Impact of Macroeconomic Variables on Stock Market Performance: The Case of Karachi Stock Exchange

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Abstract
The aim of this paper is to analyze the impact of key macroeconomic variables on stock market performance. These variables include Gross Domestic Product (GDP), interest rate, inflation rate, exchange rate, money supply (M2), Foreign Direct Investment (FDI), and use of IMF credit. The dependent variable is the market capitalization of Karachi Stock Exchange. The results of co-integration confirmed a long-run co-integrating relationship between the selected macroeconomic variables and stock market performance. Furthermore, the Vector Error Correction Model was applied which showed a long-run equilibrium relationship between macro variables and stock market performance but it failed to established any short-run relationship. The results of Toda-Yamamoto Causality test confirmed a uni-directional causality from market capitalization to GDP and interest rate only but no causality was found from any variable to market capitalization. So it is concluded that the macroeconomic variables do form a relationship with the stock market performance in the long-run but no such relationship was found in the short-run and hence Karachi Stock Exchange cannot be regarded as a leading indicator of Pakistan's economy.

Keywords: *Macroeconomic Variables, Karachi Stock Market, Foreign Direct Investment, Gross Domestic Product, Vector Error Correction Model, Toda-Yamamoto Causality Test*

1. Introduction

Stock market performance is considered a leading indicator of the performance of an economy because it plays an important role in the overall financial system of the country. Stock market is the channel which helps flow of funds from savers to borrowers and plays a pivotal role in the development of the industry and commerce of a country (Hussain, Aamir, Rasool, Fayyaz, & Mumtaz, 2012). Stock markets provide an easy platform to trade securities and hence enable the firms to acquire capital quickly. These are the reasons that the government, industry and even the central bank of a country closely watch the performance of the stock market and hence stock market's performance is significant from both the industry and investors point of view (Nishat & Shaheen, 2004). But in order for stock market to play its role, it must be efficient. An efficient market is the one where prices adjust to new information quickly and hence prices reflect all available information about the securities. If stock prices correctly reflect the underlying essentials of macroeconomic variables, then the stock prices set future economic agenda. But if stock prices do not reflect all the information, then investors would be able to exploit that information to earn abnormal profits and hence preventing the stock market from performing its due role in the development of an economy. But it is not known that how quickly prices adjust to changes in key macroeconomic variables in the country. Further, the effect of changes in key macroeconomic variables on stock market performance in the country is also not known. Such knowledge is important for investors, borrowers, business managers and policy makers in making their decisions. Therefore, it is important to find if there is any long-run relationship among macroeconomic variables and stock market performance because it is vital in devising the macroeconomic policy of a country.

1.1 Research Objectives

The aim of this study is to analyze the impact of key macroeconomic variables on the performance of Karachi Stock Exchange. These macroeconomic variables include Gross Domestic Product, interest rate, exchange rate, money supply, Foreign Direct Investment and use of IMF credit. This study also investigates if there is any long-run causal relationship between the selected macroeconomic variables and stock market performance. The specific objectives of the study are as follows.

- To estimate the effect of key macroeconomic variables on Karachi Stock Market using data from 1974 to 2014.
- To find out any causal relationship between macroeconomic variables and Karachi Stock Market.

2. Review of Literature

The available literature on finance and development suggests that macroeconomic variables, financial system performance, and economic development do form an interrelationship but the exact nature of the relationship has been inconclusive. Economists have divergent views on the nature of interrelationships between financial system performance and economic development. These views are divided into the following four groups based on the model followed by Tangjitprom (2012).

