Relationship between Stock Prices and Macroeconomic Variables: A Case Study of Karachi Stock Exchange

Zahid Mehmood Akhtar Muhammad Sohail Muhammad Haroon[1, 2, 3]

Abstract

This study investigates the relationship between the stock prices and macroeconomic variables in Pakistan. The study uses monthly data from January 2001 to May 2012. This study used those variables which have not been previously evaluated. This study incorporated the effect of market crash 2008 and its implications for Karachi Stock Exchange. This study used Johansen Co-integration test, Vector Error Correction Model (VECM) to capture the association among the variables. The study found the long-run relationship between macroeconomics variables and stock prices. Impulse response and variance decomposition analysis have also been carried out for further verification of the result. Exports, Exchange Rate and Money Supply showed a positive and substantial relationship with stock prices while inflation and discount rate negatively affect stock prices. Index of industrial production had a positive but insignificant relationship with stock prices. Market crash had a negative relationship with stock prices and prolonged crises affected the stock prices significantly. The error correction term from VECM is significant and indicated short term adjustments towards the equilibrium path. Impulse response and variance decomposition exhibits pattern in conformance with the already obtained results.

Keywords: Exchange Rate, Money Supply, Stock Exchange, Inflation

Introduction

The financial system of a country is comprised of the banking sector, financial institutions like insurance companies, pension funds, bond markets and stock exchange markets. This system helps the public and private sector to enhance the financial and economic activities. Stock exchange performance has attained much attention due to its twofold effect; one on the finance of the corporate sector and the other on the economic activities of a country. Various projects of investments are activated through the equity generated by the stock exchange markets. Savings are mobilized by the stock exchange markets which play an important role in channelizing all these saved funds into wide variety of fruitful investment projects.

Three stock exchange markets Karachi Stock Exchange (KSE), Lahore Stock Exchange (LSE) and Islamabad Stock Exchange (ISE) are now merged to create Pakistan Stock Exchange Limited.

[1, 2, 3] National university of Modern Languages, Islamabad

In 1949 KSE was established as the largest one in Pakistan. SECP *"Securities and Exchange Commission of Pakistan"* is the authority that regulates the stock markets. The systematic transparent trading system (KATS & CDS) and infrastructure development has enhanced the performance and efficiency of the market. In the year 2002 KSE showed its best performance that was acknowledged by the International Magazine "Business Week" and USA News Paper "USA Today". That was the reflection of economic development, stability in the exchange rate, low discount rates, mergers and acquisition of big companies, incentives for recovery of bad debts and outstanding loans, timely payments of foreign debts, good working relationship with all the nearby countries and specially role of investment banks. The main thing which attracted the investment was privatization, liberalization and deregulation.

Karachi Stock Exchange is a volatile market and faced serious crises in March 2005, second quarter of 2006, May 2008 to January 2009 which resulted in reduction of market capitalization. A number of incidents like judiciary crises, death of former prime minister honorable Benazir Bhutto, political unrest and the storm of terrorism were the main factors for this volatility of KSE. KSE usually shows bullish trend and it is argued that degree of volatility is always more in the Bullish market as compared to the Bear market.

The major crash of KSE was in 2008. There were perceptions that this crash was due to the "Global Financial Crisis" in which the credit market and specially the banking sector faced a severe problem of liquidity. It was started in USA when the property started losing value due to excessive liquidity available to the individuals and corporate sector as banks and other lending authorities offered loans on very easy terms. This excessive debt level turned into global financial crises and caused multiple adverse effects on the global economy. Growth rate of the developing countries started shrinking, exports started declining and local currency started depreciating. The massive flight of capital and decrease in foreign remittances resulted in stock market indices to decline.

Figure 1: *Trend of KSE 100 Index*

During the same period Pakistan was also facing low growth rate and its currency was depreciating. Reserves were getting low and budget deficit was widening. The stream of terrorism and unstable political scenario resulted in a sluggish economy. A fall in FDI and foreign remittances, fall in exports, energy shortages and hyper food inflation put the economy of Pakistan in a difficult situation. Therefore the economy of Pakistan was already facing poor situation before the global financial crises of 2008.

In 2008 KSE 100 index faced a massive decline of approximately 6000 points only within three months i.e. from 15,000 points to 9,200 points. The massive decline in KSE 100 index was due to decline in investor's confidence because of apprehensions regarding global financial crises and rise in brutal attacks of terrorism. This huge decline was alarming for the government. Therefore the government placed a floor and a bailout plan was proposed. In 2008 the central bank of Pakistan estimated that only $500 million in lieu of FDI came in Karachi Stock Exchange which was just a 20 percent of the fiscal year 2007. The KSE 100 index showed a continuous downward trend and reached the lowest level at 5,865 points after a prominent loss of 58.3 percent in the month of Dec 2008 as compared to month of Dec 2007.

This study is conducted in the light of efficient market hypothesis as the studies already conducted by Fama & Schwert (1977), Nelson (1977) and Jaffe & Mandelker (1976) all proved that macroeconomic variables have impact on stock prices.

Objectives of the study

This study has the following objectives:

1) To check the association of stock prices with macroeconomic variables.
2) To find the bivariate causal association between the stock prices and macroeconomic variables.
3) To incorporate the impact of 2008 crises of KSE in order to know if prolonged crises effects the stock market or not.

