The Relationship between Macroeconomic Volatility and the Stock Market Volatility: Empirical Evidence from Pakistan

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Abstract

The relationships among the macroeconomic variables and stock returns analyzed in both the developed and developing countries, but are not well estimated in Pakistan. The current study explores the time series as analysis of economic variables and stock market by applying the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH). The macroeconomic variables include interest rate, inflation, and gross domestic product. For representation of stock market, Karachi Stock Exchange (KSE-100 Index) is taken as test market. The monthly data of the variables for the time period from December 1991 to August 2012 is used for the current study analysis. The ADF and ARCH tests are used to check the stationarity and homoskedasticity in the data respectively. The results show that macroeconomic variables have substantial influence on the stock prices. The stock prices have much impact on the economy of the country, and are consider as the best indicators for future prediction of the market and economy as well. Furthermore, the stock market in Pakistan is highly volatile the regulatory bodies must pay attention to make it less volatile.

Keywords: Stock market volatility; macroeconomic volatility; EGARCH; KSE.

1. Introduction

A well-established stock market is always providing the opportunity for savings and investments. The key objective of a stock market is to facilitate the savers and the borrowers, as it collects the savings from different pools and provide the platform to convert them into fruitful investment. A stock market is also helpful for reallocation of funds in different sectors of the economy. It act as a platform where many factors jointly work together to drive the wheel of the economy of any country. The macroeconomic variables have important concerns in choosing the stocks available in stock market. The

investors always want to know about the variables that have significant impact on the future returns to manage their portfolios. The most common approach Arbitrage Pricing Theory (APT) developed by Ross (1976) takes into account the multiple risk factors describing the stock returns.

$$R_i = \alpha + \beta_1 f_1 + \beta_2 f_2 + \cdots \beta_k f_k + \epsilon_i. \qquad (1.1)$$

The Capital Asset Pricing Model (CAPM) is also used to analyze this relationship by using one risk factor known as market risk.

$$E(R) = Rf + \beta(E(Rm) - Rf) \qquad (1.2)$$

The policy makers should pay attention to the economic variables in the connection of stock returns that are supposed to be leading indicator for prediction of the economic activities. The crash in any stock market shows poor economic conditions and pushes the economic activities of its country to back steps. Karachi Stock Exchange (KSE) is established in 1947 and KSE 100 index was launched in 1991 consists of top 100 companies which are picked on the basis of capitalization. The macroeconomic variables have much influence on a stock market. There are many global events and policies, followed by the developing countries along with their domestic variables cause the negative influence on market. In recent past, the industry and KSE changed rapidly and hence, affected the economic conditions of Pakistan.

The developed countries financial market are observed to be more explained as compared to the developing countries, so more research is needed in order to improve investment decision by maximizing the expected value of stock returns in developing countries. The presence of a relationship, if any has enticed many researches to empirically established models to predict stock prices. All these efforts challenged the efficient market hypothesis (EMH). The present value models (PVM) using future expected earnings and future expected discount rates has been empirically tested for predicting stock prices. The future expected earnings and discount rates are subjected to expected economic conditions. Therefore, PVM is useful in established a long term relationship among stock prices and macroeconomic variables, some studies also focused on the two way relations between stock prices and macro-economy.

The basic objective of this paper is to explain the stock market on the basis of macroeconomic variables like GDP, interest rate (IR) and inflation (INF), then to see how significant the relationship among these variables and stock returns. The variables have been chosen after the extensive study of literature that explains the economic conditions of Pakistan. The study, therefore, uses the asymmetric relationship between the stock market volatility and macroeconomic volatility in the country. It also analyses the theoretical association that exists between stock market volatility and macroeconomic variables. For this purpose EGARCH test is used to measure the volatility and granger causality test used to measure the causal relationship among the variables.

