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Stock prices and Macroeconomic Performance in Pakistan: An Analysis

[1]Saima Mukhtar, [2]Imran Sharif Chaudhary, [3]Furrukh Bashir

[1]M. Phil. Scholar, School of Economics, Bahauddin Zakariya University Multan
[2]Professor and Director, School of Economics, Bahauddin Zakariya University Multan, imran@bzu.edu.pk
[3]Lecturer, School of Economics, Bahauddin Zakariya University Multan

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ABSTRACT

This paper analyzes long-term equilibrium relationships between the Karachi stock exchange index and a group of macroeconomic variables. The macroeconomic variables are represented by the gross domestic product, the consumer price index, M2 and the exchange rate. We employ a multiple regression model to explore such relationships during 1991 to 2012. Our results indicated a "causal" relationship between the stock market and the economy analysis of our results indicates that KSE 100 index has a strong positive impact on GDP and M2 in Pakistan. Whereas it has a negative and significant impact on CPI and exchange rate in Pakistan. Granger causality test shows that KSE 100 index Granger causes GDP, CPI, M2, EXRT, AGRI, FDI and BOT and the direction of causality runs from KSE 100 index to these variables.

Corresponding author's email address: imran@bzu.edu.pk
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1: Introduction - Pakistani stock market and macroeconomic variables

Over the past few decades, the interaction of share returns and the macroeconomic variables has been a subject of interest among academics and practitioners. It is often argued that stock prices are determined by some fundamental macroeconomic variables such as the interest rate, the exchange rate and the inflation. Anecdotal evidence from the financial press indicates that investors generally believe that monetary policy and macroeconomic events have a large impact on the volatility of stock price.

This implies that macroeconomic variables can influence investors' investment decision and motivates many researchers to investigate the relationships between share returns and macroeconomic variables. But it does not mean that stock prices cannot affect macroeconomic variables. To prove this phenomenon we have conducted this research.

Stock exchange performance has attained major role in global economics and financial markets, due to their impact on corporate finance and economic activity. For instance Adjasi and Biekpe (2006) stated that stock exchanges allow firms to attain capital quickly, due to the ease with which securities are traded. Stock exchange activity, thus, plays an important role in helping
to determine the effects of macroeconomic activities.

2. Pakistan's Equity Market .

Karachi Stock Exchange (KSE) is the biggest and most liquid exchange of Pakistan. For the year 2002, it was declared the best performing stock market of the world. A total of 654 companies were listed on December 8, 2009 with a market capitalization of Rs. 8.561 trillion (US$ 120.5 billion). Pakistan's industrial export and foreign investment has grown rapidly. Pakistan's foreign exchange reserves reached 12,425.2 million US$ in the year 2008-2009. Now days our all stock markets traded on international markets. The KSE 100 index reached at 7760.69 in 2009. An international magazine 'Business Week' ranked KSE as one of the best performing markets of the world for three years.

.Many studies have been conducted on the impact of macroeconomic variables on stock prices such as: **Wongbangpo and Sharma (2002), Dickinson (2010), Mishra (2005), Naik and Padhi (2012), Akmal (2007), Aurangzeb (2012), Menike (2006), Nishat and Shaheen (2004), Hasan and Nasir (2008), Kwon and Shin (1999)** and many. But no study was conducted to know the impact of stock prices on macroeconomic variables. That is why, our study seeks to examine the impact of stock prices on macroeconomic variables and for this purpose we have selected KSE 100 index and some macroeconomic variables (GDP, CPI, M2, and EXRT). Karachi Stock Exchange 100 index is used to represent the Pakistani stock market index, because it provides an easy way to inspect the performance of capital market and the economy as a whole.

2.1 The Asset Valuation Model and Pricing of Macroeconomic Factors

The capital assets pricing model was introduced as a model of risk and return by Sharpe (1964), Linter (1965), Treynor (1962) and Mossin (1966). It has become the most significant theory of the link between risk and return in asset pricing. This was renowned by the works of Black, etc. al., (1972) and Fama and Macbeth (1973).
The basis of capital asset pricing model is the making of an efficient market portfolio that maximizes return, at a certain level of risk. The expected return of an individual security is based on its risk covariance with the market.

2.2 Stock prices and Macroeconomic Variables

We will take in our study KSE 100 index as a measure for stock prices and five macroeconomic variables, namely Gross Domestic Product(GDP), Agriculture production(value added), CPI(as a proxy for inflation rate), exchange rate and M2(as a measure of money supply) and balance of trade(BOT). We will suppose following relationships between stock prices and macroeconomic variables:

Stock prices and GDP

We will suppose here a positive relationship between stock prices and GDP.