2.1 General Economic Conditions

This group contains variables that relate to general economic conditions. GDP growth rate or national output is considered as the direct measurement for economic condition of a country. Hussain and Mahmood (2001) analyzed the co-integration between macroeconomic factors and stock prices, including the gross domestic product in the Pakistani stock market. By employing Error Correction Model, they found a long-run relationship between macroeconomic variables and stock prices. They further argue that there is a unidirectional causality running from macroeconomic variables to stock prices. Hussain (2006) also studied the relationship between GDP and stock prices for Pakistan, by analyzing the data from 1960-2005. The study shows a unidirectional causality from stock prices to GDP, implying a change in GDP is caused by a change in Pakistani stock market. Osamwonyi and Osagie (2012) found a positive relationship between GDP and stock prices in Nigeria. They used Vector Error Correction Model on the data from 1975 to 2005. The same relationship was found by El-Nader and Alraimony (2012) for Jordan using the GARCH model. On the other hand, Attari & Safdar (2013) found no causality between GDP and stock market volatility in Pakistan. They used monthly data from 1991 to 2012 and applied the GARCH model and Granger Causality Test for their study.

2.2 Interest Rate and Monetary Policy

This group of variables includes interest rate and money supply etc. Coleman & Tittey (2008) found a negative impact of interest rate on stock market. They employed co-integration technique and Error Correction Model to draw their conclusions. Yahyazadehfar & Babaie (2012) also found the same relationship for Iran by employing a Vector Autoregressive Technique. Sajjad, Shafi, Jan, Saddat & Rehman (2012) found a unidirectional causality between stock prices and interest rate for Pakistan. Mamun (2013) argues that real interest rate has significant long-run contribution in the development of stock market in Global Growth Generated countries. In the study of Attari & Safdar (2013), it was found that interest rate has long-run causal relationship with stock prices. They analyzed monthly time series data and applied Exponential GARCH and Granger Causality Test. Another study by Sharkas and Adel (2004) argues that interest rate, money supply and Amman Stock Market have a co-integrating relationship. They used Vector Error Correction Model for their analysis. Similarly, (Osamwonyi & Osagie, 2012) conducted the same study in Nigeria and found a significant impact of money supply and interest rate on stock market. But another study in Nigeria by Asaolu & Ogunmuyiwa (2011) concluded a weak relationship between interest rate and Amman Stock Market. On the other hand, Hussain, Aamir, Rasool, Fayyaz & Mumtaz (2012) found a positive impact of interest rate on stock prices in Pakistan. They analyzed the macroeconomic data through Johansen co-integration technique and Vector Error Correction Model to establish their findings. Moreover, Maysami and Koh (2000) also found a co-integrating relationship between exchange rate, interest rate and stock market performance in Singapore. They analyzed monthly time series data through Vector Error Modeling technique to draw their conclusion. Finally, Bekhet & Othman (2012) argued that monetary and fiscal policy tools play a significant role in speeding up the financial performance in Malaysia. They used stock index as proxy for financial performance. However, they suggest that monetary tools can perform better than fiscal tools.

2.3 Price level

This group includes variables related to price level. Generally, consumer price index (CPI) is the most prominent measure of general price level and inflation. There is a strong impact of inflation on stock market performance. Since there is a positive relationship between inflation rate and money growth rate (Fama, 1970), an increase in the money supply may lead the government to increase the basic interest rate (discount rate) which ultimately cause lower stock prices (Maysami and Koh, 2000). Researchers have divergent views on the relationship between inflation and stock prices. Coleman & Tittey (2008) investigated the impact of inflation on stock returns and found a negative impact of inflation on Ghana stock market performance. They employed co-integration technique and Error Correction Models to draw their conclusion. Mohamed, Wisam, Aris and Fouad (2009) found a significant impact of inflation and money supply on Malaysian equity market. They argued that there is a positive relationship between inflation rate and stock prices. Monthly data were analyzed and used co-integration and Error Correction Model in their study. Similarly, a positive relationship between inflation rate and stock returns was also found by (Maysami, 2004). This is in contrast to other studies (El-Nader and Alraimony, 2012; HusseiniAhmad, & Lai, 2011; Osamwonyi and Osagie, 2012) that concluded a negative relationship between inflation rate and stock prices. The authors gave the reason that after the 1997 financial crisis it is the active role of government in preventing price increase after the economy continued to progress. Maysami and Koh (2000) found that inflation and money supply growth form a co-integrating relation with changes in Singapore's stock market levels. Similarly, (Osamwonyi, 2012) find a positive relationship between consumer price index and stock prices in Nigeria. They attributed this relationship to an increase in the inflation pushes stock prices, especially when returns to stocks are expected to rise.