Review of Literature

Stock prices are influenced by macroeconomic variables and risk which is prevailing in the capital markets. Ross (1976) presented a theory named as "The Arbitrage Pricing Theory" which states that return on securities is influenced by the risk premia which plays a crucial role in determination of the asset prices. The findings of Chen, Roll & Ross (1986) concluded that economic variables have effect on discount rate which in turn influences future dividend payments and hence affects the cash flow generation ability of the companies. Their study serves as the basis to believe that there is a significant association among macroeconomic variables and stock prices. Maysami & Koh (2000) analyzed the long run association between the stock markets of Singapore,

Japan and USA. They find that interest and exchange rate were highly significant and the three of the markets were significantly cointegrated to each other.

Short and long run association between macroeconomic variables and stock prices was found by Maysami & Sims (2002), Maysami & Sims (2001a) and Maysami & Sims (2001b) in Hong Kong and Singapore, Malaysia and Thailand and Japan and Korea, respectively. Muhammad & Rasheed (2002) conducted a research to check the relationship between prices of stocks and exchange rate in South Asian Countries and found no association in case of Pakistan and India, where as bi-directional long run causal association found in case of Sri Lanka and Bangladesh.

Chong & Koh (2003) explore the relationship between the prices of stocks, index of industrial production, interest rate and money supply and found a significant long-run association in Malaysia. In the same way in case of Pakistan (Nishat & Shaheen, 2004) tried to explore the bivariate causality between prices of stocks and macroeconomic variables and found a positive relationship. They concluded that movement in the stock prices are affected by the macroeconomic variables. In contrast Ali *et al.* (2010) found that there was neither any relationship nor any causal association between the variables of macroeconomics and prices of stocks. In the same manner Sohail & Hussain (2009) found long as well as short run association between the variables of macroeconomics and prices of stocks i.e. LSE 25 index.

Chakravarty (2005) found after examination a unidirectional causal relationship from IIP to stock prices in India. Whereas balance of trade proved to be insignificant this was against the findings of (Bhattacharya, 2002) who concluded the balance of trade to be significant and negatively related to stock prices. The effect of volatility between forex market and stock exchange market was analyzed by Qayyum & Kamal (2007). The research revealed some interesting outcomes that stock prices found to be sensitive to the volatility of forex market and vice versa.

Kanasro *et al*. (2009) conducted a study to know that whether concentration of stocks effect the capitalization of market or not. After investigation they concluded that large concentration of stocks of Cotton and textile industry, Chemical and pharmaceuticals industry, Fuel and energy sector, Transport and communication sector and banking sector played a dominant role in capitalization of the market. The research also concluded that if the market is highly concentrated it is very difficult for the investors to choose optimum combination of negatively correlated securities for portfolio investment.

Hussain *et al.* (2011) investigated the day of the week impact on the returns of the stocks by taking into account the KSE 100 index. The research was conducted in the light of efficient market hypothesis and it was found that KSE is efficient in weak form and bears a lot of anomalies. The results of the study confirmed the presence of day of the week effect and it was found that returns on Tuesday were highly significant and positive than other days of the week. Kiymaz (2001) analyzed the effect of rumors relating to stock exchange market on returns of the stocks. 355 rumors relating to stock exchange market were taken from Weekly Magazine the contents of which were; Expectations regarding earnings (128), Sales of firms or exports (6), Undervalued stocks (23), Purchases by foreigners (22), Unclassified (108), Rumors without any content (68). It was found that that the effect of rumors is high before and after the publication of the rumors and proved a significant impact of rumors on the stock prices.

A number of studies regarding the association between the variables of macroeconomics and prices of stocks in different countries of the world have been conducted. Riely & Brown (2000) pointed inverse relationship of Discount Rate with Stock Prices. In the same manner Fama & Shwert (1977), Chen *et al*. (1986), Nelson (1976), Jaffe & Mandelkar (1976) showed that inflation is negatively correlated with the stock prices. According to Mukherjee & Naka (1995) there exists a positive association between the rate of exchange and prices of stocks whereas the association between the prices of stocks and supply of money is an empirical question. Tainer (1993), Fama (1990) and Geske & Roll (1983) is of the view that index of industrial production has a positive association with the stock prices.

This study also inspects the relationship among different variables of macroeconomics and prices of stocks to address the question that stock prices can be predicted by the macroeconomic variables or not. Further, a dummy variable is used to capture the market crash to know that either prolonged crises significantly affects the stock prices or not.

Data and Methodology

Data

Depending upon the availability of data and the existing literature monthly time series data from January 2001 to May 2012 is used to assess the association between the macro economic variables and stock prices of Karachi Stock Exchange. Variables of macroeconomics that are used as independent in the study are Inflation (Consumer Price Index as a proxy to inflation), Money Supply (M2 is broader money and composed of circulated currency, deposits with commercial banks, deposits with central bank and various time deposits), Exchange Rate, Index of industrial production (Proxy for GDP), Discount Rate, Exports and Dummy Variable for 2008 Crash of KSE (D=0 Before Crash

& D=1 After Crash) whereas KSE 100 index is dependent variable. Data is gleaned from published sources of IFS (International Financial Statistics), SBP (state bank of Pakistan) and KSE (Karachi Stock Exchange).