Stock prices and CPI

We are taking here CPI as a proxy for inflation and we are going to propose a negative relationship between stock prices and CPI here.

Stock prices and Exchange Rate

We are going to propose a negative relationship between stock prices and exchange rate in our study.

Stock prices and Money Supply

We are going to propose a positive relationship between stock prices and money supply.

3. Methodology and Data

Data

The variables which we use to represent Pakistan's stock market and its output, inflation, money stock and exchange rate are respectively the KSE 100 Index, the gross domestic product (GDP), the Consumer Price Index (CPI) , a broad money supply (M2), and the exchange rate (EXRT). In our study we sourced data from the World Bank and from the Financial Database website. Data on GDP, Agriculture value added, CPI, Broad money (M2), and Exchange rate were taken from the World Bank's World Development Indicators while the data for KSE 100 Index was gotten from the Financial Database website. Therefore all the data used is secondary in nature.

Empirical Methodology

Because in our research we have used time series data, so regression analysis was employed to be able to examine if any significant relationship exists between KSE 100 Index and macroeconomic variables(GDP, CPI, M2, EXRT, BOT and FDI). The models in our study are estimated using the co-efficient of independent variables and their level of significance. These tests present an empirical podium for simplification in this study.

In our model we have used four models of the form:

$$\mathbf{Y = \alpha_o + \alpha_1 X1 + \alpha 2 X2 + \alpha 3 X3 + \alpha 4\ X4 + e}t$$

Where:

Y = dependent or unexplained variable

α0 = constant of the model

α1, α2, α3, α4 = coefficients of the model

X1, X2, X3, X4, = Independent or explanatory variables.

et = error term.

We will use following four models

Model 1:

$$\mathbf{GDP = \alpha_0 + \alpha 1\ KSE + \alpha 2\ CPI + \alpha 3\ AGRI + et}$$

Where:

GDP = Gross Domestic Product

KSE = Karachi Stock Exchange 100 index

CPI = Consumer Price Index (a proxy for inflation)

AGRI = Agriculture value added

Model 2:

$$\mathbf{CPI = \alpha 0 + \alpha 1\ KSE + \alpha 2\ M2 + \alpha 3\ GDP + \alpha 4 AGRI + et}$$

Where:

CPI = Consumer price index

KSE = Karachi Stock Exchange 100 index

M2 = broad money

GDP = Gross Domestic Product

AGRI= Agriculture Value Added

Model 3:

$$\mathbf{M2 = \alpha 0 + \alpha 1\ KSE + \alpha 2\ CPI + \alpha 3\ EXRT + \alpha 4\ GDP + et}$$

Where:

M2 = Broad Money
KSE= Karachi Stock Exchange
CPI= Consumer Price index
EXRT = Exchange rate
GDP = Gross Domestic Product

Model 4:

$$\mathbf{EXRT = \alpha_0 + \alpha_1 KSE + \alpha_2 M2 + \alpha_3 FDI + \alpha_4 BOT + et}$$

Where:
EXRT = Exchange rate
KSE = Karachi Stock Exchange 100 Index
M2 = Broad Money
FDI = Foreign Direct Investment
BOT = Balance of Trade

4. Analysis of Results

Augmented Dickey Fuller test

ADF with Intercept:

Table 1 presents the results of ADF test with intercept. The critical t-value at 10% level is -2.65. The results show that KSE series is not stationary at levels, because ADF < t-value here. So we have taken its first difference and after differencing once, it became stationary. So its order of integration is I (1). Series of GDP is stationary at levels. So its order of integration is I (0). Series of AGRI is also stationary at levels. So its order of integration is I (0). Series of CPI became stationary after differencing two times and its order of integration is I (2). Series of M2 and FDI are also stationary at levels and their order of integration is I (0). Series of EXRT became stationary after differencing once and its order of integration is I (1). Series of BOT became stationary after differencing two times and its order of integration is I (2).

ADF with Intercept and Trend

Table 2 presents the results of ADF test with trend and intercept. The t critical value at 10% level is -3.2856. The results indicate that KSE is stationary at first difference and its order of integration is I (1). GDP, CPI, M2 and EXRT are stationary at second difference and their order of integration is I (2). Only two series, AGRI and BOT are not stationary.

