in India, Philippines, South Africa, Brazil, Pakistan, Turkey and Mexico expect Malaysia, where TARCH model is better fit. Policy makers, investors and administrators especially of stock markets could use these findings to predict the volatility for hedging risk in the process of global portfolio management (Errunza, V. R., 1983).

Keywords: Volatility clustering, Leverage effects, Stock Markets, Pakistan, Newly industrialized countries**.**

Introduction

Volatility dynamics between different countries have gained much importance for discussion in finance, academics and policy makers. During the last decade, newly industrialized countries showed rapidly

[*] Safdar Husain Tahir, Associate Professor, Lyallpur Business School, Government College University, Faisalabad.Email: drsafdar@gcuf.edu.pk

[†] Rikza Sarosh, MS-Scholar, Lyallpur Business School, Government College University, Faisalabad

‡ Asma Shoukat, MS-Scholar, Lyallpur Business School, Government College University, Faisalabad

[§] Gulzar Ahmad, Professor, Department of Psychology, Lahore Garrison University, Lahore.

** Muhammad Rizwan Ullah, MS-Scholar, Lyallpur Business School, Government College University, Faisalabad

growth in equity markets that plays important role in the expansion of economy (Hossain, M. S., 2011). Financial market of every country is viewed as a key indicator of the country's economy (Chen, S. S., 2009). The economists use NIC a group of countries that considers in between developing and developed nations. These countries, which fall underthis classification, are considered by fast export-driven financial development and relocation of workers from rural areas to urban areas(Kobrin,S.J.,2000).

Major reason for choosing these countries is that these newly industrialized countries markets are more attractive and investors searches these markets for gaining high returns (Yang, C. H., & Chen, J. R., 2003). Investors are more interested to make an investment in these newly industrialized countries. Because these countries provide higher return with higher, risk due to volatility in micro economic variable and efficiency of stock market (Errunza, V. R., 1983).

Volatility is a ratio at which price of security variates for a certain set of returns. When a security price varies quickly in a short time, it is called high volatility and when security price varies gradually in a long time, it is called low volatility. Volatility is used in various ways for example in trading, investing and predicting the direction of stock market (Bohl, M. T., & Henke, H., 2003).Volatility can also be used to assume the fair value of an asset. Some stocks have a tendency to be more volatile than other means that price changes in these stocks are frequent. In stock market this relative volatility is called beta of stock .If a stock has same relative volatility as broad market, those stock which are more volatile have beta greater than 1.00 and low volatility stocks have less than 1.00 beta.

Volatility is generally concerned with market information and transfer of information leads to up and down of stock markets. Stock market volatility is considered as a risk management technique, which is important for both policy makers and fund managers in terms of risk diversification. (Adrian, T., & Rosenberg, J., 2008). The volatility could has critical effects on many variables like capital investment and consumption factors that further impact on business cycle (Demirgüç-Kunt, A., & Levine, R. 1996). That is why; especially option traders and investors of stock markets to forecast the new trend in markets use volatility, as a key indicator. There are two notable types of volatility i.e. historical as well as implied volatilities.

Some researchers (Bollerslev, T., & Mikkelsen, H. O., 1996) & Madhavan, 1992) define volatility in the context of share price change. Investor's prefer Lower volatility because low volatility minimize the

avoidable risk tolerated by shareholders thus enables market brokers for liquidate their assets without large price movements (Rossi, M., 2014).

The volatility clustering is common in time series data around the globe Niu, H., & Wang, J. (2013). Characteristics of volatility are i.e. volatility clustering, persistence of shocks, leverage effect. The volatility clustering is piles of low and high prices for the return of financial asset. The persistence of shock is a measure to demonstrate how much time a price shock takes for decline in financial time series. Lever effect of loans demonstrates the negative correlation between current asset return and future volatility of asset return. All this information can be helpful in global portfolio allocation and hedging in financial markets.