Estimation Technique

A time series VAR model is estimated by testing for stationarity by the ADF test, Johansen test for cointegration and long run equilibrium, VECM for short run adjustments and convergence whereas impulse response and variance decomposition analysis have also been applied. The methodology is used as follows:

Stationarity Checks

Generally, the time series macroeconomics variables are not stationary at level (Hill *et al*., 2001). In order to get rid of spurious regression unit root tests are applied to convert non-stationery variables into stationery by differencing.

Three renowned unit root tests are:

1. ADF Test presented by Dickey & Fuller (1981)
2. PP Test presented by Phillips & Perron (1988)
3. KPSS presented by Kwiatkowski, Phillips Schmidt & Shin (1992)

To find unit roots this study uses the ADF test which takes into account the assumption of error term ε_t that it should be asymptotically normal and the null hypothesis is tested as:

$H_0 : \beta = 0$ in

$$\Delta y_t = a_0 + \beta y_{t-1} + \sum \lambda_i \Delta y_{t-i+1}^{P} + \varepsilon_t$$

Lag Length:

Sims probability proportion test is utilized for the choice of ideal lag length. It is very important to use appropriate criteria for ideal length of lags so that extra parameters are not assessed and DFs "Degrees of Freedom" are not lost. So that the test stays effective and spurious relapse might be maintained a strategic distance. Primarily Akaike Information Cretia (AIC) along with Shwarz Bayesian Criteria (SBC) are employed in this study for using appropriate lag lengths.

AIC = “T” in (sum of squares of residuals) + II n

SBC = “T” in (sum of squares of residuals) + n in “T”

Co-integration Test and Vector Error Correction Model:

Cointegration test is used to identify association between the variables in the long-run and VECM is used to check the association of variables in the short run. In order to assess the dynamics of association between the macroeconomic variables and stock prices two approaches can be used:

1. Engle and Granger Approach (1987)
2. Johansen and Juselius Approach (1990)

The Engle and Granger Approach is used in the context of multi variables and the errors are corrected in two steps whereas the conintegration between the variables using "Johansen's Approach" is tested only in one step by taking into account the entire system of equations. Moreover the Johansen Approach allows the assumptions of any endogeniety/ exogeneity of the variables to be avoided. Therefore Johansen Approach is applied in this study. The VAR specification tested by Johansen Approach is used as follows:

$$x_t = A_0 + \sum_{j=1}^{k} A_j x_{t-j} + D_t + \varepsilon_t$$

Where A_0 represents the constant vector, x_t represents the vector of variables which are integrated I(1), the lags are represented by k, the coefficient matrix is represented by A_j and ε_t represents the error term also known as idiosyncratic error term or Gaussian error term. D_t is a vector of dummy for market crash. The reformulation of vector autoregressive process into Vector Error Correction Model (VECM) is in the following way:

$$\Delta x_t = A_0 + \sum_{j=1}^{k-1} \Gamma_j \Delta x_{t-j} + \Pi x_{t-k} + \sum_{i-1}^{P} \sigma_{1i} D_{t-1} + \varepsilon_t$$

Where $\Gamma_j = -\sum_{i=j+1}^{k} A_j$ and

$$\Pi = -I + \sum_{i=j+1}^{k} A_j$$

'I' represents the identity matrix whereas Δ represents the difference. The numbers of cointegrating vectors are found using Trace statistics and the Maximum Eigen Values. Those number of Characteristic Roots are used that are significantly alike the unity.

Model Specification

This study analyzes the long-run association between the variables of macro economics and prices of stocks i.e. KSE 100 index which is depicted by employing the following model:

$$LKSE_t = \beta_0 + \beta_1 LCPI_t + \beta_2 LM2_t + \beta_3 LER_t + \beta_4 LIIP_t + \beta_5 Li_t + \beta_6 LEX_t + \beta_7 D_t + \varepsilon_t$$

The dynamics of the short run association and behavior of the variables i.e. convergence towards long run equilibrium path is estimated by employing the following model:

$$\Delta LKSE_t = \alpha_1 + \gamma_1 U_{t-1} + \sum_{i-1}^{P} \theta_{1i} \Delta LCPI_{t-1} + \sum_{i-1}^{P} \beta_{1i} \Delta LM2_{t-1} + \sum_{i-1}^{P} \mu_{1i} \Delta LER_{t-1} +$$

$$\sum_{i-1}^{P} \eta_{1i} \Delta LIIP_{t-1} + \sum_{i-1}^{P} \lambda_{1i} \Delta Li_{t-1} + \sum_{i-1}^{P} \phi_{1i} \Delta LEX_{t-1} + \sum_{i-1}^{P} \rho_{1i} D_{t-1} + \varepsilon_t$$

The variables used in this study are described as follows:

LKSE	=	Log values of KSE100 index
LCPI	=	Log values of Consumer Price Index
LM2	=	Log values of Money Supply
LER	=	Log values of Exchange Rate
LIIP	=	Log values of Industrial Production index
Li	=	Log values of Discount Rate
LEX	=	Log values of Exports
D	=	Dummy Variable (D=0 before crash and D=1 otherwise)