Husseini, Ahmad, & Lai (2011) investigated the impact of macroeconomic variables on stock market indices in India and China. They found that the effect of increase in inflation on these stock indices is positive in both countries. They employed a multivariate co-integration and Vector Error Correction techniques in their study. Sajjad, Shafi, Jan, Saddat, & Rehman (2012) also find a strong causality between inflation rate and Pakistani stock market. El-Nader and Alraimony (2012) also find a negative impact of inflation on stock market for Jordan but they employed Autoregressive Conditional Heteroskedasticity (ARCH) model. Engle (1982) introduced this model which is widely used now in modeling the behavior of time series data. Later on, this model was extended to the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. The GARCH model was also used by Choo, Lee, & Ung (2011) in investigating the impact of macroeconomic variables on Japanese stock market and reported that there is no relationship between macroeconomic variables and stock prices in Japan. Attari and Safdar (2013) confirmed a unidirectional causality between inflation and stock prices in Pakistan. Sharkas and Adel (2004) argued that there is a co-integrating relationship between inflation and stock prices in Aman Stock Exchange. They employed Vector Error Correction Model in their study.

2.4 International Activities

In today's globalized world, people have come closer to each other despite the geographical boundaries. Hence, while studying the behavior of stock markets, one must also consider international economic activities. The most important factors in this group are exchange rate and foreign direct investment. Hussain, Aamir, Rasool, Fayyaz, & Mumtaz (2012) investigated the impact of macroeconomic variables, including foreign exchange rate, on stock prices in Karachi Stock Exchange and find a negative relationship between exchange rate and stock prices. It shows that with the increase in value of home currency, the prices in the stock market declines. Maysami and Koh (2000) also found a co-integrating relationship with stock market levels in Singapore. Similarly, Mohammad, Hussain, Jalil, & Ali (2009) find a positive impact of exchange rate on stock prices in Pakistan.

Agrawalla & Tuteja (2008) argued that there exists a long-run relationship between exchange rate and stock market index in India. Sajjad, Shafi, Jan, Saddat, &

Rehman (2012) found bidirectional Granger causality between exchange rate and stock market in Pakistan. El-Nader and Alraimony (2012), by using ARCH and GARCH models, found a negative impact of exchange rate for Jordan. Singh (2010) also found the same result for India. But on the other hand side, Singh (2010) concluded in his study that there is no correlation between exchange rate and stock prices in India. Choo, Lee & Ung (2011) also concluded that there is no impact of exchange rate on stock market volatility. Similarly, Valadkhani, Chancharat and Havie (2009) also argued that there is no significant impact of exchange rate on stock prices in Thai Stock Market Price Index. They used GARCH model on monthly data from 1988 to 2004.The second factor in this group is Foreign Direct Investment. Foreign Direct Investment has also a prominent impact on the performance of a stock market. Issahaku, Ustarz & Dobanman (2013), for instance, analyzed the relationship between foreign direct investment and stock market returns in Ghana and found a significant long-run relationship. The study also revealed a causal relationship running from stock returns to foreign direct investment. Mamun (2013) also found that foreign direct investment has a significant long-run contribution to the development of stock market.

Foreign exchange reserves are also an important factor in affecting stock returns. As concluded by Mohammad, Hussain, Jalil, & Ali (2009) in their study that after the stock market reforms of 1991 in Pakistan, foreign exchange rate and foreign exchange reserves significantly affect stock market. The purpose of this section is to review studies which examined the impact of key macroeconomic variables on the performance of stock market in Pakistan. Review shows that macroeconomic variables primarily GDP, money supply, interest rate, FDI, exchange rate and inflation are important determinants of stock market performance. Most of the studies used Error Correction Models (ECM), Generalized Autoregressive Conditional Heteroskedasticity (GARCH) and Vector Autoregressive (VAR) tests as the estimation techniques. These studies have also used long term financial time series data and investigated the causal relationship between macroeconomic variables and stock exchange performance using co-integration, Error Correction Models and Granger Causality tests. The present study has used macroeconomic variables identified in the review. These variables include Gross Domestic Product, interest rate, exchange rate, money supply (M2), Foreign Direct Investment (FDI), inflation rate and a relatively new variable, i.e. loan from IMF.

