Macroeconomic Policies and Stock Returns in Pakistan: 
A Comparative Analysis of Three Stock Exchanges
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Abstract
The stock market is a barometer of a country’s economy. The stock market of Pakistan was initiated in the year 1947 at Karachi. Later on two more stock exchanges were established in Lahore and Islamabad in the year 1970 and 1992 respectively. The intent of this study is to investigate the response of stock prices to macroeconomic variables i.e. industrial production index, consumer price index, money supply, real effective, three months treasury bills rate, and exchange rate on three stock indices i.e. ISE10 index, LSE25 index, and KSE100 index relating three stock exchanges namely Islamabad Stock Exchange, Lahore Stock Exchange, and Karachi Stock Exchange respectively. To explore the long run relationships Johansen cointegration technique was applied. The results showed that industrial production has long run positive impact on stock prices in all three markets. Exchange rate was positively affecting all indices except ISE10 index. Inflation was positively related with stock returns at Karachi Stock market, while it was negatively related with rest of the two markets. The money supply affected stock returns negatively, while treasury bills rate had mixed effect.

Key words: Stock Prices, Cointegration, Macroeconomic variables
JEL Classification: G11, G12, G15, F30, F31,

Introduction
Capital market provides funds for the large business organizations. It works as a channel for flow of funds from the lenders to the borrowers. Therefore, stock market had a very important role in the economic development of a country and considered as a key element of a modern market economy. Several factors are considered for the revival and strength of the stock market of the country including infrastructures, exchange rate, foreign exchange reserves, trade balance, monetary policy, inflation, terms of trade, oil prices, real GDP growth rate, foreign direct investment, burden of debts, relationships with the regional countries, positive reporting by international financial and brokerage institutions. The liberalization, privatization, and deregulation policies also have a positive effect in promoting private investment which led to increase in the stock returns.
The changes in macroeconomic variables and expectations affect stock returns intensively. The domestic economic conditions are an important determinant of the stock market development. However, the global events and the policies implemented by developed countries along with domestic economic variables can also bring changes in the domestic stock markets because of globalization. In global economy, international factors that affect the stock return would be the rate of interest, exchange rates, and stock indices of other stock markets. For example, outflow and inflow of capital is affected by domestic interest rate as well as by the interest rates of developed countries. The financial theories stress on the factors i.e. risk source. The long run returns of an asset must show the changes in such factors. It means that financial and real sectors of the economy are related to stock markets movements and this relation can be analyzed in two ways; (a) stock market shows economic activities, (b) impact of the stock market on aggregate demand suggesting that it lags economic activity. This process continues through aggregate expenditures on consumer goods and expenditures on capital goods. The impact of macroeconomic variables on stock returns is very important in financial theory. The efficient stock markets are very helpful and essential for economic growth and prosperity.


Mandelker and Tandon (1985) explored relationship between stock returns and expected inflation, and unanticipated inflation and discovered that relationship between stock prices and anticipated inflation was negatively related. Chatrath et al. (1997), found negative impact of inflation on stock prices Indian economy. Groenewold et al. (1997) explored association between stock prices and expected inflation in Australian economy which was found negative in previous studies. The results demonstrated an indirect relationship between inflation and stock prices. Alagidede (2008) investigated whether stock market provide hedge against inflation for South Africa, Nigeria, Egypt, Morocco, Tunisia, and Kenya because this issue got great consideration in the economics and finance. The author tested Fisher’ Hypothesis for these countries. In Kenya only, the Fisherian hypothesis was not rejected. Ratanapakorn and Sharma (2007) disclosed that inflation had a positive impact on stock prices in US while Humpe and Macmillan (2009), found negative association between stock returns and inflation.
Some studies explored impact of economic growth on stock prices and found that oscillation in stock prices usually imitate true economic activities (Fama, 1981; Nishat and Shaheen, 2004; Cook, 2007; Ratanapakorn and Sharma, 2007; Shabaz et al. 2008; Humpe and Macmillan, 2009 ;). Fama (1981) studied the connections of real GDP and stock returns and explored immense association among stock returns and GNP, and stock returns and industrial production. Chen et al. (1986) found a powerful affiliation among the economic activity and the stock market.