Multiple Regression Analysis

We have four models to analyze in our study. The results of each model are presented below

Regression Results of Model 1

Our first model is

$$GDP = \alpha_0 + \alpha_1 KSE + \alpha_2 CPI + \alpha_3 AGRI + et$$

In first model, we have focused on the impact of KSE 100 index on GDP. In this model GDP is the dependent variable and KSE 100 index along with CPI and Agriculture Value Added are the independent variables. The Regression estimates show that, the coefficient of KSE 100 index is positive and significant. It means when KSE 100 index price increases GDP also increases. This is so because, when KSE 100 index price increases, wealth of investors increases. So, investment and consumption also increases and in this way GDP also increases. The results also indicate that CPI has a negative but less significant impact on GDP and AGRI (Agriculture value added) has a positive and significant impact on GDP. This is so because Pakistan is basically an agrarian country and agriculture production plays an important role in enhancing its GDP.

R-squared and Adjusted R-squared are 0.99. Its mean 99% variation in GDP is due to these variables. DW statistics is 1.84 which shows there is no multicollinerity. So, our estimated model becomes

GDP = -178756.7 **+**83.67487 **KSE +**-9813.813 **CPI +** 5.379802 **AGRI**

Regression Results of Model 2

Table 5.7 presents the regression results of model 2. The model is

CPI = α0 + α1 KSE + α2 M2 + α3 GDP +α4Agri +et

In this model we emphasize on the relationship of KSE 100 index and CPI. CPI is our dependent variable and the explanatory variables are KSE, M2 and Exchange Rate. The results indicate that, the coefficient of KSE is negative and significant at 6%. Its mean KSE 100 index has a less powerful negative impact on CPI in Pakistan. The second explanatory variable is M2. Its coefficient is positive and significant. Money supply has a powerful positive impact on CPI in Pakistan because when money in circulation increases prices of goods will increase. Results indicate that GDP also has a positive and significant impact on CPI in Pakistan. This is so because when production will stronger prices would automatically move downward. The same reason is true for AGRI having a positive significant impact on CPI in Pakistan. R-squared and Adjusted R-squared are 0.99; its means 99% of the total variation in CPI is due to these variables. D.W. statistics is 1.75 which shows there is no multicollenerity in our model.

So our model becomes

CPI = 30.53 -0.002 KSE + 0.0000195M2 -0.00000704 GDP + 0.0000503Agri

Regression Results of Model 3

Our third model is

M2 = α0 + α1 KSE + α2 CPI + α3 EXRT + α4 GDP + et

In this model our aim is to identify the impact of KSE 100 index on money supply (M2) in Pakistan. Dependent variable is M2 and the explanatory variables are KSE 100 index, CPI, EXRT and GDP. According to the results, constant is -330064.4. The results indicate that KSE 100 index has a strong positive impact on M2 in Pakistan. CPI has a positive but less significant impact on M2. EXRT has also a positive and significant impact on M2. GDP has also a positive and powerful significant impact on M2. R-squared and Adjusted R-squared are 0.99; it shows that 99% of the total variation in M2 is just because of these variables. D.W. statistics is 2.08 which indicate no multicollinerity in this model. So, after estimation model becomes

M2 = -330064.4 **+**109.7765 **KSE** +3204.924 **CPI +** 10842.46 **EXRT +** 0.252592 **GDP**

Regression Results of Model 4

Our fourth and last model is

EXRT = $\alpha_0 + \alpha_1$ KSE + α_2 M2 + α_3 FDI + α_4BOT + et

In this model, our emphasis is on the impact of KSE 100 index on Exchange Rate in Pakistan. In this model our dependent variable is Exchange Rate and the explanatory variables are KSE 100 index, M2, FDI and BOT. The results indicate that KSE 100 index has a strong negative impact on Exchange Rate in Pakistan. M2, FDI and BOT have a strong positive impact on Exchange Rate in Pakistan. Adjusted R-squared is 0.94, which indicates that 94% of the variation in Exchange Rate is due to these variables. D.W. statistics is 1.787 which shows there is no problem of multicollinerity in this model. So, our estimated model becomes

EXRT =26.57696- 0.003441 KSE + **1.90E-05**M2 + **0.006712**FDI +**0.002381**BOT

Granger Causality Test

Granger Causality test shows the strength and direction of the relationship between variables.