The paper in hand is systematized as follows: section 2 contains the empirical findings of the selected literature review; Section 3 explains the research objectives along with methodology. Section 4 explains the complete analysis with interpretations of the results. In the end, Section 5 gives conclusion and recommendation.

2. Literature Review

There are many studies that analyze the relation among macroeconomic volatility and stock market volatility. GARCH patterns introduce by Engle (1982) to see that conditional variances and the current variance equation is proposed. The stationary conditions and autocorrelation structure for these new models are obtained. Bollerslev (1986) used, first time, ARCH and GARCH methodology to measure the inflation rate conditional variance equation for North Holland. Maysami and Koh (2000) analyzed stock market of Singapore and the result shows that Singapore market is sensitive due to interest rate and exchange rate. Morelli (2002) had examined the stock and macroeconomic volatility for UK monthly data ranges from January 1967 to December 1995 by applying GARCH models, but the results show that conditional macroeconomic variables not explain the stock market volatility.

Altay (2003) used Germany and Turkey stock market and the results show that IR and inflation rate are having good results in German market but insignificant results in Turkish market. Fabozzi and Tunaru (2004) used GARCH-M, IGARCH and TAGARCH for Shenzhen and Shanghai markets. The results show that the evidence of volatility clustering shows each market has a different GARCH model. The models used for testing the spill-over effect between two Chinese markets. Gan et al. (2006) found that the macroeconomic fluctuations are not fully judged by the New Zealand's stock index. Beltratti and Morana (2006) had investigated the relationship between stock market and macroeconomic volatility using S&P data and found the causality direction runs from stock market to macroeconomic variables which is most strong than vice versa.

Puah and Jayaraman (2007) had found that all variables show the long term relationship and stock prices are cointegrated with variables in Malaysian stock market. Liu and Shrestha (2008) found that the long relation exists among stock prices and the macro-factors in China stock market. It also explains that stock market has significant impact in the long run. Gay (2008) had used ARIMA model and no relationship is observed among stock indexes, ER, and OP variables in Brazil, India, Russia and China. Adam and George (2008) investigated for Ghana by using multivariate cointegration and the results show that there exist a long rum relationship between variables and stock index. Diebold and Yilmaz (2008) investigate the relationship among macroeconomic variables and stock returns volatility of African and Asian developing countries. The results show a positive relation between stock, GDP and consumption. The stock market volatility is regressed on GDP per capita and provides negative relations The stock market does not granger cause GDP, while GDP does granger cause stock market.

Büyükşalvarcı (2010) had investigated Turkish stock market and the results show that oil prices, exchange rate effect negatively on returns, while money supply has positively influence. Inflation rate does not appear to have significant results on Istanbul stock exchange. Butt et al. (2010) analyzed Pakistan's stock with macroeconomic variables. The results show that market variation in stock returns but adding the other macro variables it shows extra explanation in variation of stock returns. It tells that different firms can respond differently in the same economic environments. Liljeblom and Stenius (1997) show the conditional stock market volatility and macroeconomic volatility for Finland and significant results are obtained which shows stock market volatility as predictor of macroeconomic predictor. Sabetfar et al. (2011) had found four groups of macro variables that affect the stock returns but significant of factors does not exist

consistence over time in Iran. Sohail and Hussain (2011) had found that the positive relation exist, among inflation, GDP, and exchange rate , while there is a negative impact on money supply and three month T-bills relationship with stock returns in case of Pakistan.

Singh et al. (2011) study findings reveal that exchange rate and GDP seem to have negative impact on portfolios and inflation, and money supply has negative impact on returns of different size companies in Taiwan's stock market. Oseni and Nwosa (2011) found that there is bi-casual relation among Nigeria's stock market volatility and GDP volatility and no causal relation between stock market and inflation rate. The study recommends that to decrease the volatility of stock market, government should take necessary steps. Al-Jafari et al. (2011) had investigated the macroeconomic variables of 16 developed countries and 16 developing countries. The results show that strong long run interaction exists among stock prices in developed economies. Moreover, the relation among the variables is even stronger in emerging economies than stable economies.