Nishat and Shaheen (2004) explored that there was a strong positive effect of industrial production on stock returns in Pakistan. Granger causality test showed stock price affected industrial production. Ratanapakorn and Sharma (2007) investigated the long run association between industrial production and US stock prices. The authors found that stock prices were perhaps influenced by change in output level via impact of output on profitability. Humpe and Macmillan (2009) investigated effects of industrial production on stock returns by using cointegration technique and found in US stock returns were positively affected by the industrial production.

Many economists worked to explore the relationship between exchange rate and stock returns during the last twenty five years. Mixed results were found. Aggarwal (1981) found positive association between foreign exchange rate and stock prices in US. Soenen and Hennigan (1988) explored negative relationship between exchange rate and stock prices.

Mookerjee (1987) analyzed supply of money and stock returns in Switzerland, Japan, Canada, Germany, Italy, UK, France, Holland, Belgium and United States; and Jeng, et al. (1990) explored relationship between money supply and stock returns in United States, Belgium, France, Hungary, Japan, Poland, Sweden, Britain, Canada, Czechoslovakia, and. Nishat and Shaheen, (2004) found negative but insignificant association between money supply and stock returns and Ratanapakorn and Sharma, (2007) investigated that there was positive effects of increase in money supply on stock prices in US. While; Humpe and Macmillan, (2009) explored negative influence of increase in supply of money on NKY 225 in Japan

Few economists found positive effects of increase in interest rate on stock prices while; some studies explored negative relationship between these two variables e. g. Ratanapakorn and Sharma, (2007) reported positive relationship stock prices and rate of interest in United States
and Humpe and Macmillan (2009) reported that rate of interest had negative effects on stock returns.

The rest of the paper is planned as. Second section provides source of data and explains methodology to explore long run associations among stock returns and macroeconomic variables. Third section, reveals results while conclusion is discussed last and fourth section.

2: DATA and METHODOLOGY

Monthly data was examined to discover the nature of association between the macroeconomic variables such as consumer price index, real effective exchange rate, three month bills rate as a proxy for rate of interest, industrial production index as a proxy for GDP growth rate, money supply (M₂), KSE 100 (Index relating to Karachi stock exchange), LSE 25 (Index relating to Lahore stock exchange) and ISE 10 (Index relating to Islamabad stock exchange). The mostly data were collected from monthly bulletins published by the State Bank of Pakistan, International Financial Statistics, Federal Bureau of Statistics, Annual reports of Islamabad stock exchange, and financial newspaper “Business Recorder”. KSE 100, LSE 25, and ISE 10 indices were introduced in November, 1991, December, 2002, and July, 2004 respectively. Therefore; the study used the data from November, 1991 to June, 2008 to examine the association between macroeconomic variables and KSE100 index. The relationship between LSE 25 and macroeconomic variables was examined from the last month of 2002 to the 6th month of 2008 and association between macroeconomic variables and ISE10 was analyzed from July, 2004 to June 2008. The portrayals of the variables used in this article were given as under:

- KSE 100 = KSE 100 index after transforming into natural log
- LSE 25 = LSE 25 index after transforming into natural log
- ISE 10 = ISE 10 index after transforming into natural log
- CPI = Consumer price index after transforming into natural log
- IPI = Index of industrial production index after transforming into natural log
- REER = Real effective exchange rate after transforming into natural log
- M₂ = Money supply (Broader money) after transforming into natural log
- TTBR = Three months treasury bills rate after transforming into natural log

2.1: Stationary Checks

Hill et al. (2001) described that most of macroeconomic variables time series such as inflation rate, GDP growth rate, money supply etc. were nonstationary. A time series said to be
stationary if shocks are temporary and if the variance or the mean or both the variance or the mean, then the time series is said to be nonstationary. Asteriou and Hall, (2006) further explained that in case of non-stationary time series, the variance of a series depended upon time and becomes infinity with the passage of time.