Granger causality test shows that KSE 100 index Granger causes GDP, CPI, M2, EXRT and FDI and the direction of causality runs from KSE 100 index to these variables. CPI Granger causes GDP as well as M2, EXRT, FDI and Bot. M2, EXRT and BOT granger cause AGRI. M2, FDI and BOT granger cause CPI. M2 granger causes EXRT. A two way causality runs from FDI to M2 and M2 to FDI. M2 granger

causes BOT. FDI granger causes EXRT. A two way causality runs from BOT to EXRT and from EXRT to BOT. FDI granger causes BOT.

Table 1

Correlation Matrix

Column1	KSE	GDP	AGRI	CPI	M2	EXRT	FDI	BOT
KSE	1	0.859	0.842	0.851	0.909	0.785	0.747	-0.914
GDP	0.859	1	0.998	0.994	0.992	0.923	0.432	-0.888
AGRI	0.842	0.998	1	0.996	0.987	0.933	0.419	-0.874
CPI	0.851	0.994	0.996	1	0.989	0.950	0.450	-0.881
M2	0.909	0.992	0.987	0.989	1	0.931	0.523	-0.912
EXRT	0.785	0.923	0.933	0.950	0.931	1	0.454	-0.778
FDI	0.747	0.432	0.419	0.450	0.523	0.454	1	-0.728
BOT	-0.914	-0.888	-0.874	-0.881	-0.912	-0.778	-0.728	1

Table 2

ADF with Intercept

Column1	Level	1st.Diff.	2nd.Diff	Order
KSE	-0.596719	-3.409493		I(1)
GDP	4.241393			I(0)
AGRI	3.014931			I(0)
CPI	1.482619	-0.294403	-3.14724	I(2)
M2	5.02223			I(0)
EXRT	0.099095	-3.136907		I(1)
FDI	-2.828408			I(0)
BOT	0.111821	-2.263768	-3.057492	I(2)

Table 3

ADF with Intercept and Trend

Column1	Level	1st.Diff.	2nd.Diff.	Order
KSE	-2.423479	-3.370494		I(1)
GDP	3.05793	-0.440299	-3.935145	I(2)
AGRI	1.323431	-1.117215	-2.655097	
CPI	-0.133954	-1.387748	-3.307875	I(2)
M2	2.927076	-1.378478	-5.626014	I(2)
EXRT	-2.118426	-3.213241	-4.839824	I(2)
FDI	-3.699406			I(0)
BOT	-1.49575	-2.566863	-2.930172	

Regression Results of Model 1

Dependent Variable: GDP

Method: Least Squares

Sample: 1991 2012
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-178756.7	555157.2	-0.321993	0.7512
KSE	83.67487	30.98167	2.700787	0.0146
CPI	-9813.813	15993.60	-0.613609	0.5472
AGRI	5.379802	0.753326	7.141399	0.0000

R-squared	0.997003	Mean dependent var	6336571.
Adjusted R-squared	0.996503	S.D. dependent var	5665763.
S.E. of regression	335039.9	Akaike info criterion	28.44485
Sum squared resid	2.02E+12	Schwarz criterion	28.64322
Log likelihood	-308.8934	F-statistic	1995.806
Durbin-Watson stat	1.841323	Prob(F-statistic)	0.000000

Regression Results of Model 2

Dependent Variable: CPI
Method: Least Squares

Sample: 1991 2012
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.52593	2.068534	14.75727	0.0000
KSE	-0.001525	0.000784	-1.946426	0.0683
M2	1.95E-05	5.93E-06	3.290343	0.0043
GDP	-7.04E-06	3.12E-06	-2.254403	0.0377
AGRI	5.03E-05	1.37E-05	3.673634	0.0019

R-squared	0.995487	Mean dependent var	97.37651
Adjusted R-squared	0.994425	S.D. dependent var	52.63995
S.E. of regression	3.930308	Akaike info criterion	5.772029
Sum squared resid	262.6045	Schwarz criterion	6.019993
Log likelihood	-58.49232	F-statistic	937.5028
Durbin-Watson stat	1.752945	Prob(F-statistic)	0.000000

Regression Results of Model 3
Dependent Variable: M2
Method: Least Squares

Sample: 1991 2012
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-330064.4	181099.5	-1.822559	0.0860
KSE	109.7765	11.07935	9.908209	0.0000

CPI	3204.924	6843.699	0.468303	0.6455
EXRT	10842.46	5001.870	2.167680	0.0447
GDP	0.252592	0.052517	4.809679	0.0002
R-squared	0.997782	Mean dependent var		2727026.
Adjusted R-squared	0.997260	S.D. dependent var		2250941.
S.E. of regression	117827.8	Akaike info criterion		26.38855
Sum squared resid	2.36E+11	Schwarz criterion		26.63652
Log likelihood	-285.2741	F-statistic		1911.732
Durbin-Watson stat	2.083293	Prob(F-statistic)		0.000000