2.5 Hypotheses

In order to analyze the impact of selected macroeconomic variables on stock market performance, the following hypotheses have been developed for the study.

H_{01}: Key macroeconomic variables have no significant effect on the performance of Karachi Stock Market during the period of 1974 to 2014.

H_{02}: There is no causal relationship between key macroeconomic variables and Karachi Stock Market.

3. Methodology

This study has attempted to analyze the short term and long term relationship through the following econometric models and statistical analysis.

3.1 Stationarity Tests

Time series data normally suffers from stationarity problem. If OLS is applied on non-stationary data, it gives spurious results. So it is necessary to first check the data for any unit roots. Therefore, the two most common tests were applied to check the data for stationarity, i.e. Augmented Dickey Fuller unit root test and Phillip Peron test. The decision was taken by comparing the test statistics and critical values for both tests.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.1)$$

Where ε_t is the disturbance term and ΔY_{t-1} the number of lagged difference term which is empirically determined (Gujarati, 1995).

3.2 Johansen Cointegration

One of the main objectives of this study is to analyze any long-term relationship between macroeconomic variable and stock market performance. So order to find the long-run relationship, Johansen and Juselius (1990) cointegration was used. Before going for Johansen cointegration, it should be confirmed that all the variables are integrated of the same order, i.e. I(1) or I(2). Then, according to the process of Johansen cointegration, all the variables were converted to logged form so that to remove temporary shocks and the data could become relatively stable. Furthermore, it was also necessary to convert the data to natural logarithm to avoid any Hetroskedasticity.

The Johansen Cointegration equation is as under:

$$z_t = \alpha_0 \sum_{i=1}^{n} \alpha_j z_{t-j} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Where;

α_0 = Vector of Constants

z_t = Vector non-stationary variables

n = number of lags

a_j = coefficients matrix

e_t = Vector of error terms

The decision about the presence of long term equilibrium relationship was taken through Trace statistics and Maximum Eigen Value statistics. Finally, the optimal lag length was selected through Schwartz Information Criterion.

3.3 Vector Error Correction Model (VECM)

As discussed above, cointegration was used to see if there is any long-term relationship between the independent and dependent variables. But cointegration does not tell us about the short-term dynamics of the data. So for this purpose, Vector Error Correction Model was applied to find out short-run causality between the variables.

The VECM model can be written as

$$\Delta Y_t = \mu + \sum_{j=1}^{k-1} \Gamma_j \, \Delta Y_{t-j} + \alpha\beta' Y_{t-k} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots..(3.3)$$

Where

Δ = First difference notation

Yt = p x 1 vector integrated of order one

μ = px1 constant vector representing a linear trend in a system

k = Lag structure

ε_t = px1 Gaussian white noise residual vector

Γj = pxp matrix indicating short-term adjustments among variables across p equations at the jth lag.

α = pxr speed of adjustment

β = pxr cointegrating vectors.

Even if Yt is nonstationary, a long-term equilibrium relationship (stationary linear combinations of β'Yt) is found when variables are cointegrated. When the variables are not cointegrated then we cannot estimate restricted VAR (VECM), rather we use unrestricted VAR model.

3.4 Toda-Yamamoto Causality Test

This study uses Toda-Yamamoto causality test rather than traditional granger causality test. Toda and Yamamoto (1995) suggest a procedure requiring the estimation of an augmented VAR which guarantees the asymptotic distribution of the Wald statistic (an asymptotic χ2-distribution), because the testing procedure is robust to the integration and cointegration properties of the process.