Three tests were applied to test the stationarity

i. ADF test (Dickey & Fuller, 1981),
ii. PP test (Phillips & Perron, 1988)
iii. KPSS (Kwiatkowski, Phillips, Schmidt. and Shin, 1992)

2.2: Co integration Technique

To explore the no. of equilibriums relationships or long-run associations among the time series Co integration technique was used. Johansen and Juselius (1990), illustrated that in the presence of long-run relationship among variables, the divergence from equilibrium path were bounded and concluded as existence of co-integration among the variables in the long-run. Johansen method was used to explore the long run relationships among the variables which explicated as under:

\[ z_t = a_0 + \sum_{i=1}^{n} a_j z_{t-j} + e_t \] ...............(1)

Where;
\[ a_0 = \text{vector of constants (nx1)} \]
\[ z_t = \text{vector of non stationary variables(nx1)} \]
\[ n = \text{the no. of lags} \]
\[ a_j = \text{coefficients matrix (nxn)} \]
\[ e_t = \text{vector of error terms (nx1)} \]

After reformulated the above VAR process VECM (vector error correction model) to employ Johansen and Juselius technique as below:

\[ \Delta z_t = a_0 + \sum_{j=1}^{p} \Gamma_j \Delta z_{t-j} + \Pi z_{t-n} + e_t \] ...........(2)

Where;
\[ \Gamma_j = - \sum_{j'=1}^{j} a_{j'} \quad \text{and} \quad \Pi = - I + \sum_{j'=1}^{p} a_{j'} \]
\[ I = \text{identity matrix (n x n)} \]
\[ \Delta = \text{the difference operator.} \]

Maximum Eigen Value test statistics and the Trace test statistics were used to explore the no. of attribute roots.

**Models**

To find long run relationship between macroeconomic variables and stock indices at different stock exchanges following four models were estimated.

**Model 1:**
\[ \text{KSE100} = \beta_1 \text{CPI} + \beta_2 \text{IPI} + \beta_3 \text{REER} + \beta_4 \text{M2} + \beta_5 \text{TTBR} + \varepsilon_t \]

**Model 2**
\[ \text{LSE 25} = \beta_1 \text{CPI} + \beta_2 \text{IPI} + \beta_3 \text{REER} + \beta_4 \text{M2} + \beta_5 \text{TTBR} + \varepsilon_t \]

**Model 3**
\[ \text{ISE 10} = \beta_1 \text{CPI} + \beta_2 \text{IPI} + \beta_3 \text{REER} + \beta_4 \text{M2} + \beta_5 \text{TTBR} + \varepsilon_t \]

3: **Empirical results**

3.1: **Stationarity test**

The study applied three different tests for checking the stationarity of the time series for the period November, 1991 to June, 2008. All three tests were unanimously in the results and indicated that all the series were found nonstationary at level. But, at the first difference time series were found stationary as was shown in Table 1 (Period= 11th month of 1991 to 6th of 2008), Table 2 (Period= 12th month of 2002 to 6th of 2008) and Table 3 (Period= 7th month of 2004 to 6th of 2008).

**Table 1: Unit Root Analysis**

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF test statistic</th>
<th>PP test statistics</th>
<th>KPSS test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ho: Variable is Non-stationary</td>
<td>Ho: Variable is Non-stationary</td>
<td>Ho: Variable is stationary</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>First Difference</td>
<td>Level</td>
</tr>
<tr>
<td>KSE100</td>
<td>-0.187</td>
<td>-14.509*</td>
<td>-0.175</td>
</tr>
<tr>
<td>CPI</td>
<td>-0.148</td>
<td>-4.273*</td>
<td>-0.695</td>
</tr>
<tr>
<td>IPI</td>
<td>2.106</td>
<td>-13.446*</td>
<td>-2.285</td>
</tr>
<tr>
<td>REER</td>
<td>-1.904</td>
<td>-11.346*</td>
<td>-1.383</td>
</tr>
<tr>
<td>M2</td>
<td>0.295</td>
<td>-3.107*</td>
<td>-0.734</td>
</tr>
<tr>
<td>TTBR</td>
<td>-2.172</td>
<td>-5.249*</td>
<td>-1.609</td>
</tr>
</tbody>
</table>