The main seasons, which cause high volatility in stock markets are an extensive conversation among the participant of market and academics. French (1980) & Fama (1965) established that volatility is initiated by trade, means that larger the trade level and size, movement in prices are greater. French & Roll (1986) found that reasons of volatility in stock markets are interest, inflation rate, credit policy, financial advantage, business earnings, and policies of dividend yields and bonds prices. Ghouse et al. (2015) studied that the transmission mechanisms connecting worldwide stock markets this is significant for both who makes policies and managing fund in terms of risk diversification. Gokbulut and Pekkaya (2014) discovered that volatility of financial markets, mainly stock markets, is a significant issue that alarms the academics also experts as well. Most of the time volatility leads to financial crisis. Joshi (2012) studied that stock market volatility has turn out to be a problem of joint distress in current years for stockholders, managers and agents. Volatility of stock return deters financial performance through customer expenses. Volatility of stock returns may possibly dismayed capital investment and spending any corporation. Extreme volatility could disturb the smooth operation of the financial system that lead to structural or regulatory changes. Kansaro et al. (2009) studied that developing markets are facing various obstacles in their fiscal markets, excess volatilities in share price is also considered as high risk and this is the reason the stockholders become fearful and leave the stock market. Karmakar (2007) explored that in recent years modeling of stock market volatility was very active.

Objectives of the study

To find the volatility characteristics i.e. volatility clustering and leverage effects of Pakistan stock exchange (PSX) with stock exchanges of newly industrialized countries.

Literature Review and hypotheses development

Empirical studies on volatility behavior for developed markets are sufficient but study on newly industrialized have gain importance due to globalization and association of markets. Ghufran et al. (2016) investigated the volatility in KSE with the perspective of behavioral finance. They used ARCH, GARCH and EGARCH models to check the volatility at KSE 100 index. Yan (2015) concluded by using EGARCH model that China stock price Volatility far greater than US markets and Japanese markets. Relationship between three economies is important to predict the future development of their economies. Abbas et al. (2013) studied about the existence of transmission of volatility among local stock markets and long running relationship among Sri-lanka, China, Pakistan, India and some other countries of developed nations such like Japan, USA, Singapore and UK). Indices of all eight markets in the study showed the effects of loans is significant. The current study add value in the existing literature in examining the volatility clustering in these countries. This study is significant to rest of the world.

Pakistan has a geostrategic location in Asia as one of the largest and most populated continents in the world. Pakistan lies at the junction of Central Asia, South Asia and West Asia linking the continental landmasses of Eurasia with Afro-Asia and Europe, and connecting high-income countries of the world with low-income countries Afghanistan, Africa. Therefore, Pakistan's development also has global political and economic implications. The creation of the China–Pakistan Economic Corridor (CPEC) in May 2013 heightens this significance (Hussain, E., 2019). China uses this corridor to transport cargo to the Gwardar port for further shipment to West Asia and Africa. However, there has also been an investment of USD$46B in infrastructure projects that strengthen Pakistan's economic activities with countries such as Saudi Arabia, Iran, Afghanistan and China.

China and Pakistan both had friendly relation and geologically closed to each other. Developed nations such like Japan, USA, Singapore & UK and other Asian countries indicate link spillover with existing co-cooperation of Pakistan and China (Jebran, K., Chen, S., Ullah, I., & Mirza, S. S., 2017). Volatility spillovers found from USA, UK, Japan, and Singapore to the four Asian markets such like Sri-lanka, Pakistan India, Sri-lanka China (Abbas, Q., Khan, S., & Shah, S. Z. A., 2013). They documented that these outcomes is linked of investment and economic trade among countries (Mukherjee, K., & Mishra, R. K., 2007). Joshi (2012) concluded that the volatility in the Asian stocks market exhibits the persistent of volatility, volatility clustering and mean reverting behavior by using GARCH and TARCH models on nine years data of Asian markets. They explored the presence of leverage effect in

all stock exchanges of Asia before and during the crisis. However, studies showed a robust nexus of China, India, Japan, Hong Kong, Indonesia and Malaysia with US markets.