4. Empirical Results

4.1 Descriptive Statistics Correlation

The descriptive statistics and correlations of the variables are given in table 4.1 and 4.2. Market capitalization has achieved highest value of $70262.2 million in 2007 and a minimum of $348.7 million in 1974. It is increasing consistently as evident by its skewness. Similarly GDP has also increased during time and has reached to maximum of $246,800 million in 2014. Interest rate in Pakistan was lowest at 7.5% in 2002, 2003 and 2004 and highest at 20% in 1996. Inflation rate, money supply, IMF loan and FDI has also increased over time all having positive skewnesses. The correlation table is suggesting that all the variables except interest rate and inflation rate are significantly and positively related to stock market performance. Which means that the stock market moves as the related variables move and their direction is also same. While the inflation rate and interest rate are insignificantly related to the stock market performance. Meaning that there is no significant co-movement in stock market performance and the two variables. The movement of these variables is independent of each other. Now we move on to next section to see further behavior of time series data.

Table 4.1: Descriptive Statistics

($Million)	MC	GDP	INR	INFR	EXR	MS	IMFL	FDI
Mean	15302.2	77770.3	11.06	9.24	39.76	31912.4	2267.2	886.19
Standard Error	3072	10550.5	0.44	0.76	4.50	4190.5	395.2	211.7
Kurtosis	1.365	0.519	1.992	3.587	-0.71	-0.054	4.368	5.933
Skewness	1.509	1.277	1.556	1.592	0.691	1.075	2.284	2.471
Minimum	348.7	8773	7.5	2.91	9.9	3149.72	292.47	4.00
Maximum	70262.2	246800	20	26.66	101.62	97280.38	10257.98	5590.00
Observations	41	41	41	41	41	41	41	41

MC = Market Capitalization, GDP = Gross Domestic Product, INR = Interest Rate, INFR = Inflation Rate, EXR = Exchange Rate, MS = Money Supply, IMFL = Loan from IMF,
FDI = Foreign Direct Investment

Table 4.2: Correlations

	LMC	LGDP	LINR	LINFR	LEXR	LMS	LIMFL	LFDI
LMC	1							
LGDP	.954	1						
LINR	.196	.210	1					
LINFR	-.016	-.070	.302	1				
LEXR	.946	.955	.213	-.116	1			
LMS	.965	.995	.210	-.096	.953	1		
LIMFL	.775	.885	.228	-.051	.835	.864	1	
LFDI	.939	.923	.267	-.068	.900	.937	.747	1

4.2 Testing for Stationarity

Time series data normally suffers from stationarity problem. In the presence of unit roots in the data, OLS does not produce fair results. So, the variables need to be stationarity before analyzing any long term relationship and estimating an econometric model. To check the variables for stationarity, the most commonly applied tests have been used, i.e. The Augmented Dickey Fuller Test and the Philip Peron test. The results are shown in Table 4.3.

Table 4.3: ADF and Philip Peron Test Results

Variables	ADF Test		PP Test	
	Level	1st Difference	Level	1st Difference
LMC	-0.672386	-4.012983	-0.824516	-6.659276
LGDP	-0.729425	-4.061806	-1.467071	-5.268534

LINR	-2.405698	-3.127399	-2.447634	-5.360789
LEXR	-0.283814	-3.731936	0.123931	-4.290552
LINFR	-2.237517	-5.263281	-2.405772	-6.787989
LMS	-1.238056	-3.693268	-1.816276	-3.766617
LFDI	-1.393936	-4.384971	-2.486813	-7.562857
LIMFL	-1.393936	-4.384971	-2.486813	-7.562857
Critical Values				
1% Significance Level	-3.6067	-3.6117	-3.6019	-3.6067
5% Significance Level	-2.9378	-2.9399	-2.9358	-2.9378
10% Significance Level	-2.6069	-2.6080	-2.6059	-2.6069

By looking at the results in Table 4.3, we see that all the variables are stationary at first difference. Meaning that all the variables are integrated of order one. So we are ready to test for any long term cointegrating relationship between the dependent and independent variables because for applying the Johansen cointegration, it is necessary that the variables should be integrated of the same order.

4.3 Johansen's Cointegration

As the variables are not stationary, so we cannot apply OLS because it gives spurious results (Irfanullah and Rahman, 2014). So the appropriate technique for this study is the Johansen and Juselius cointegration. Trace statistics and Maximum Eigen Value criteria have been used to make decision. In order to choose proper lag length, Shwarz Information Criterion (SIC) was used. According to SIC, the minimum value is the optimum. So we have taken lag 1 for our model as shown in table 4.4.