| At 5 percent Level | -2.875 | -2.875 | 0.463 |
| At 10 percent Level | -2.574 | -2.574 | 0.347 |
Table 2: Unit Root Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF test statistic</th>
<th>PP test statistics</th>
<th>KPSS test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ho: Variable is Non-stationary</td>
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<td>Ho: Variable Is stationary</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>First Difference</td>
<td>Level</td>
</tr>
<tr>
<td>LSE25</td>
<td>-2.0</td>
<td>-7.0*</td>
<td>-2.1</td>
</tr>
<tr>
<td>CPI</td>
<td>3.4</td>
<td>-5.6*</td>
<td>2.7</td>
</tr>
<tr>
<td>IPI</td>
<td>-1.2</td>
<td>-7.7*</td>
<td>-1.9</td>
</tr>
<tr>
<td>REER</td>
<td>-1.7</td>
<td>-7.8*</td>
<td>-1.7</td>
</tr>
<tr>
<td>M2</td>
<td>-0.9</td>
<td>-3.2*</td>
<td>0.0</td>
</tr>
<tr>
<td>TTBR</td>
<td>-0.5</td>
<td>-5.3*</td>
<td>-1.7</td>
</tr>
</tbody>
</table>


- At 5 percent Level: -2.9, -2.91, 0.46
- At 10 percent Level: -2.6, -2.59, 0.35

Table 3: Unit Root Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF test statistic</th>
<th>PP test statistics</th>
<th>KPSS test statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ho: Variable is Non-stationary</td>
<td>Ho: Variable is Non-stationary</td>
<td>Ho: Variable Is stationary</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>First Difference</td>
<td>Level</td>
</tr>
<tr>
<td>ISE10</td>
<td>-2.43</td>
<td>-5.93*</td>
<td>-2.40</td>
</tr>
<tr>
<td>CPI</td>
<td>2.99</td>
<td>-1.08</td>
<td>2.44</td>
</tr>
<tr>
<td>IPI</td>
<td>-2.51</td>
<td>-5.54*</td>
<td>-2.53</td>
</tr>
<tr>
<td>REER</td>
<td>-1.76</td>
<td>-6.81*</td>
<td>-1.73</td>
</tr>
<tr>
<td>M2</td>
<td>-0.14</td>
<td>-2.68**</td>
<td>-0.13</td>
</tr>
<tr>
<td>TTBR</td>
<td>-2.47</td>
<td>-3.81*</td>
<td>-6.24</td>
</tr>
</tbody>
</table>


- At 5 percent Level: -2.925169, -2.925169, 0.463000
- At 10 percent Level: -2.600658, -2.600658, 0.347000

3.2: Cointegration Analysis

In this study, to find the long run association between the three indices (i.e. KSE100 index, LSE 25 Index, and ISE10 Index) and macroeconomic variables Johanson and Juselius (1988) cointegration technique was applied after confirming the stationarity of the series.

The results of stationarity analysis showed that all the time series involved in the analysis were integrated of order one. Therefore, the Johansen and Juselius (1990) cointegration procedure was used to find the long-run relationship between the macroeconomic variables i.e.
CPI, IPI, REER, M₂, and TTBR and the three indices (i.e., KSE100 index, LSE 25 Index, and ISE10 Index).

3.3: Long Run Relationship between KSE 100 Index and Macroeconomic Variables

Normalized cointegrating coefficients were explored which were shown in the Table 4.