Özlen and Ergun (2012) examined the relationship for Bosnia and Herzegovina stock market and macro variables using ARDL technique. The results show that interest rate and exchange rate have significant factor in stock prices fluctuations; and stock returns are sensitive to changes in factors. Sulaiman et al. (2012) had examined KSE-100 index. The domestic interests respond negatively to KSE, and inflation reported insignificantly to KSE. Akbar et al. (2012) had found that further the stock returns have positive relation with money supply and short term interest rates in case of Pakistan. Khalid et al. (2012) had found that there are no co-movements among variables and stocks in Pakistan. Okoli (2012) had used Nigeria All-Share Index with macroeconomic variables and found that only exchange rate variables have influence in stock market volatility. The study, therefore, suggested that the government policy should focus on exchange rate to stabilize the stock market. Tangjitprom (2012) had found that macroeconomic variables are less important to predict future stock return; whereas stock returns can be used to predict macroeconomic variables in case of Thailand.

Hussin et al. (2012) used Kuala Lumpur Sharia Index (KLSI) and their findings show that, Islamic stock prices are integrated among macro variables in which the stocks are related positively and significantly with CPI and industrial production index. Ray (2012) study suggested that oil price and gold rates show negative effect on stock price, while balance of trade, interest rate, foreign exchange reserve, gross domestic product and money supply have positively influence at the Indian stock price. Hussain et al. (2012) study show a positive and significant long run association among factors and stock prices, while exchange rate and imports show negative and insignificant results in case of Pakistan. Beetsma and Giuliodori (2012) had used US macroeconomic data and found that macroeconomic response to stock market volatility shocks has changed over time. And negative response of GDP towards these shocks has become smaller over time. Tokmakcioglu and Tas (2012) has predicted volatility and investigated the forecast performance of US stock market. The results show that forecast volatility of stock market is much better than macroeconomic volatility.

3. Research Methodology

Heteroskedasticity is mostly associated with the cross sectional data but we have observed through theoretical literature that time series data consists of numerous shocks

and instability. The variance of disturbance term is less stable than the other studies which do exist during different time periods. So, it's more important to look for heteroskedasticity in time series data. The following econometric tools in the research study are used.

3.1 Unit Root Test

In macroeconomic study, most of the economic variables are non-stationary. But stationary checking is one of the important developments of econometric study. It is important to check for stationary of variables before moving further towards model estimation. There are many tests to check that problem but the most popular test namely Augmented Dickey Fuller (ADF) is used. ADF is mostly used, because it contains extra lags for the dependent variable to remove serial autocorrelation, which is decided on the basis of AIC and SBC criteria. The equation includes:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{p} \beta_i \, \Delta y_{t-i} + \mu_t \qquad (3.1)$$

Where y is variable in particular time *t*, and *t-1* shows the lag periods.

3.2 Exponential Generalized Auto regressive Conditional Heteroskedasticity (EGARCH)

ARCH (autoregressive conditional heteroskedasticity) model is used for the phase of increasing volatility. This model is also used when high impact for volatility is found and the heteroskedasticity exist in the data. ARCH becomes the best tool for measuring changes in variances and volatility. Bollerslev (1986) extended this model into the generalized ARCH (GARCH) model. The benefit of GARCH model is that, it takes small number of terms and show better results than an ARCH higher order model. It is assumed that volatility increases in time frame of decreasing growth and on the other hand it falls throughout stages of high growth. Neither ARCH nor the GARCH model can capture this asymmetry or lopsidedness. EGARCH model developed by Nelson (1991) can further explain the existence for asymmetry in volatility. The EGARCH *(p, q)* equation is:

$$\log \sigma_t^2 = \omega + \sum_{i=1}^{p} (\alpha_i \, |z_{t-1}| + \gamma_i z_{t-i}) + \sum_{i-1}^{p} \beta_i \log \sigma_{t-1}^2 \qquad (3.2)$$