Table 4.4: Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-51.38838	NA	3.15e-09	3.125704	3.470459	3.248365
1	236.2900	439.0881*	2.61e-14	-8.646844	-5.544049*	-7.542893
2	303.4857	74.26887	3.54e-14	-8.815036	-2.954201	-6.729796
3	422.6942	81.56372	9.15e-15*	-11.72075*	-3.101872	-8.654217*

* indicates lag order selected by the criterion

Table 4.5 shows the Trace statistics and Maximum Eigen value statistics. The first hypothesis of no cointegration is rejected because the value of Trace and Maximum Eigen statistics are greater than the critical values at 0.05 level of significance. Also the probabilities are significant, i.e. less than 0.05. Similarly, the second hypothesis of one cointegrating equation and the third hypothesis of two cointegrating equations are also rejected at 0.05 level. So both tests are suggesting the presence of 3 cointegrating equations at .05 level. So we conclude that there exist a long term relationship between macroeconomic variables and stock market.

Table 4.5: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.838299	238.1023	159.5297	0.0000
At most 1 *	0.797167	167.0440	125.6154	0.0000
At most 2 *	0.671763	104.8245	95.75366	0.0103
At most 3	0.495889	61.37771	69.81889	0.1955
At most 4	0.340752	34.66430	47.85613	0.4658
At most 5	0.246787	18.41472	29.79707	0.5355
At most 6	0.171898	7.361856	15.49471	0.5359
At most 7	0.000147	0.005739	3.841466	0.9389

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.838299	71.05835	52.36261	0.0003
At most 1 *	0.797167	62.21949	46.23142	0.0005
At most 2 *	0.671763	43.44679	40.07757	0.0201
At most 3	0.495889	26.71341	33.87687	0.2790
At most 4	0.340752	16.24957	27.58434	0.6445
At most 5	0.246787	11.05287	21.13162	0.6421
At most 6	0.171898	7.356116	14.26460	0.4479
At most 7	0.000147	0.005739	3.841466	0.9389

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.4 Vector Error Correction Model

Now that we have found a long term cointegrating relationship between macroeconomic variables and stock market performance, we can estimate the Vector Error Correction Model to analyze the short-run dynamics of the variables. From table 4.6, we can see that the coefficient of ECM(-1) is negative and significant which shows a long-run unidirectional causality running form macroeconomic variables to stock prices.

It indicates a stable error correction mechanism which ultimately converges to the long-run equilibrium level even when there is a departure from the equilibrium level in the short run. The negative coefficient of the ECT (-0.558720) confirms the existence of long-run equilibrium relationship of the model. The speed of adjustment to the long run equilibrium level is 55.87% which means that 55.87 percent of any previous disequilibrium in the long run will be corrected in the short term. Moreover, we can see that all the coefficients of the variables are insignificant implying that the independent variables have no effect on the dependent variable in the short-run. It means that the variables are independent of each other in the short-run. The coefficients of Democracy, Military Led Democracy and Military Government are also insignificant implying that no structural breaks have been observed due to different government structures. So the performance of stock market is independent of the government structure. The R-squared value of 0.5388 is means that 53% of the variation in market capitalization can be explained by the independent variables collectively. The significant F-value is implying that the model is significant to establish the relationship. Moreover, the Durbin-Watson statistic is almost 2 which is the evidence of the absence of Autocorrelation in the model.