Results and Discussion

Stationarity results

For cointegration analysis the stationarity of the variables is a pre requisite. ADF test is applied for the stationarity of variables employed in the study. The results of ADF Test are as follows:

Table 1: *Augmented Dickey Fuller Test Statistic*

Variables	Null Hypothesis: Variable is non stationary	
	Level	
	-1.26	1st Difference
KSE 100 Index	-0.38	-10.50*
IIP	-1.64	-4.69*
M2	-2.16	-3.68*
CPI	-1.94	-9.39*
ER	-2.38	-5.13*
I	-0.50	-11.65*
Ex	-0.50	-4.46*
Test Critical values (MacKinnon, 1996)		
5% Level	-2.90	
10% Level	-2.59	

It can be seen in the table 1 that all the variables are integrated of same order i.e. I(1) stationary at 1st difference.

Cointegration analysis

Johansen Approach is applied in the study to assess the association between the variables of macroeconomics and prices of stocks in the long run. The selection of optimum/appropriate lag length is the first step for the analysis of cointegration in the multivariate context.

Lag Length

For selection the optimum/appropriate lag length AIC and SBC is used in this study. The appropriate lag length is one which is depicted in Table 2.

Table 2: *Lag Length Selection Criteria*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	744.839	NA	4.57e-14	-10.851	-10.701	-10.791
1	2085.236	2523.098*	2.59e-22*	-29.841*	-28.642*	-29.354*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Johansen and Juselius Cointegration Test

The long run relationship is determined by JJ cointegration test. For long run relationship to exist among the variables there must be at least one cointegrating vector. The results of the test are given in table 3.

Table 3: *Unrestricted Cointegration Rank Test (Trace)*

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.433	270.395	159.530	0.000
At most 1 *	0.405	193.726	125.615	0.000
At most 2 *	0.263	123.534	95.754	0.001
At most 3 *	0.219	82.387	69.819	0.004
At most 4 *	0.191	49.225	47.856	0.037
At most 5	0.084	20.575	29.797	0.385
At most 6	0.057	8.697	15.495	0.394
At most 7	0.006	0.784	3.841	0.376
Trace test indicates 5 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

According to the results of Trace Statistics test given in table 3, there exist five cointegrating equations. Therefore five cointegrating equations are used in the study to establish a long run relationship between the variables of macroeconomics and KSE 100 index.

Long run relationship is depicted in Table 4.

Table 4: *Normalized Cointegrating Coefficients*

Normalized cointegrating coefficients (standard error in parentheses)							
LKSE	LCPI	LER	LEX	LI	LIIP	LM2	D
1.00	5.990	-6.522	-0.826	0.669	-0.054	-4.007	1.426
SE	(0.851)	(1.032)	(0.215)	(0.162)	(0.202)	(0.412)	(0.167)
t-value	7.04	6.32	3.83	4.13	0.26	9.73	8.54

The normalized equation can be written as:

$$LKSE_t = -5.98LCPI_t + 4.007.LM2_t + 6.52LER_t + 0.05LIIP_t - 0.66Li_t + 0.82LEX_t - 1.42D_t$$

The results obtained from the analysis of cointegration are as follows:

The estimated coefficient of CPI is significant and has a negative sign. This indicates negative relation with stock prices. A possible explanation for this relation can be the decrease in disposable income which reduces savings that are being invested in the stock market. Hence the resultant decrease in demand for stock market products lowers their price. When the inflation rises it forces the authorities to control this by adopting a contractionary monetary policy which ultimately leads to increase the rate of interest and hence the discount rate increases. It is an economic phenomenon that inflation is caused by an increase in money supply which leads to contractionary monetary policy and results in discount rate to increase. The increased discount rate leads the stock prices to depreciate. As the rate of inflation and the rate of cash flows are not the same so the effect to increase the rate of interest may not be offset by a rise in cash flows due to inflation. This is because of existence of nominal contracts which hampers the revenues of the firm and costs of the firm to be immediately adjusted. Therefore the cost of inputs increases and it effects the demand which results in cash flows to decrease and thus stock prices depreciates.

M2 is significant and positively related with the stock prices. More securities will be bought with the availability of excess liquidity, hence rises demand for securities and the increased demand leads the prices of the securities to increase. On the other hand the economic stimulus generated by an increase in money supply may dissolve the negative effects of inflation results in an increase in the cash flows and stock prices of the firms which are due to the effect of corporate earnings.

ER is significant and positively associated with stock prices. Theoretically exchange rate has twofold relation with the stock market prices. Firstly, a lower price of stocks in foreign currency is an attraction for portfolio investment in the stock market. Secondly, if a local currency depreciates this will result in exports of that country to become cheap and hence the demand for exports of that country will increase. Ultimately results in exports of that country to increase. The increased exports lead the cash inflows of that country to increase. As the demand for exports is assumed to be sufficiently elastic and thus raises the revenue for the export oriented industries which ultimately results in a positive mood in the stock exchange market and leads the stock prices to increase. In contrast, the appreciation of a domestic currency reflects economic stability which ultimately results in increased investment both in the real as well as in the financial sector. The increased demand for local listed securities will push up the level of index of

stock exchange market. Therefore there exists a positive correlation between the exchange rate and stock prices

IIP is positively related to the stock prices but insignificant. The result is in contradiction with (Nishat & Shaheen, 2004) which indicated that a positive significant relationship exists between the stock prices and IIP. Because in the last decade a continuous decline in the economy and GDP was observed and the real sector of the economy remained effected mainly because of poor law and order situation, political unrest and severe energy crises. Therefore impact of IIP is insignificant.