EGARCH (1,1) equality is given as follows:

$$\log \sigma_t^2 = \omega + \alpha_i |z_{t-1}| + \gamma_i z_{t-i}) + \beta_1 \log \sigma_{t-1}^2 \qquad (3.3)$$

Now z_{t-i} term shows the asymmetric impact of positive and negative Shocks. If $\gamma > 0$ then volatility is said to rise when lagged standardized shock $z_{t-i} = \epsilon_{t-1} / \sigma_{t-1}$ are positive. While if $\gamma < 0$ then volatility is said to fall and standardized shocks have negative impact. For positive shock the eq. 3.3 becomes:

$$\log \sigma_t^2 = \omega + (\alpha_i + \gamma_i) z_{t-i} + \beta_1 \log \sigma_{t-1}^2 \qquad (3.4)$$

For negative shocks the equation 3.4 becomes

$$\log \sigma_t^2 = \omega + (\alpha_i - \gamma_i) z_{t-i} + \beta_1 \log \sigma_{t-1}^2 \qquad (3.5)$$

Various benefits of applying the EGARCH test are that the log value of volatility is considered as explained variable. It needs not any non-negative constraint for the parameters of variance dynamics and this EGARCH model may consider the asymmetric result of volatility. In last only the coefficient of GARCH explains shocks volatility. Every model is estimated on the basis of maximum likelihood method, and testing of SBIC and Ljun-Box test is applied to see the autocorrelation that exists in the data. ARCH-LM test is also used to see the heteroskedasticity in the data as well.

3.3 Granger Causality Test

Engle-Granger causality tool are used to observe the cause and effect relationship among the stock variables and macro-economic variables. In Granger's causality, X is said to be Granger because of Y, and also judge the degree of accuracy by considering the previous values of X. Consider the following equation:

$$Y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + U_t \tag{3.6}$$

Now if β_1 is equal to zero X does not Granger cause Y. On the other hand, any of the β coefficients is non-zero, and then X does Granger cause. The results of Granger may be explained in three ways: uni-directional, bi-directional and non-directional (where variables move in independent direction).

3.4 Data and Variables

To represent the stock market index for Pakistan, Karachi stock exchange (KSE-100 index) was chosen for study and analysis. The selections of macroeconomic variables are quite problematic but according to Fama (1981) study the economy and the inflation are the best factors for measuring the stock market conditions. Gross Domestic Product (GDP) is selected as the measure of economic activity. Other variables, like inflation and interest rate are also taken up as they may affect economic activity and stock market. The KSE index is converted into stock returns by applying the below mentioned formula:

$$Stock\ returns = Log \left(Index_t / Index_{t-1} \right) \tag{3.7}$$

Monthly data of above variables is used that covers the time period, for December 1991 to August 2012.The data is gathered from the hand book of statistics and monthly bulletins of State Bank of Pakistan (SBP) and data of KSE is taken up from Karachi stock exchange. The 2 steps process is preformed to analyze the relation among the stock market and the macro-economic variables volatility. At first step process, the volatility of each macroeconomic variable is seen by applying E-GARCH that explains uni-variant analysis (one variable at one time).In the second step process the casual relationship among the variables is determined by using Granger causality test.

4. Empirical Findings

The analysis section provides the detailed results of various econometrics tools used; start with descriptive statistics, given in Table 4.1, Table 4.2 shows the results of ADF. Table 4.3 shows the results of EGARCH models along with diagnostic checks are presented. In last, Table 4.4 shows the results of granger causality among variables.

4.1 Descriptive Statistics

Table 1 provides the results of standard deviation, kurtosis, mean, skewness, Jarque-Bera respective variables and their *p-values* these outcomes show that stock price are much more impulsive than the major macro-variables. It also shows the negative skewness for stock prices and interest rates along with relative high levels of kurtosis. The results of JB statistics and *p*-values reject the null hypothesis of normal distribution at *1%* significance level for all variables.