Kanasro et al. (2009) concluded that high volatility is present in KSE-100 and KSE all share index. Similarly, Srivastava (2008) found that in the Indian stock market leverage effects are present. Saleem (2007) examined the leverage effects and modeling of time varying volatility of KSE 100 (Pakistan stock exchange). He used GARCH for modeling the time varying volatility and for capturing advantage effects EGARCH model was used, reported that KSE 100 returns were related to high volatility and adverse returns of equal level of magnitude. Evident provided in this research that historical residuals influence highly on current volatility.

Methodology

The study aims to find out the volatility characteristics i.e. volatility clustering and financial l effect of leverage of Pakistan Stock Exchange (PSX) with newly industrialized countries i.e. India, Philippines, South Africa, Brazil, Turkey, Mexico and Malaysia. Variables of the study are Daily return of KSE 100 index (Pak), SSE composite index (china), S&P BMV IPC index (Mexico), BOVESPA index (Brazil), FTSE Philippines index (Philippines), BIST 100 index (Turkey), NIFTY 50 index (India), FTSE KLCI index (Malaysia), FTSE South Africa index (South Africa). For objectives of the study, the daily based time series data ranging from June 3, 2003 to Dec 31, 2016 from some NIC countries like India, Philippines, South Africa, Brazil, Turkey, Mexico and Malaysia (Hossain, M. S., 2011) are taken for analysis. Augmented Dickey–Fuller (ADF) test is used to check the stationarity of the data. ARCH and GARCH, EGARCH and TARCH models are applied for analysis of data. The daily returns of indices are computed as below mentioned formula.

$$ROD=Ln\ (CDP\ /PDP) \text{ ---------- (1)}$$

Where, ROD = return on days, Ln=Natural log, CDP= Current day price on index, PDP =prior day price on index. The regression model is as below:

$$\Delta Z_t = (X\text{-}1)\ Z_t\text{-}1+\varepsilon_t=\delta z_t\text{-}1+\varepsilon_t \text{ ---------- (2)}$$

ARCH Model

Robert F. Engle developed this model (ARCH model) by assuming that the **c**urrent error term variance is associated with the size of the earlier period`s error terms that leads to rise the volatility clustering

$$E_t^2 = B_0+\left[\sum_{t-1}^{a} \mathrm{B}\ \epsilon_{t-0}^2\right]+\mathcal{U}_t \text{----------(3)}$$

Where $\boldsymbol{E_t^2}$ (error term) indicates residual value. It is a regression model of the square of residual value on a constant and lagged square residual value up to order a.

GARCH Model

$$\sigma^2_{t=\omega+\sum_{i=1}^{q} a_i S^2_{t-i}+\sum_{j=1}^{p} \beta_j S^2_{t-j}} \text{----------(4)}$$

Where q and p indicates the ARCH and GARCH processes respectively. The volatility is gauged as lagged of square residual value from the mean of equation (ARCH term) $a_i S^2_{t-i}$. There q indicates new information arrival and the estimates of p. Similarly $\beta_j S^2_{t-j}$ gives the effect previous (old) information on volatility.

TARCH Model

Leverage effects is checked through TARCH model that helps in checking that either bad news create more volatility or good news create more volatility on index.

$$v^2_{t=M+\sum_{-i=1}^{q} \beta_i \delta^2_{t-i}+\sum_{i=1}^{p}} \quad a_i \epsilon^2_{t-i+\sum_{k=1}^{r} y_k \epsilon^2_{t-k}\ r^t-k--(5)}$$

Where r^t =1 if $\epsilon_{t<0}$ and 0 indicates otherwise. This model shows good information with $\epsilon_{t-1>0}$ and similarly bad information with $\epsilon_{t-1>0}$, For the difference effects on the conditional variance, good information indicates with a_i , while bad information with $a_i + y_i$. If $y_i > 0$. If bad information enhance volatility then we can say that there is an effect of leverage effect i-[th] order. If $y_i \neq 0$, exhibits asymmetric information.