Table 4.6: Vector Error Correction Model

	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.558720	0.247472	-2.257711	0.0383
LGDP(-1)	3.756166	2.912570	1.289640	0.2155
LINR(-1)	-0.522344	0.944722	-0.552908	0.5880
LEXR(-1)	-1.613624	3.681534	-0.438302	0.6670
LINFR(-1)	-0.300219	0.313628	-0.957245	0.3527
LMS(-1)	0.264076	2.704348	0.097649	0.9234
LFDI(-1)	0.124130	0.301145	0.412194	0.6857
LIMFL(-1)	-0.460933	0.452005	-1.019751	0.3230
D(DEM(-1))	-0.070623	0.180012	-0.392322	0.6980
D(MLD(-1))	0.168872	0.209444	0.806286	0.4274
D(MG(-1))	-0.051066	0.166964	-0.305850	0.7622
R-squared	0.538859	Durbin-Watson stat		1.972492
F-statistic	6.890312			
Prob(F-statistic)	0.004916			

4.5 Toda-Yamamoto Causality Test

If there is a long-term cointegrating relationship between the variables, there must be a causality from either side. The long-run causality was found from the ECM term but in order to find the short-run causality, we have used the Toda Yamamoto causality test. The results of Toda-Yamamoto causality test are given in table 4.7 on the basis of Wald Test. From the results of Wald Test, we find a unidirectional causality from DLMC to DLGDP and DLINR only. It means that in the short-run, a change in market capitalization cause a change in GDP and interest rate. But no other causality could be found in either direction. So we can say that in the short-run, the macroeconomic variables cannot affect the stock market performance and conclude that investors cannot use the information regarding macroeconomic variables to earn abnormal profits. We can also conclude that stock market is not the leading indicator of the economy in Pakistan.

Table 4.7: Wald Test Results

Null Hypothesis	Chi-Sq Value	Prob.	Causality
DLGDP does not Granger cause DLMC	3.293389	0.1927	No causality
DLMC does not Granger cause DLGDP	5.787991	0.0161	Unidirectional causality
DLINR does not Granger cause DLMC	2.998845	0.2233	No causality
DLMC does not Granger cause DLINR	5.935710	0.0148	Unidirectional causality
DLEXR does not Granger cause DLMC	1.911847	0.3845	No causality
DLMC does not Granger cause DLEXR	1.167626	0.2799	No causality
DLINFR does not Granger cause DLMC	1.313188	0.5186	No causality
DLMC does not Granger cause DLINFR	0.234550	0.6282	No causality
DLMS does not Granger cause DLMC	0.051882	0.9744	No causality
DLMC does not Granger cause DLMS	3.810560	0.0509	No causality
DLFDI does not Granger cause DLMC	0.382914	0.8258	No causality
DLMC does not Granger cause DLFDI	1.130344	0.2877	No causality
DLIMFL does not Granger cause DLMC	1.123327	0.5703	No causality
DLMC does not Granger cause DLIMFL	0.001095	0.9736	No causality

4.6 Variance Decomposition Test

The results of Variance Decomposition Test suggests that the volatility in stock prices are due to its own internal dynamics in the short-run. While in the long-run, only shocks in GDP and interest rates are contributing to the volatility in stock market performance. Similarly, shocks in FDI and GDP are contributing to the volatility in stock market to a little extent in the long-run as 2% and 5% respectively. While interest rate and exchange rate are explaining the volatility in market capitalization to a reasonable extent as the period extends. Interest rate and exchange rate are contributing 10% and 9% respectively.

Table 4.8: Variance Decomposition Test Results

Period	LMC	LGDP	LINR	LEXR	LINFR	LMS	LFDI	LIMFL
1	100.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	89.6408	0.07745	3.31935	1.17895	0.67174	0.07620	1.49685	0.00303
3	78.4385	0.29974	6.80194	4.44689	1.09205	0.75235	2.21572	0.16927
4	70.4793	1.45096	9.09965	7.33636	1.18557	1.35947	2.07634	0.51599
5	65.7804	2.95405	10.4313	8.81157	1.17188	1.47932	1.97864	0.87509
6	63.2529	4.14473	11.0594	9.31809	1.14151	1.41840	2.12558	1.13491
7	61.9518	4.85229	11.1917	9.40676	1.11422	1.46833	2.35940	1.27467
8	61.2339	5.19030	11.0731	9.36851	1.09428	1.68944	2.55379	1.32543
9	60.7153	5.31611	10.9150	9.31756	1.08370	2.02718	2.67098	1.32975
10	60.2403	5.34295	10.8201	9.28865	1.08582	2.44630	2.71956	1.31944