A negative and significant relation is indicated between the discount rate and the stock prices. The effect of increase or decrease in discount rates is on the profits of the companies which in turn affect the dividends and thus prices of the stocks. Increase in Discount rate increases the borrowing cost of the companies where as decrease in discount rate decreases the borrowing cost of the companies and thus serves as an incentive for expansion and leads to increase the expected returns for the firm in the future and results in stock prices to appreciate.

The results reveal that exports are significant and positively related with the stock prices. The increase in exports results in foreign exchange reserves to improve due to which the exchange rate and prices become stable. The exports become cheap due to the reduced domestic prices and the demand for exports increases. This increased demand generates cash inflows and results in increased dividends thus show a positive impact on stock prices.

The results show that there is a significant negative long run relationship of crises with stock prices. Prolong crises have greater effects as the overall economic activity is depressed for a longer period, lowering output supply and decreasing productivity. This directly reduces growth and longevity of this will result in the economy entering a recession persisting for a longer duration. The Great Depression of 1929 was a manifestation of this phenomenon.

VECM Results

For short run association the model is estimated in differenced form. The estimated equation of VECM is as follows:

$$\Delta LKSE100_t = 0.012 + \sum_{i-1}^{P} \theta_{1i} \Delta LCPI_{t-1} + \sum_{i-1}^{P} \beta_{1i} \Delta LM2_{t-1} + \sum_{i-1}^{P} \mu_{1i} \Delta LER_{t-1} + \sum_{i-1}^{P} \eta_{1i} \Delta LIIP_{t-1} + \sum_{i-1}^{P} \lambda_{1i} \Delta Li_{t-1} + \sum_{i-1}^{P} \phi_{1i} \Delta LEX_{t-1} + \sum_{i-1}^{P} \rho_{1i} D_{t-1} - 0.15$$

The convergence towards equilibrium path in the long run and its speed to adjust is depicted by the adjustment coefficient of KSE in VECM. The results of above

equation show that the coefficient of error term of KSE is below one and is significant with a negative sign.

Table 5: *VECM Results*

Error Correction:	D(LKSE)	D(LCPI)	D(LER)	D(LEX)	D(LI)	D(LIIP)	D(LM2)	D(D)
CointEq1	-0.157	-0.002	0.022	0.099	0.042	0.021	0.009	-0.038
	(0.038)	(0.004)	(0.004)	(0.054)	(0.019)	(0.037)	(0.007)	(0.042)
	[-4.161]	[-0.550]	[5.607]	[1.831]	[2.201]	[0.547]	[1.229]	[-0.907]
D(LKSE(-1))	0.113	0.006	-0.019	0.176	-0.021	0.104	-0.003	-0.014
	(0.085)	(0.009)	(0.009)	(0.123)	(0.042)	(0.085)	(0.016)	(0.094)
	[1.328]	[0.669]	[-2.196]	[1.433]	[-0.495]	[1.231]	[-0.181]	[-0.147]
D(LCPI(-1))	-0.592	0.273	0.173	-1.766	1.154	-0.847	-0.080	2.861
	(0.979)	(0.098)	(0.103)	(1.407)	(0.488)	(0.970)	(0.185)	(1.082)
	[-0.605]	[2.771]	[1.680]	[-1.255]	[2.365]	[-0.874]	[-0.431]	[2.644]
D(LER(-1))	1.475	0.153	0.447	-0.136	-0.039	0.047	-0.326	0.318
	(0.756)	(0.076)	(0.080)	(1.087)	(0.377)	(0.749)	(0.143)	(0.836)
	[1.952]	[2.004]	[5.605]	[-0.125]	[-0.104]	[0.063]	[-2.284]	[0.380]
D(LEX(-1))	-0.145	0.006	0.010	-0.422	0.034	-0.322	0.004	0.022
	(0.062)	(0.006)	(0.007)	(0.0890)	(0.031)	(0.061)	(0.012)	(0.068)
	[-2.344]	[0.984]	[1.526]	[-4.748]	[1.091]	[-5.258]	[0.372]	[0.323]
D(LI(-1))	-0.353	0.014	-0.031	0.075	-0.067	0.128	-0.030	-0.054
	(0.192)	(0.019)	(0.020)	(0.275)	(0.096)	(0.190)	(0.036)	(0.212)
	[-1.843]	[0.730]	[-1.555]	[0.273]	[-0.701]	[0.676]	[-0.832]	[-0.256]
D(LIIP(-1))	0.110	-0.001	-0.013	-0.067	0.002	0.068	-0.010	-0.062
	(0.084)	(0.008)	(0.009)	(0.120)	(0.042)	(0.083)	(0.016)	(0.093)
	[1.319]	[-0.099]	[-1.473]	[-0.556]	[0.045]	[0.819]	[-0.637]	[-0.667]
D(LM2(-1))	0.220	0.0356	0.132	0.116	0.427	2.092	-0.194	0.075
	(0.506)	(0.051)	(0.053)	(0.727)	(0.252)	(0.501)	(0.096)	(0.559)
	[0.436]	[0.699]	[2.472]	[0.160]	[1.695]	[4.176]	[-2.026]	[0.134]
D(D(-1))	0.160	-0.001	-0.061	0.071	-0.060	-0.039	0.019	-0.045
	(0.093)	(0.009)	(0.010)	(0.133)	(0.046)	(0.092)	(0.018)	(0.103)
	[1.728]	[-0.054]	[-6.275]	[0.531]	[-1.302]	[-0.421]	[1.088]	[-0.443]
C	0.012	0.005	-0.001	0.024	-0.014	-0.013	0.017	-0.016
	(0.013)	(0.001)	(0.001)	(0.018)	(0.006)	(0.013)	(0.002)	(0.014)
	[0.938]	[3.544]	[-0.310]	[1.328]	[-2.175]	[-1.089]	[6.497]	[-1.107]