EGARCH Model

Nelson (1991) used GARCH and EGARCH Models for nonnegative constraints on the parameters and no restrictions on parameters respectively. In these models, he used the conditional variance,v_t , is an asymmetric function produce disturbance in lagged period`s value.

$$\text{Log}(v^2_{t)=M+\sum_{i-1}^{q} B_{ilog} v^2_{t-i}})+\sum_{i-1}^{p} xi+\left[\frac{et-1}{\sigma t-1}\right]+\sum_{k-1}^{r} yk \frac{et-k}{vt-k} \ldots\ldots\ldots (6)$$

Please note that the log of the conditional variance indicates that effects of leverage. The exponent (quadratic) examines of the conditional variance as provided by nonnegative. The impact is asymmetric if $y_i \neq 0$

Empirical Results

The ADF test indicates all series are non-stationary at level with intercept. At first difference, there series reveal stationary at statistical level of 1%, 5% and 10%. Table-1 exhibits the results of ADF test for unit root.

Table 1: ADF Unit Root Test

Measures	ADF test	At Level in % Critical Values		Stock Ex	ADF test	At Level in % Critical Values	
	-28.04	0.01 Level	-3.96		-54.39	0.01 Level	-3.96
FTSEKLCI	(0.00)	0.05 Level	-3.41	KSE	(0.00)	0.05 Level	-3.41
		0.10 Level	-3.12			0.10 Level	-3.12
	-54.19	0.01 Level	-3.96		-47.48	0.01 Level	-3.96
FTSEP	(0.00)	0.05 Level	-3.41	S&PBMV	(0.00)	0.05 Level	-3.41
		0.10 Level	-3.12			0.10 Level	-3.12
	-58.70	0.01 Level	-3.96		-43.84	0.01 Level	-3.96
BIST	(0.000	0.05 Level	-3.41	FTSESA	(0.00)	0.05 Level	-3.41
		0.10 Level	-3.12			0.10 Level	-3.12
	-34.10	0.01 Level	-3.96		-59.07	0.01 Level	-3.96
BOVSPA	(0.00)	0.05 Level	-3.41	NIFTY	(0.00)	0.05 Level	-3.41
		0.10 Level	-3.12			0.10 Level	-3.12
	-37.84	0.01 Level	-3.96		-43.84	0.01 Level	-3.96
SSE	(0.00)	0.05 Level	-3.41	FTSESA	(0.00)	0.05 Level	-3.41
		0.10 Level	-3.12			0.10 Level	-3.12

Table-2 exhibits the result of ARCH Model. It shows the possible presence of ARCH effects in all countries stock exchange except China. The findings show that there is clustering effects in return i.e. small (large) shocks are followed by small (large) ones. In addition, the results indicate that large ones follow the error process. Similarly, the study shows conditional volatility through ARCH and GARCH models with mean return.

Table 2: ARCH Model

Country	F-Value	Obs*R^2	Prob. Chi-Sq (1)	Prob. F
Pakistan	582.23	499.45	0.00	0.00
India	174.35	166.17	0.00	0.00
China	0.09	0.09	0.75	0.75
South Africa	139.51	134.24	0.00	0.00

Malaysia	1164.38	874.15	0.00	0.00
Mexico	114.33	110.78	0.00	0.00
Brazil	1165.29	874.66	0.00	0.00
Turkey	40.61	40.16	0.00	0.00
Philippines	34.90	34.58	0.00	0.00

Table-3 describes the GARCH effects as GARCH (1, 1) model is estimated. Result of GARCH Model display significant positive results the coefficient C. Similarly, GARCH (-1) exhibits significant positive results. Whereas the coefficient ofARCH and GARCH models explicitly show conditional variance as influenced by lagged variance. It is, therefore, indication the significance of previous shocks on current return. These evidence signals toward not weak form of efficiency in all indices expect SSE.