TABLE 4:

<table>
<thead>
<tr>
<th>KSE100</th>
<th>CPI</th>
<th>IPI</th>
<th>REER</th>
<th>M₂</th>
<th>TTBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-35.56*</td>
<td>-25.05*</td>
<td>-10.95*</td>
<td>26.37*</td>
<td>2.33*</td>
</tr>
<tr>
<td>S.E.</td>
<td>-6.14</td>
<td>-2.28</td>
<td>-5.46</td>
<td>-3.61</td>
<td>-0.51</td>
</tr>
<tr>
<td>t-value</td>
<td>5.79</td>
<td>10.96</td>
<td>2.01</td>
<td>-7.29</td>
<td>-4.55</td>
</tr>
</tbody>
</table>

*shows statistically significant

The first normalized equation was estimated as below:

KSE100 = 35.56*CPI + 25.05*IPI + 10.95*REER – 26.37*M₂ – 2.33*TTBR............ (1)

The first normalized equation, depicted that in the long run, consumer price index had an positive impact on KSE100 Index which implied that equities were hedged against inflation. The positive relation between consumer price index and stock prices was consistent with the study of Ratanapakorn and Sharma (2007), and Sohail and Hussain (2010). Fisher (1930), the market rate of interest included anticipated inflation and along with rise in the rate of inflation, the nominal rate of interest also goes up. Consequently, real rate of interest remained the same in the long run. Thus, it was concluded that there was a positive one to one linkage between rate of inflation and stock prices. Thus, equities provided hedge against inflation rate. Industrial production showed positive impact on KSE100 Index as reported in many studies (see inter alia Fama, 1981; Abdullah & Hayworth, 1993; Nishat & Shaheen, 2004; Cook, 2007; Ratanapakorn & Sharma, 2007; Liu & Sinclair, 2008; Shabaz et al., 2008; Humpe & Macmillan, 2009). Stock prices were also positively affected by real effective exchange rate. It interpreted that with the depreciation in domestic currency due to increase in exchange rate, exports become cheaper which resulted in increase in exports and stock prices of exporting firms. The same results were reported by Aggarwal (1981), Sohail & Hussain (2009) and Sohail & Hussain, (2010) but Soenen & Hennigan (1988) reported negative correlation between foreign exchange rate and stock prices and the impact of money supply on KSE100 Index was found negative. The same outcomes were shown in the study of Humpe & Macmillan (2009). The negative relation between stock returns and money supply was perhaps due to Keynesian liquidity trap experienced by Pakistani economy in the last nine years. The study established that there was a
negative long run connection between three month treasury bills and the stock prices. This finding was consistent with the previous studies (see Nishat & Shaheen, 2004; Humpe & Macmillan, 2009) but it was in contrast with the results of Ratanapakorn & Sharma, (2007) and Sohail & Hussain, (2009).

3.4: Long Run Relationship between LSE 25 Index and Macroeconomic Variables

Normalized cointegrating coefficients were explored as shown in the Table 5.

**TABLE 5:**

<table>
<thead>
<tr>
<th>LSE25</th>
<th>CPI</th>
<th>IPI</th>
<th>REER</th>
<th>M2</th>
<th>TTBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.30*</td>
<td>-2.02*</td>
<td>-3.32*</td>
<td>-2.24*</td>
<td>-0.06</td>
</tr>
<tr>
<td>S. E.</td>
<td>-1.90</td>
<td>-0.29</td>
<td>-1.14</td>
<td>-0.94</td>
<td>-0.07</td>
</tr>
<tr>
<td>t-value</td>
<td>-3.20</td>
<td>6.94</td>
<td>2.92</td>
<td>2.39</td>
<td>0.77</td>
</tr>
</tbody>
</table>

*"* shows statistically significant

The first normalized equation was estimated as below:

\[ \text{LSE25} = -6.3 \times \text{CPI} + 2.02 \times \text{IPI} + 3.32 \times \text{REER} + 2.24 \times M2 + 0.06 \times \text{TTBR} \quad \ldots \quad (2) \]

The results revealed that LSE25 had a negative association with inflation rate. The findings were consistent with the study of Humpe & Macmillan (2009) but contrasted with results of Ratanapakorn & Sharma (2007). The Equation 2 revealed a positive association between stock returns and index of industrial production. The findings were steady with the results several studies. Stock prices were positively affected by the REER (real effective exchange rate). Positive associations between LSE25 index & supply of money and between LSE25 index & three month treasury bills rate were explored, similar to the findings of Ratanapakorn & Sharma, (2007).