The KSE 100 index is adjusted by 15.73 percent which is depicted by the coefficient of error term. The time required to remove the disequilibrium is calculated as (1/0.1573 = 6.00) i.e. approximately 6 months are required to achieve the equilibrium path in the long run.

KSE index have negative and significant relation with the one period lagged exchange rate i.e., the previous period exchange rate negatively affects the stock price. One of the possible reasons for this behavior in case of Pakistan can be the addition to the national debt by exchange rate depreciation. Higher outflow of funds will therefore leave

lesser for investment in the industry and stocks. The relation between exchange rate and stock index may be bidirectional as is indicated by the ER relation with the lagged stock index.. The negative and significant relation indicates this relation.

The direct relation of the remaining variables with stock prices is insignificant. This can be interpreted theoretically by taking into account the short term relation of the stock prices and economic variables. The data frequency time period is one month, This time period is significant for the stock indices as they are highly sensitive to information whereas may not be very significant for the economic variables which operate over a longer time period. The process of stock market adjustment to economic variables is thus a longer time period than one month. In other words it may be hypothesized that stock incorporates the change in economic variable over a longer time period and hence the relation is insignificant over the frequency of the data.

Impulse response and variance decomposition

For further verification of the results impulse response and variance decomposition analysis have also been carried out. The response of KSE to impulses of significant variables is shown in the Fig 2. The response of log value of KSE index to one standard deviation shock of the variables for the ensuing period of 40 months (data frequency) is shown. Response to CPI shock was also significant in the VECM framework also exhibited here. The index responds negatively to any inflationary shock and then regains its normal path after an approximate duration of 7 time period. Except for the money supply M2 the response of KSE to other variables follows identical track – initially declines and then in the 10 to 18 months' time period resume the original path. For the M2 the response is identical but with opposite sign .i.e., positive change in response to M2 deviation shock.

The results of impulse responses and variance decomposition are shown in Fig 2 and 3 respectively. The results exhibit pattern in conformance with the already obtained results. The variance in KSE index is significant and persistent to CPI, discount rate and M2. These variables positively and approximately identically contribute to the variance of KSE index. Exports confirm the previous results of not significant contribution to the KSE.