Table 3: GARCH Model

Measure	Coefficient	St. Err.	Z-statistic	Probability
		Pakistan		
C	0.001376	0.00	8.81	0.00
		VE*		
C	5.69E-06	4.50E-07	12.65	0.00
RESID(-1)^2	0.166077	0.0103	15.99	0.00
GARCH (-1)	0.802799	0.009154	87.69	0.00
Schwarz criterion	-6.226787		AIC**	-6.23
		India		
C	0.000911	0.000185	4.93	0.00
		VE*		
C	3.34E-06	4.37E-07	7.65	0.00
RESID(-1)^2	0.099857	0.006657	14.99	0.00
GARCH(-1)	0.886746	0.006910	128.32	0.00
Schwarz criterion	-5.874554		AIC**	-5.88
		South Africa		
C	0.000752	0.000157	4.783897	0.00
		VE*		
C	2.51E-06	4.67E-07	5.373608	0.00
RESID(-1)^2	0.097290	0.008724	11.15144	0.00
GARCH(-1)	0.884700	0.009733	90.89716	0.00
Schwarz criterion	-6.306374		AIC**	-6.31
		Malaysia		
C	0.000752	0.000157	4.783897	0.00
		VE*		
C	2.51E-06	4.67E-07	5.373608	0.00
RESID(-1)^2	0.097290	0.008724	11.15144	0.00
GARCH(-1)	0.884700	0.009733	90.89716	0.00
Schwarz criterion	-6.306374		AIC**	-6.31
		Mexico		
C	0.000707	0.000165	4.290920	0.00
		VE*		
C	2.20E-06	3.55E-07	6.193265	0.00

$RESID(-1)^2$	0.089054	0.006609	13.47369	0.00
GARCH(-1)	0.895906	0.007436	120.4888	0.00
Schwarz criterion	-6.274205		AIC**	-6.28
		Brazil		
C	0.000796	0.004294	0.185285	0.85
		VE*		
C	0.004742	1.87E-05	253.3731	0.00
$RESID(-1)^22$	0.083678	0.015005	5.576716	0.00
GARCH(-1)	-0.011275	0.001981	-5.690477	0.00
Schwarz criterion	-3.113870		AIC**	-3.12
		Turkey		
C	0.001103	0.000254	4.350510	0.00
		VE*		
C	1.19E-05	1.62E-06	7.354990	0.00
$RESID(-1)^2$	0.097619	0.007201	13.55698	0.00
GARCH(-1)	0.863123	0.010519	82.05725	0.00
Schwarz criterion	-5.415827		AIC**	-5.42
		Philippines		
C	0.000781	0.000187	4.186675	0.00
		VE*		
C	3.86E-06	4.12E-07	9.373167	0.00
$RESID(-1)^2$	0.098572	0.006921	14.24298	0.00
GARCH(-1)	0.882962	0.006721	131.3767	0.00
Schwarz criterion	-5.977095		AIC**	-5.98

*Variance Equation **Akaike info criterion

For more information, the study used EGARCH model for examining the impact of good or bad news as in Table-4. The results in Table-4, of EGARCH model shows the significance of leverage effects. Coefficient of the C_4 is negative and statistically significant in all countries except for SSE (China). It implies that every change in price respond asymmetrically to the negative (positive) news in the markets. However, the strength of positive news is less than negative news on conditional variance. Therefore, it is clear that all stock markets are inefficient in the whole region except China.