5. Conclusion and Recommendations

The aim of this paper was to investigate the relationship between stock market and a range of macroeconomic variables in Pakistan. These variables include GDP, interest rate, exchange rate, inflation rate, money supply (M2), FDI and loan from IMF. It goes further to analyze whether movement in stock prices is determined by the selected macroeconomic variables in Pakistan. To see this, time series macroeconomic data were collected from 1974-2014. The study used Johansen Cointegration technique to estimate any long-term cointegrating relationship among the dependent and explanatory variables. The results showed that there is a long-term cointegrating relationship between independent and dependent variables. Which means that in the long-run, the independent variables affect the performance of stock market. In the second step, Vector Error Correction Model was applied to see the short-run dynamics of the variables. The results suggest that there is a long-term equilibrium relationship between the independent and dependent variables even if they don't agree in the short-run. But if we look at the coefficients of the variables and their respective t-values, not any variable has a significant relationship with the performance of stock market. It means that in the short-run, the selected macroeconomic variables have no effect on stock market but in the long-run, they do form an equilibrium relationship, that is, they move together. Also the dummy variables for different government structures have no effect on the performance of the stock market in the short-run. Whatever the government structure is, the stock market is not affected by those structures significantly.

The results of Toda-Yamamoto causality test are only suggesting a unidirectional short-run causality from market capitalization to GDP and interest rate. It means that the changes in market capitalization cause a change in GDP and interest rate. But no variable is causing a change in market capitalization. It means that stock market is not affected by these variables in the short-run. Moreover, the Variance Decomposition Test reveals that the errors in forecasting of market capitalization are mostly explained by its own internal dynamics. In the short-run, 100 percent of the volatility can be contributed to the internal dynamics of market capitalization itself. But as we move on, only minor contribution is made by interest rate, exchange rate and GDP. Interest rate is explaining 11%, exchange rate is explaining 8% while GDP explains only 5% volatility in the stock market performance in the long-run while at least 60% volatility in the longer period is because of its own internal volatility. So, based on the above facts, it is concluded that the selected macroeconomic variables do have an effect on Karachi stock market performance in the long-run but no significant relationship could be found in the short-run and no causality either. It means that Karachi Stock market is not a leading indicator of the economy in the short-run. The movements in stock prices are not explained by the macroeconomic variables. So investors cannot exploit the information regarding the macroeconomic variables to earn abnormal profits. We can also say that Karachi stock market is efficient in its semi-strong form in the short-run because the stock prices quickly adjust to the changes in macroeconomic variables and hence not affected by these variables in the short-run.

The same conclusion was also given by Hussain and Mahmood (2001) and Hussain (2006) for Pakistan, Asaolu and Ogunmuyiwa (2010) for Nigeria, Aggrawalla and Tuteja (2008) for India and Choo, Lee & Ung (2011) for Japan. They also regarded their stock markets as not a leading indicator of the economy in their countries. Now it is recommended that the government should take sound policies regarding the stability of Karachi stock market so that the macroeconomic variables could be used to affect the performance of stock market. Further, government should increase the capital gains tax to encourage the investors for long-term investment. When investors would invest their money for the long-term, they would obviously use the information regarding macroeconomic variables, including other important information, to make decisions. Because investors in Pakistan do speculation rather than investment for long-term in the stock market and hence are concerned only about the short-run conditions of the stock market. So they don't bother about the economic conditions of the country while investing. Moreover, as the macroeconomic variables have a relationship with the performance of stock market in the long-run, government should create macroeconomic stability to make the stock market perform better in the long-run. Long-lasting economic stability will help improving the credit rating of Pakistan by the international credit rating agencies which will boost the confidence of international investors as well as local investors. Similarly, our stock market is highly affected by political events and law and order situation so government should focus on political stability and law and order situation of the country to boost confidence of internal as well as external investors. They should make their governance better and devise sound policies regarding macroeconomic environment. And the last recommendation is that, further research should be conducted by taking other relevant variables to study their effect on stock market performance.

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