Table 1: Descriptive Statistics

Variables	Interest Rate	Inflation	Stock Price	GDP
Mean	0.1745	0.7304	0.0042	0.0014
St. Dev.	0.0388	0.8295	0.0410	0.0025
Skewness	-0.6288	0.2409	-0.7877	4.6649
Kurtosis	2.2974	5.8353	6.2601	37.438
JB- stats	21.53 (0.00)	85.81 (0.00)	136.02 (0.00)	13208.04 (0.00)

4.2 Stationary Test

In time series study stationary or non-stationary process is adopted to observe the integration order of the variables. In our data set the Augmented Dickey Fuller (ADF) test is applied. Table 2 shows that all four variables are stationary at level with constant and linear trend, i.e. *I (0)*, it shows that the variables having constant mean, variance and covariance. The results are significant and show that all effects of the shocks are eliminated and now it's helpful in making an accurate decision for the future prediction. The lag lengths, t-stats and respective p-values are given in the Table 2 below:

Table 2: ADF Unit Root Test

Variables	K	T-stat	P-value	Decision
Interest rate	0	-2.5981	0.0093*	I(0)
Inflation	2	-6.7002	0.0000*	I(0)
Stock price	0	-15.2421	0.0000*	I(0)
GDP	11	-2.9722	0.0390**	I(0)
Note: * and ** rejection of null hypothesis at 1% and 5% significance levels respectively.				

4.3 Estimating the Volatility by EGARCH

In the present study uni-variant analysis is done shows the variation along different time. The use of EGARCH *(p, q)* model is to observe the dynamic nature that present in the variables. By using SBIC and residuals diagnostic test, the models selected are *AR(1)–EGARCH(1,1)* for GDP, *AR(1),MA(1)-EGARCH(2,1)* for inflation, *AR(1)-EGARCH(1,1)* for IR and finally *AR(0)-EGARCH(1,1)* for stock prices. Table 4.3shows the parameters and their values. The coefficients of the GARCH term β are estimated to be 0.069285 for GDP,-0.122261 for interest rate, 0.039617 for inflation and 0.921865 for KSE respectively. GDP, interest rate and stock price are statistically significant at 1% level. The coefficient of the ARCH term α is estimated to be -1.795314, 1.890473, 0.563322 and 0.008833 for GDP, interest rate, inflation and stock returns respectively. GDP, interest rate and inflation are statistically significant at 1%level. The asymmetric parameter γ is estimated to be 0.202472, -0.189508, 0.273690 and -0.105808 for GDP, interest rate, inflation and stock price respectively. The asymmetric effect is statistically significant at 1% and 5% for all variables. The results of the L-Jung box show that there is no autocorrelation up to order *(11)* for standardize residuals and for standardized residuals squared, thus null hypothesis of no autocorrelation is accepted. The LM value

shows there is no more heteroskedasticity in the variables and thus acceptance of *Ho* which states that no more ARCH effect is present.