3.5: Long Run Relationship between ISE 10 Index and Macroeconomic Variables

Normalized cointegrating coefficients were found as shown in the Table 6.

**TABLE 6:**

<table>
<thead>
<tr>
<th>ISE10</th>
<th>CPI</th>
<th>IPI</th>
<th>REER</th>
<th>M2</th>
<th>TTBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.99</td>
<td>-5.15*</td>
<td>17.54*</td>
<td>1.27</td>
<td>-2.56*</td>
</tr>
<tr>
<td>S. E.</td>
<td>-6.548</td>
<td>-0.967</td>
<td>-3.789</td>
<td>-3.409</td>
<td>-0.616</td>
</tr>
<tr>
<td>t-value</td>
<td>-0.763</td>
<td>5.328</td>
<td>-4.630</td>
<td>-0.375</td>
<td>4.160</td>
</tr>
</tbody>
</table>

*"* shows statistically significant
The first normalized equation was estimated as below: 

\[ M_2 \]

\[ ISE10 = -4.99CPI + 5.15*IPI -17.54*REER* -1.27 M_2 + 2.56*TTBR* \] …… (3)

The first normalized equation showed that ISE10 insignificantly negative relationship with CPI. The results depicted a significant positive association between ISE10 and index of IPI. The ISE10 index was negatively affected by REER and M_2 but statistically insignificant. The results revealed a positive but insignificant relation between ISE10 and TTBR.

4: Conclusion

The stock market is a mirror index of an economy. Pakistan stock market was first established in Karachi and later on established in Lahore and Islamabad. All three stock exchanges are closely related. This study investigated long run relationships between stock prices and five macroeconomic variables in Pakistan. This explored impact of macroeconomic variables on three indices i.e. KSE100 index (representing Karachi stock exchange), LSE25 (relating to Lahore stock exchange), and ISE10 (representative index of Islamabad stock exchange). All the series used in this analysis were found non stationary at first difference. Three cointegrating vectors were found in case of KSE100, and ISE10 while two long run relationships were found between macro economic variables and LSE25.

In the long run, inflation was positively related with stock returns at Karachi Stock exchange (KSE100 index), while it was negatively related with the rest of the two exchanges i.e. Lahore stock exchange (LSE25 index) and Islamabad stock exchange (ISE10 index). The study found significant positive impact of Industrial production index on stock returns in the long run in case of all indices. A long term positive relationship was found between real effective exchange rate and KSE100 index, and LSE25 index but showed significant and negative association with ISE10 index. Money supply showed negative impact on KSE100 index, and ISE10 index and positive effect on LSE25 index in the long run. Three month treasury bills rate depicted negative impact on the stock returns in Karachi Stock exchange (KSE100 index), while TTB (treasury bills rate) had positive affect in case of Lahore (LSE25 index ) and Islamabad stock exchanges (ISE10 index).

The study recommends formulating such policies which strengthened the stock market in Pakistan and uphold stock returns. It should encourage industrial sector for the promotion of Industrial production. The long run positive impact of exchange rate on KSE100 index, and
LSE25 index suggested that for the development of stock market in Pakistan, exchange rate should be managed carefully keeping in view the elasticity of exports and elasticity of imports which will lead to stability in stock market. The monetary authorities should take care in executing monetary policies particularly to affect movements in the stock market, because soft monetary policy to elevate stock prices in the short-run will lead to adverse results in the long-run. The study also recommended that three months treasury bills rate should be kept appropriately low so that it cannot affect stock returns adversely.
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