Regression Results of Model 4

Dependent Variable: EXRT
Method: Least Squares
Date: 11/10/13 Time: 11:10
Sample: 1991 2012
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.57696	1.963845	13.53313	0.0000
KSE	-0.003441	0.000893	-3.854817	0.0013
M2	1.90E-05	1.95E-06	9.735691	0.0000
FDI	0.006712	0.001557	4.309855	0.0005
BOT	0.002381	0.000551	4.322954	0.0005
R-squared	0.952689	Mean dependent var		54.53746
Adjusted R-squared	0.941557	S.D. dependent var		20.58708
S.E. of regression	4.976909	Akaike info criterion		6.244211
Sum squared resid	421.0836	Schwarz criterion		6.492176
Log likelihood	-63.68633	F-statistic		85.58165
Durbin-Watson stat	1.787284	Prob(F-statistic)		0.000000

Granger Causality Test

Pair wise Granger Causality Tests

Sample: 1991 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause KSE	20	1.31898	0.29670
KSE does not Granger Cause GDP		1.34184	0.29100
AGRI does not Granger Cause KSE	20	1.35294	0.28827
KSE does not Granger Cause AGRI		4.76361	0.02502
CPI does not Granger Cause KSE	20	2.37887	0.12666
KSE does not Granger Cause CPI		5.80262	0.01360
M2 does not Granger Cause KSE	20	6.04567	0.01187
KSE does not Granger Cause M2		0.74476	0.49162
EXRT does not Granger Cause KSE	20	2.50948	0.11478
KSE does not Granger Cause EXRT		3.82514	0.04546
FDI does not Granger Cause KSE	20	1.04725	0.37520

KSE does not Granger Cause FDI		2.74552	0.09637
BOT does not Granger Cause KSE	20	1.15348	0.34200
KSE does not Granger Cause BOT		32.6135	3.5E-06
AGRI does not Granger Cause GDP	20	0.74977	0.48938
GDP does not Granger Cause AGRI		2.23225	0.14170
CPI does not Granger Cause GDP	20	10.4821	0.00142
GDP does not Granger Cause CPI		2.03060	0.16579
M2 does not Granger Cause GDP	20	2.71481	0.09857
GDP does not Granger Cause M2		1.04648	0.37545
EXRT does not Granger Cause GDP	20	3.73329	0.04832
GDP does not Granger Cause EXRT		1.98323	0.17210
FDI does not Granger Cause GDP	20	4.89595	0.02309
GDP does not Granger Cause FDI		1.22884	0.32047
BOT does not Granger Cause GDP	20	4.00733	0.04033
GDP does not Granger Cause BOT		2.76136	0.09526
CPI does not Granger Cause AGRI	20	18.7802	8.2E-05
AGRI does not Granger Cause CPI		0.09113	0.91340
M2 does not Granger Cause AGRI	20	4.52090	0.02907
AGRI does not Granger Cause M2		0.56306	0.58105

4. Conclusion

Our study focused on the impact of KSE 100 index on four macroeconomic variables; GDP, CPI, M2 and EXRT in Pakistan. The study can be concluded in few lines as follows.

In model one we have concluded that KSE 100 index has a positive and significant impact on GDP in Pakistan. In model two, we have concluded that KSE 100 index has a negative impact on CPI in Pakistan. It means that stock prices should remain high in order to cut down inflation. In model three, we have concluded that KSE 100 index has a positive significant impact on supply of money. Finally, in model four, we have concluded that KSE 100 index has a negative significant impact on Exchange Rate in Pakistan.

5. Policy Implications and Recommendations

The policy implication state that the Macroeconomic factors are not responsive to changes in Pakistani stock exchange prices in spite of the sizable proportion of stock market capitalization as a share of the country's GDP. Hence, predicting stock prices and returns via Changes in stock prices becomes precarious and this affects economic forecast, planning and growth. It thus becomes obvious that the macroeconomic factors might be very sensitive to global stock markets or other salient issues in the Pakistani environment which of course warrants further investigation.

Under the light of above results it is highlighted that there is a need of well managed macroeconomic policies in order to obtain the benefits from the capital market. In order to take the full advantage of stock market and carry on with the international markets well managed macroeconomic policies are necessary in which interest rates and inflation rate are thoroughly monitor and try to reduce the value as much possible.

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