Table 4: EGARCH Model

Variable	Coefficient	St. Err.	z-Statistic	Prob.
		Pakistan		
C	0.000927	0.000122	7.580814	0
		VE*		
C(2)	-0.867918	0.047008	-18.46303	0
C(3)	0.332067	0.014443	22.99103	0
C(4)	-0.105942	0.009907	-10.69383	0
C(5)	0.931334	0.004529	205.6266	0
Schwarz criterion	-6.245609		Akaike info criterion	-6.254405
		India		
C	0.000610	0.000182	3.341300	0.0008
		VE*		

C(2)	-0.386042	0.028932	-13.34295	0
C(3)	0.208213	0.012162	17.11937	0
C(4)	-0.085342	0.006859	-12.44242	0
C(5)	0.973895	0.002653	367.1092	0
Schwarz criterion	-5.887182		Akaike info criterion	-5.895978
		South Africa		
C	0.000424	0.000154	2.754765	0.0059
		VE*		
C(2)	-0.287615	0.033543	-8.574612	0
C(3)	0.127957	0.013005	9.839143	0
C(4)	-0.099741	0.008840	-11.28249	0
C(5)	0.979444	0.003178	308.1900	0
Schwarz criterion	-6.328530		Akaike info criterion	-6.337327
		Malaysia		
C	0.002469	4.80E-05	51.46408	0
		VE*		
C(2)	-9.916421	0.015909	-623.3099	0
C(3)	3.625418	0.024445	148.3080	0
C(4)	-3.292624	0.024615	-133.7624	0
C(5)	0.004309	0.001135	3.794954	0.0001
Schwarz criterion	-4.675553		Akaike info criterion	-4.684350
		Mexico		
C	0.000384	0.000159	2.413413	0.0158
		VE		
C(2)	-0.294416	0.026439	-11.13565	0
C(3)	0.152344	0.012537	12.15131	0
C(4)	-0.090286	0.007909	-11.41552	0
C(5)	0.980502	0.002421	405.0293	0
Schwarz criterion	-6.292453		Akaike info criterion	-6.301250
		Brazil		
C	-0.005564	8.75E-05	-63.60903	0
		VE		
C(2)	-2.966617	0.036354	-81.60469	0
C(3)	2.286103	0.022551	101.3744	0
C(4)	0.138191	0.023480	5.885448	0
C(5)	0.769643	0.004443	173.2176	0
Schwarz criterion	-3.854740		Akaike info criterion	-3.863536
		Turkey		
C	0.000836	0.000238	3.515227	0.0004
		VE		
C(2)	-0.530508	0.049010	-10.82442	0
C(3)	0.180523	0.012454	14.49543	0
C(4)	-0.070530	0.006977	-10.10827	0
C(5)	0.952504	0.005394	176.5956	0
Schwarz criterion	-5.422864		Akaike info criterion	-5.431660
		Philippines		
C	0.000627	0.000184	3.402661	0.0007
		VE		
C(2)	-0.382916	0.029046	13.18296	0
C(3)	0.192397	0.010306	18.66912	0
C(4)	0.062751	0.006210	-10.10519	0

C(5)	0.972899	0.003019	322.2376	0
Schwarz criterion	-5.992163		Akaike info criterion	-5.983367

Leverage effects are tested by TARCH model as in Table-5. The RESID (-1) ^{2}*(RESID (-1) <0) is positive significant. The intensity of negative news generate more volatility in comparison with positive news. However, positive (negative) shocks have diverse influence on the volatility of all indices.