Table 3 EGARCH Results

Variables	GDP	Interest Rate	Inflation	KSE
Model	AR(1) EGARCH (1,1)	AR(1) EGARCH (1,1)	AR(1), MA(1) EGARCH (2,1)	AR(0) EGARCH (1,1)
Mean Equation				
π_0	0.001 (0.00)*	-0.01 (0.00)*	0.038 (0.20)	0.003 (0.14)
π_1	-0.05 (0.00)*	0.95 (0.00)*	0.94 (0.00)*	0.059 (0.38)
π_2	0.04 (0.00)*	0.50 (0.00)*	0.05 (0.54)	-
π_3	-	-	-0.87 (0.00)*	-
Variance Equation				
Ω	-10.8 (0.00)*	-11.60 (0.00)*	-1.23 (0.00)*	-0.51 (0.02)**
α_1	-1.79 (0.00)*	1.89 (0.00)*	0.56 (0.00)*	0.01 (0.86)
γ_1	0.20 (0.00)*	-0.18 (0.00)*	0.27 (0.04)**	-0.11 (0.00)*
β_1	0.07 (0.00)*	-0.12 (0.01)**	0.04 (0.64)	0.92 (0.00)*
Diagnostic Test				
$Q\ (11)$	10.48 (0.39)	9.44 (0.49)	3.90 (0.91)	9.22 (0.60)
$Q^2\ (11)$	1.61 (0.99)	1.60 (0.99)	7.87 (0.54)	8.66 (0.65)
LM	0.00 (0.98)	0.12 (0.72)	0.08 (0.77)	0.00 (0.98)
SBIC	6.44	6.13	4.13	4.33

Note: 1. The numbers in parentheses are p-values.
2.* (**) shows the statistical Significance level at 1% (5%) level.
3. $Q\ (11)$ shows that there is no autocorrelation up to order (11) for residuals
4. $Q^2\ (11)$ shows that there is no autocorrelation up to order (11) for residuals squared.

4.4 Granger Causality Test

Granger causality test is used for measuring the causality relation among variables. Table 4 outcome shows that no relation between GDP and stock returns exists. These two variables move independently during a period from December 1991 to August 2012. It also states that Pakistan stock market is does not relate to the economic growth nor it explains any change in future economic activity that provide valuable information. It is also observe that a unidirectional relation exists between inflation to stock return volatility. The null hypothesis is rejected at 10 % significant level, staying that inflation

rate not cause stock market, at significant p-value. In the last, a unidirectional relation is found between stock returns volatility to interest rate. The rejection of null hypothesis occurs at 10 % significant level shows that stock returns volatility does not Granger cause interest rate at significant p-value.

Table 4: Granger Causality Results

Null hypothesis	F- stats	p-value	Results
GDP volatility does not Granger cause stock return volatility	0.4949	0.6102	**GDP <≠> Stock Returns**
Stock return volatility does not Granger cause GDP volatility	0.71405	0.4907	
Inflation rate volatility does not Granger cause stock return volatility	2.7839	0.0638*	**Inflation rate → Stock Returns**
Stock return volatility does not Granger Cause inflation rate volatility	0.2244	0.7992	
Interest rate volatility does not Granger cause stock return volatility	1.1553	0.3167	**Stock Returns → Interest Rate**
Stock return volatility does not Granger cause interest rate volatility	2.7342	0.0670*	
Note: * shows the level of significance at 10%			

5. Conclusion

The study examines the association between the variation that timely occurs between stock market of Pakistan and economic variables. The secondary data has been employed to analyze the relationship by using EGARCH to observe the volatility and granger causality test to check the causality among the variables. First we apply the ADF test for making the data stationary and it occurs at level. The result of causality suggests that there is no relationship among GDP and stock returns as they move towards the independent direction. But the inflation rate has a casual effect on stock returns. And another unidirectional relationship exists between stock returns and interest rate. It is mostly believed that stock prices have significant impact on the economy of the country, and hence and that they should reflect the future cooperate performance of their respective institutions. If this could be true, then stock prices should be used as the best tool for measuring the economic conditions and used as a leading indicator of future prediction. Now it is common perception in economic environment of Pakistan that a small investor is always interested in short term gains and ignore long term opportunities.

There is always a fair chance that in future the conditions may affect badly due to many reasons. So market in Pakistan is more volatile than these of the developed nations and is not linked with the long term institutional performances and economic growth. The local stock market is somewhat separated from real economic conditions and stocks not truly

reflect the better picture of economy. It is concluded that predicting the stock market returns is heavily depend on the changes that occur in the macroeconomic factors, and in turn consider the best indicators of predicting the country economic environments. Thus local stock market reacts sensitively not only the domestic economic factors as they bring a minute change in Pakistan but also political and other social issues have big impact on the economic indicators which always open the space in our country for further investigations.