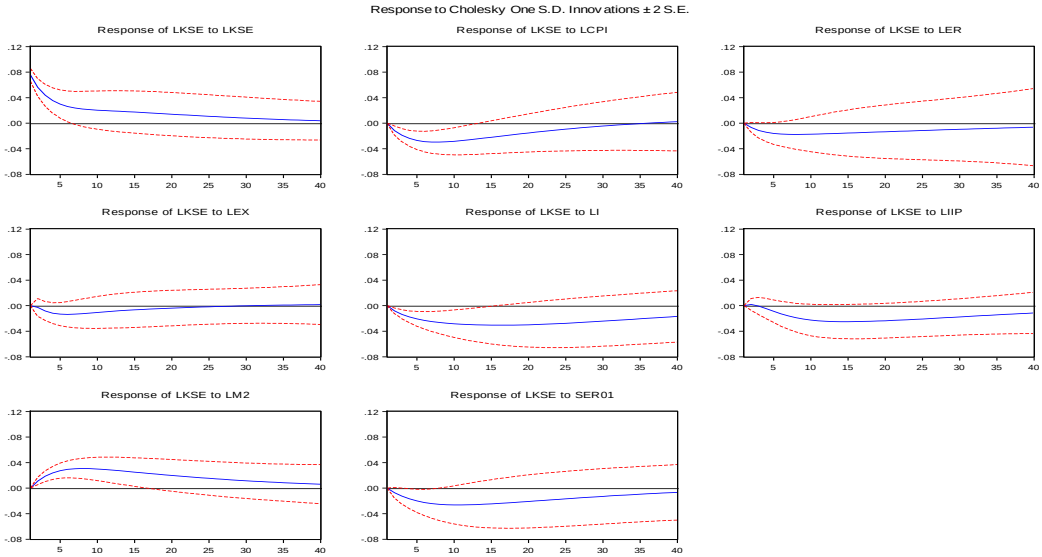

Figure 2: *Impulse Response Function*

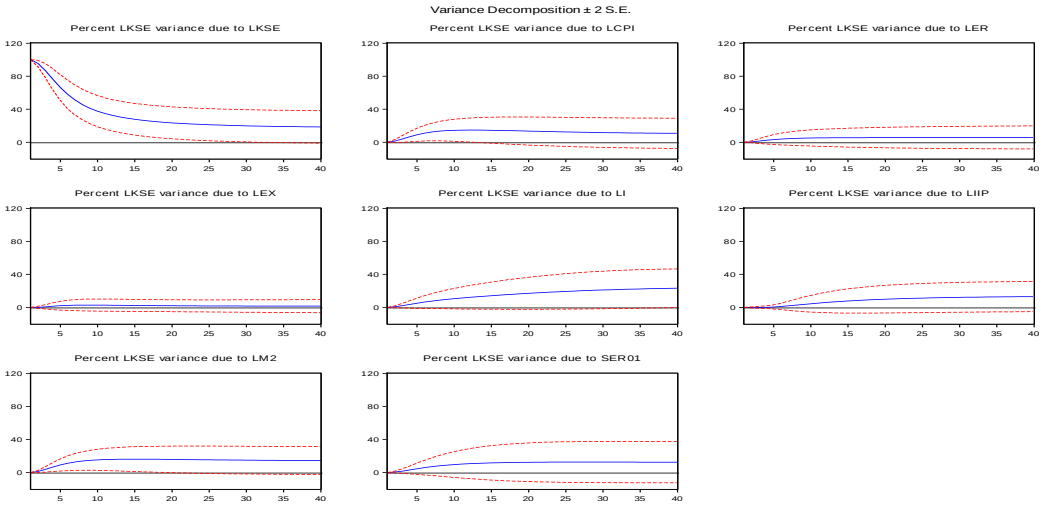

Figure 3: *Variance Decomposition*

Conclusion

The results of ADF implies that the whole time series is integrated of order I(1). The trace statistics show five co-integrating equations that proved the existence of long run association among variables. In the long run CPI, i and D shows negative while ER, EX and M2 shows a positive and significant relationship with the prices of stocks whereas IIP depicts a positive but insignificant impact on stock prices. The significant negative effect of market crash 2008 on stock prices is depicted by the dummy variable

used in the model. The analysis of VECM describes the convergence which is depicted by the ECM, which shows the speed of adjustment towards the equilibrium path in the long run i.e. it will take approximately 6 months to overcome any distortions and converge towards long-run equilibrium.

The findings of the study are compatible with the economic theory and no apparent contradiction has been found. The performance of KSE may be taken as an indicator of the underlying economy specially of exchange rate and inflation behavior, both being financial variables with deeper effects on the other macroeconomic variables. These indications of the results after further robust studies can be used for pre-emptive adjustment in the monetary and fiscal policies to avert recessions, inflations and may be spikes and crashes in the stock market. In the same manner the study can be extended to the weaknesses and imperfections in the capital markets across Pakistan.

The study can further be extended by using data of different frequencies to find the synchronized time duration between the economic variables and stock indices. Another extension of the study can be made by inclusion of variables for information and also integration with international stock markets.

References

Abdalla I.S.A. & Murinde, V. (1997). Exchange rate and stock price interactions in emerging financial markets: Evidence on India, Korea, Pakistan and Philippines. *Appl. Fin. Econ*., 7(1), 25-35.

Aggarwal, R. (1981). Exchange rates and stock prices: A case study of U.S capital markets under floating exchange rates. *Akron Business and Economic Review,* 21(3), 7-12.

Aggarwal, R., & Rivoli, P. (1989). The relationship between the US and four Asian stock markets. *ASEAN Economic Bulletin*, 6(1), 110-117.

Ali, I., Rehman, K. U., Yilmaz, A. K., Khan, M. A. & Afzal, H. (2010). Causal relationship between macro-economic indicators and stock exchange prices in Pakistan. *African Journal of Business Management*, 4(3), 312-319.

Ali, I., Rehman, K. U., Yilmaz, A. K., Khan, M. A., & Afzal, H. (2010). Causal relationship between macro-economic indicators and stock exchange prices in Pakistan. *African Journal of Business Management*, 4(3), 312.

Ali, M. B. (2011). Impact of micro and macroeconomic variables on emerging stock market return: A case on Dhaka Stock Exchange (DSE). *Interdisciplinary journal of research in business*, 1(5), 8-16.

Al-Sharkas, A. (2004). The dynamic relationship between macroeconomic factors and the Jordanian stock market. *International journal of applied econometrics and quantitative studies*, 1(1), 97-114.

Charkravarty, S. (2005). Stock market and macroeconomic behavior in India. *Institute of Economic Growth. Available from Internet: http://www. iegindia. org/dispap/dis106. pdf*.

Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of business*, 59(3), 383-403.

DeFina, R. H. (1991). Does inflation depress the stock market. *Business Review, Federal Reserve Bank of Philadelphia*, 3(4), 3-12.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, 74(366a), 427-431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 49(4), 1057-1072.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society*, 55(2), 251-276.