Table 5: TARCH Model

Variable	Coefficient	St. Err.	**z-Statistic**	**Prob.**
		Pakistan		
C	0.001207	0.000160	7.525082	0
		VE*		
C	7.01E-06	5.22E-07	13.42104	0
RESID(-1)^2	0.099767	0.011034	9.041758	0
RESD(-1)^2*(RESD(-1)<0)	0.146491	0.018712	7.828883	0
GARCH(-1)	0.783799	0.010304	76.07084	0
Schwarz criterion	-6.237640		Akaike info criterion	-6.246437
		India		
C	0.000635	0.000188	3.369582	0.0008
		VE*		
C	3.97E-06	4.47E-07	8.885276	0
RESID(-1)^2	0.046449	0.006614	7.022446	0
RSD(-1)^2*(RESD(-1)<0)	0.106249	0.010275	10.34085	0
GARCH(-1)	0.882982	0.007774	113.5843	0
Schwarz criterion	-5.895518		Akaike info criterion	-5.886721
		South Africa		
C	0.000417	0.000159	2.623045	0.0087
		VE*		
C	2.54E-06	4.01E-07	6.347719	0.0000
RESID(-1)^2	0.011046	0.007850	1.407182	0.1594
RESD(-1)^2*(RESD(-1)<0)	0.131900	0.013243	9.959998	0
GARCH(-1)	0.901578	0.009152	98.51393	0
Schwarz criterion	-6.325703		Akaike info criterion	-6.334499
		Malaysia		
C	0.002506	0.023230	0.107884	0.9141
		VE*		
C	0.004309	0.004797	0.898269	0.3690
RESID(-1)^2	0.096628	0.020949	4.612441	0
RESD(-1)^2*(RESD(-1)<0)	-0.154175	0.054081	-2.850837	0.0044
GARCH(-1)	0.595861	0.450238	1.323436	0.1857
Schwarz	-2.374029		Akaike info	-2.382826

criterion			criterion	
		Mexico		
C	0.000430	0.000162	2.657757	0.0079
		VE*		
C	2.28E-06	2.96E-07	7.700363	0
RESID(-1)^2	0.011863	0.007605	1.559879	0.1188
RESD(-1)^2*(RESD(-1)<0)	0.121867	0.010477	11.63234	0
GARCH(-1)	0.908768	0.007180	126.5635	0
Schwarz criterion	-6.297064		Akaike info criterion	-6.305861
		Brazil		
C	-0.000770	0.000351	-2.190450	0.0285
		VE*		
C	7.92E-05	9.90E-06	7.994072	0
RESID(-1)^2	5.518173	0.320292	17.22858	0
RESD(-1)^2*(RESD(-1)<0)	-5.025466	0.314377	-15.98550	0
GARCH(-1)	0.362280	0.019816	18.28192	0
Schwarz criterion	-3.757330		Akaike info criterion	-3.766126
		Turkey		
C	0.000817	0.000258	3.173707	0.0015
		VE*		
C	1.49E-05	1.81E-06	8.207549	0
RESID(-1)^2	0.052281	0.008887	5.883026	0
RESD(-1)^2*(RESD(-1)<0)	0.098199	0.011504	8.535775	0
GARCH(-1)	0.847013	0.011609	72.96144	0
Schwarz criterion	-5.423990		Akaike info criterion	-5.432786
		Philippines		
C	0.000571	0.000192	2.975970	0.0029
		VE*		
C	4.29E-06	4.93E-07	8.686862	0
RESID(-1)^2	0.065997	0.007006	9.420386	0
RESD(-1)^2*(RESD(-1)<0)	0.071600	0.010745	6.663396	0
GARCH(-1)	0.876714	0.007197	121.8166	0
Schwarz criterion	-5.982494		Akaike info criterion	-5.991291

*Variance Equation

Conclusions and Recommendation

The study finds clustering volatility and leverage effects are present in Pakistan, India, Philippines, South Africa, Brazil, Turkey, Mexico and Malaysia except China. Stock market of China has no volatility clustering and leverage effects. The study recommends to use China for portfolio management and hedge risks in the investments. These

empirical findings would be useful for investors, managers, experts and academia especially in country like Pakistan.

References

Abbas, Q. Khan, S., Shah, Z., A., S (2013) volatility transmission in regional Asian stock markets. *Emerging markets review* 16

Adrian, T., & Rosenberg, J. (2008). Stock returns and volatility: Pricing the short- run and long- run components of market risk. *The journal of Finance*, 63(6), 2997-3030.

Bohl, M. T., & Henke, H. (2003). Trading volume and stock market volatility: The Polish case. *International Review of Financial Analysis*, 12(5), 513-525.