5.1 Policy Recommendation

Pakistan is a country where economic condition is not stable and it reacts sensitively to any small and big shocks, its stock market is very much volatile and in order to make it less volatile the regulatory bodies should play their part in this regard. The Security and Exchange Commission of Pakistan (SECP) in collaborations with other institutions like State Bank of Pakistan (SBP) should engage the good quality professionals and analyst for better judgment, and prompt decision making. Following steps need to be considered:

A. The relevant information about any decisions taken by the regulatory bodies must be provided the relevant information to investors and other stakeholders.

B. Regulatory body must consult with other advisory committees of interested parties, like stock exchanges, chamber of commerce and industry while making any reforms.

C. The relevant information of securities and audit reports of every company be kept so that transparency may exist in the market.

D. Regulatory bodies should take steps to promote mutual fund investment to stabilize the market for long run.

Most important but not the least is that Government of Pakistan should pay its full attention to stabilize the market as foreign direct investment largely dependent on it.

REFRENCES

Adam, A. M., & George, T. (2008). Macroeconomic factors and stock market movement: evidence from Ghana, *Munich Personal RePEc., Paper No. 11256*, 1-17.

Akbar, M., Ali, S., & Khan, M. S. (2012). The relationship of stock prices and macroeconomic variables revisited: Evidence from Karachi stock exchange. *African Journal of Business Management*, 6(4), 1315-1322.

Altay, E. (2003). The effect of macroeconomic factors on asset returns: a comparative analysis of the German and the Turkish stock markets in an APT Framework. *Martin-Luther-Universität Halle, Betriebswirtschaftliche Diskussionsbeiträge,* Nr. 48/2003.

Al-Jafari, M. K., Salameh, R. M., & Habbash, M. R. (2011). Investigating the relationship between stock market returns and macroeconomic variables: evidence from developed and emerging markets. *International Research Journal of Finance and Economics*, *79*, 6-30.

Beetsma, R. and Giuliodori, M. (2012). The changing macroeconomic response to stock market volatility shocks. *Journal of Macroeconomics*, *34*(2), 281-293.

Beltratti, A., & Morana, C. (2006). Breaks and persistency: macroeconomic causes of stock market volatility. *Journal of Econometrics*, *131*(1-2), 151-177.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics, 31*, 307-327.

Butt, B. Z., Rehman, K. U., Khan, M. A., & Safwan, N. (2010). Do economic factors influence stock returns? a firm and industry level analysis. *African Journal of Business Management*, *4*(5), 583-593.

Büyükşalvarcı, A. (2010). The effects of macroeconomics variables on stock returns: evidence from Turkey. *European Journal of Social Sciences, 14*(3), 404-416.

Diebold, F. X., & Yilmaz, K. (2008). Macroeconomic volatility and stock Market volatility, worldwide. Working Paper No 14269. National Bureau of Economic Research, Cambridge.

Engle, R. F. (1982). Autoregressive conditional heteroskedasticity with estimates of the variance of United Kingdom inflation. *Econometrica, 50*(4), 987-1007.

Fabozzi, F, J., & Tunaru, R. (2004). Modeling volatility for the Chinese equity markets. *Annals of Economics and Finance, 5*, 79–92.

Fama, E. F. (1981). Stock returns, real activity, inflation and money. *American Economic Review*, *71*(4), 545−565.

Gan, C., Lee, M., Yong, H. H. A., & Zhang, J. (2006). Macroeconomic variables and stock market interactions: New Zealand evidence. *Investment Management and Financial Innovations*, *3*(4), 80-101.

Gay, R. D. (2008). Effect of macroeconomic variables on stock market returns for four emerging economies: Brazil, Russia, India, and China. *International Business and Economics Research Journal*, *7*(3), 01-08.