Fama, E. F., & French, K. R. (1989). Business conditions and expected returns on stocks and bonds. *Journal of financial economics*, 25(1), 23-49.

Fama, Eugene F., and G. William Schwert (1977). Asset returns and inflation. *Journal of financial economics*, 5(2), 115-146.

Famma, E. F. (1981). Stock prices, inflation, real activity and money. *American Economic Review*, 71(4), 545-565.

Famma, E. F. (1990). Stock prices, expected prices and real activity. *Journal of Finance*, 45(4), 1080-1089.

Friedman, M. (1988). Money and the stock market. *Journal of Political Economy*, 96(2), 221-245.

Geske, R., & Roll, R. (1983). The fiscal and monetary linkage between stock returns and inflation. *The Journal of Finance*, 38(1), 1-33.

Granger, C. W., Huangb, B. N., & Yang, C. W. (2000). A bivariate causality between stock prices and exchange rates: evidence from recent Asian flu. *The Quarterly Review of Economics and Finance*, 40(3), 337-354.

Humpe, A., & Macmillan, P. (2009). Can macroeconomic variables explain long-term stock market movements? A comparison of the US and Japan. *Applied Financial Economics*, 19(2), 111-119.

Husain, F., & Mahmood, T. (2001). The stock market and the economy in Pakistan. *The Pakistan Development Review*, 40(2), 107-114.

Husain, I. (2004). Financial sector reforms in Pakistan. *Italy-Pakistan Trade and Investment Conference, Rome on September* 28, 2004, 1-8.

Hussain, F., Hamid, K., Akash, R. S. I., & Khan, M. I. (2011). Day of the Week Effect and Stock Returns:(Evidence from Karachi Stock Exchange-Pakistan). *Far East Journal of Psychology and Business*, 3(3), 25-31.

Ibrahim, M. (1999). Macroeconomic variables and stock prices in Malaysia: An empirical analysis. *Asian Economic Journal*, 13(2), 219-231.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 12(2-3), 231-254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 59(6), 1551-1580.

Kanasro, H. A., Jalbani, A. A., & Junejo, M. A. (2009). Stock Market Liquidity: A Case Study of Karachi Stock Exchange. *Pakistan Journal of Commerce & Social Sciences*, 3(1), 25-34

Kiymaz, H. (2001). The effects of stock market rumors on stock prices: evidence from an emerging market. *Journal of Multinational Financial Management*, 11(1), 105-115.

Malkiel, B. G., & Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The journal of Finance*, 25(2), 383-417.

Maysami, R. C., & Koh, T. S. (2000). A vector error correction model of the Singapore stock market. *International Review of Economics & Finance*, 9(1), 79-96.

Maysami, R. C., & Sim, H. H. (2001). Macroeconomic forces and stock returns: a general-to-specific ECM analysis of the Japanese and South Korean markets. *International Quarterly Journal of Finance*, 1(1), 83-99.

Maysami, R. C., & Sim, H. H. (2002). Macroeconomics variables and their relationship with stock returns: error correction evidence from Hong Kong and Singapore. *The Asian Economic Review*, 44(1), 69-85.

Miller, K. D., Jeffrey, F. J., & Mandelker, G. (1976). The Fisher effect for risky assets: An empirical investigation. *The Journal of finance*, 31(2), 447-458.

Mookerjee, R., & Yu, Q. (1997). Macroeconomic variables and stock prices in a small open economy: The case of Singapore. *Pacific-Basin Finance Journal*, 5(3), 377-388.

Muhammad, N., Rasheed, A., & Husain, F. (2002). Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries. *The Pakistan Development Review*, 41(4), 535-550.

Muhammad, N., Rasheed, A., & Husain, F. (2002). Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries. *The Pakistan Development Review*, 41(4), 535-550.

Muhammad, S. D., Hussain, A., Ali, A., & Jalil, M. A. (2009). Impact of Macroeconomic Variables on Stock Prices: Empirical Evidence in Case of KSE. *European Journal of Scientific Research*, 38(1), 96-103.

Mukherjee, T. K., & Naka, A. (1995). Dynamic relations between macroeconomic variables and the Japanese stock market: an application of a vector error correction model. *Journal of Financial Research*, 18(2), 223-237.

Nelson, C. R. (1976). Inflation and rates of return on common stocks. *The journal of Finance*, 31(2), 471-483.

Nishat, M., & Saghir, A. (1991). The Stock Market and Pakistan Economy-1964-87. *Savings and Development*, 15(2), 131-146.

Nishat, M., Shaheen, R., & Hijazi, S. T. (2004). Macroeconomic Factors and the Pakistani Equity Market. *The Pakistan Development Review*, 43(4), 619-637.

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of economic theory*, 13(3), 341-360.

Schumpeter, J. A. (1982). The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle (1912/1934). Transaction Publishers.

Sohail, N., & Hussain, Z. (2009). Long-run and short-run relationship between macroeconomic variables and stock prices in Pakistan: The case of Lahore Stock Exchange. *Pakistan Economic and Social Review*, 47(2), 183-198.

Shahbaz, M., Lean, H. H., & Kalim, R. (2013). The impact of foreign direct investment on stock market development: evidence from Pakistan. *Economic Research-Ekonomska Istraživanja*, 26(1), 17-32.