Bollerslev, T., & Mikkelsen, H. O. (1996). Modeling and pricing long memory in stock market volatility. *Journal of econometrics*, 73(1), 151-184.

Chen, S. S. (2009). Predicting the bear stock market: Macroeconomic variables as leading indicators. *Journal of Banking & Finance*, *33*(2), 211-223.

DAWN. Last accessed on 26 April, 2016 at http://www.dawn.com/news/1200203

Demirgüç-Kunt, A., & Levine, R. (1996). Stock markets, corporate finance, and economic growth: an overview. *The World Bank Economic Review*, 10(2), 223-239.

Errunza, V. R. (1983). Emerging markets: a new opportunity for improving global portfolio performance. *Financial Analysts Journal*, 39(5), 51-58.

French, K. R., & Roll, R. (1986). Stock return variances: The arrival of information and the reaction of traders. *Journal of financial economics*, 17(1), 5-26.

Ghufran, B., Awan, H. M., Khakwani, A. K., & Qureshi, M. A. (2016). What causes stock market volatility in Pakistan? Evidence from the field. *Economics Research International*, 2016.

Glezakos, M., Merika, A., & Kaligosfiris, H. (2007). Interdependence of major world stock exchanges: How is the Athens stock exchange affected?*International Research Journal of Finance and Economics*, 7(1), 24-39.

Hameed, A., Ashraf, H., & Siddiqui, R. (2006). Stock Market Volatility and Weak-form Efficiency: Evidence from an Emerging Market [with Comments]. *The Pakistan Development Review*, 1029-1040.

Hossain, M. S. (2011). Panel estimation for CO2 emissions, energy consumption, economic growth, trade openness and urbanization of newly industrialized countries. *Energy Policy*, *39*(11)

Hussain, E. (2019). CPEC: Governance and security challenges—Implications for the Belt and Road Initiative. *Chinese Political Science Review*, 4(1), 135-147.

Jebran, K., Chen, S., Ullah, I., & Mirza, S. S. (2017). Does volatility spillover among stock markets varies from normal to turbulent periods. Evidence from emerging markets of Asia. *The Journal of Finance and Data Science*, 3(1-4), 20-30.

Joshi, P. (2012). Financial crisis and volatility behaviour of stock markets of Asia. *Quest-Journal of Management and Research*, *2*(2), 35-44.

Kanasro, H. A., Rohra, C. L., & Junejo, M. A. (2009). Measurement of stock market volatility through ARCH and GARCH models: a case study of Karachi stock exchange. *Australian Journal of Basic and Applied Sciences*, 3(4), 3123-3127.

Karmakar, M. (2007). Asymmetric volatility and risk-return relationship in the Indian stock market. *South Asia Economic Journal*, 8(1)

Kobrin, S. J. (2000). Development after industrialization: poor countries in an electronically integrated global economy. In *The Globalization of multinational enterprise activity and economic development* (pp. 133-154). Palgrave Macmillan, London.

Madhavan A. (1992) Trading mechanisms in securities markets, *The Journal of Finance*,47(2) p607–641

Mukherjee, K., & Mishra, R. K. (2007). International stock market integration and its economic determinants: A study of Indian and world equity markets. *Vikalpa*, 32(4), 29-44.

Nelson, D. B. (1991). Conditional heteroscedasticity in asset returns: A new approach. Econometrica: *Journal of the Econometric Society*, 347-370.

Niu, H., & Wang, J. (2013). Volatility clustering and long memory of financial time series and financial price model. *Digital Signal Processing*, 23(2), 489-498.

Rossi, M. (2014). Realized volatility, liquidity, and corporate yield spreads. *The Quarterly Journal of Finance*, 4(01), 1450004.

Saleem, K. (2007). Modeling time varying volatility and asymmetry of Karachi stock exchange (KSE). *Available at SSRN 964898*.

Srivastava, A. (2008). Volatility of Indian stock market: an empirical evidence. *Asia Pacific Business Review*, 4(4), 53-61.