Hussain, M. M., Aamir, M., Rasool, N., Fayyaz, M. & Mumtaz, M. (2012). The impact of macroeconomic variables on stock prices: an empirical analysis of Karachi stock exchange. *Mediterranean Journal of Social Sciences*, *3*(3), 295-312.

Hussin, M. Y. M., Muhammad, F., Abu, M. F., & Awang, S. A. (2012). Macroeconomic variables and Malaysian Islamic stock market: a time series analysis. *Journal of Business Studies Quarterly*, *3*(4), 1-13.

Khalid, M., Altaf, M., Bagram, M. M. M., & Hussain, H. (2012). Long-run relationship of macroeconomic variables and stock returns: evidence from Karachi stock exchange (KSE) 100 index. *The Journal of Commerce*, *4*(3), 45-59.

Liljeblom, E., & Stenius, M. (1997). Macroeconomic volatility and stock market volatility: empirical evidence on Finnish data. *Applied Financial Economics*, *7*(4), 419-426.

Liu, M. H., & Shrestha, K. M. (2008). Analysis of the long-term relationship between macroeconomic variables and the Chinese stock market using heteroskedasticity cointegration. *Managerial Finance*, *34*(11), 744-755.

Maysami, R.C., & Koh, T.S., (2000). A vector error correction model of the Singapore stock market. *International Review of Economics and Finance*, *9*, 79–96.

Morelli, D. (2002). The relationship between conditional stock market volatility and conditional macroeconomic volatility: empirical evidence based on UK data. *International Review of Financial Analysis, 11*(1), 101-110.

Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: a new approach. *Econometrica*, *59*(2), 347-370.

Okoli, M. N. (2012). Return-volatility interactions in the Nigerian stock market. *Asian Economic and Financial Review*, *2*(2), 389-399.

Oseni, I. O., & Nwosa, P. I. (2011). Stock market volatility and macroeconomic variables volatility in Nigeria: an exponential GARCH Approach. *European Journal of Business and Management*, *3*(12), 43-54.

Özlen, S., & Ergun, U. (2012). Macroeconomic factors and stock returns. *International Journal of Academic Research in Business and Social Sciences*, *2*(9), 315-343.

Puah, C. H., & Jayaraman, T. K. (2007). Macroeconomic activities and stock prices in a South Pacific island economy. *International Journal of Economics and Management*, *1*(2), 229 – 244.

Ray, S. (2012). Testing Granger causal relationship between macroeconomic variables and stock price behavior: evidence from India. *Advances in Applied Economics and Finance, 3*(1), 470-481.

Ross, S. (1976). The Arbitrage Theory of capital market asset pricing. *Journal of Economic Theory*, *13*, 341-360.

Sabetfar, P., Cheng, F. F., & Mohamad, S. (2011). Test of Arbitrage Pricing Theory on the Tehran stock exchange: the case of a Sharia-compliant close economy. *International Journal of Economics and Finance, 3*(3), 109-118.

Singh, T., Mehta, S., & Varsha, M.S. (2011). Macroeconomic factors and stock returns: evidence from Taiwan. *Journal of Economics and International Finance, 2*(4), 217-227.

Sohail, N., & Hussain, Z. (2011). The macroeconomic variables and stock returns in Pakistan: the case of KSE 100 Index. *International Research Journal of Finance and Economics*, *80*, 66-74.

Sulaiman, D. M., Naqvi, S. I. H., Lal, I., & Zehra, S. (2012). Arbitrage Price Theory (APT) and Karachi stock exchange (KSE). *Asian Social Science, 8*(2), 253-258.

Tangjitprom, N. (2012). Macroeconomic factors of emerging stock market: the evidence from Thailand. *International Journal of Financial Research*, *3*(2), 105-114.

Tokmakcioglu, K., & Tas, O. (2012). Stock market and macroeconomic volatility comparison: an US approach. *Quality and Quantity, 46*(5), 1-8.