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ABSTRACT

This paper re-examines the causal relationship between stock prices and the variables representing the real sector of the Pakistani economy. Using annual data from 1959/60 to 2004/05, examining the stochastic properties of the variables used in the analysis, and taking care of the shifts in the series due to the start of the economic liberalization program in the early 1990s, the paper investigates the causal relations between stock prices and variables like real Gross Domestic Product (GDP), real consumption expenditure, and real investment spending. The analysis indicates the presence of a long run relationship between stock prices and the real sector variables. Regarding the cause and effect relationship, the analysis indicates a one-way causation from the real sector to stock prices implying that the stock market in Pakistan is still not that developed to influence the real sector of the economy. Hence the market cannot be characterized as the leading indicator of the economic activity in Pakistan.

JEL Classification: E44, G1

Key Words: Stock Prices, Causal Relations, Real Sector, Economic Activity, Pakistan

I. Introduction

The stock market is supposed to play an important role in the economy in the sense that it mobilizes domestic resources and channels them to productive investments. However, to perform this role it must have significant relationship with the economy. In this context, the causal analysis between the stock market variables, e.g., stock prices, market capitalization, etc., and the variables, for instance, representing the real sector of the economy like real gross domestic product, real consumption expenditures, and real

investment spending, would provide useful insights regarding the role of stock market in an economy. In other words, we can examine whether changes in stock market variables cause fluctuations in the real sector implying that stock market leads economic activity or are caused by the real variables indicating that it lags economic activity.

The issue whether stock market leads or lags economic activity is now becoming very crucial in Pakistan as the stock market has gained much attraction in the last few years. The market has been, in general, among the best performing markets. The indicators like market capitalization, trading volume, the market index has shown phenomenal growth. These developments are often claimed by the authorities to be an indication of economic progress of the country. It would be useful to examine whether these developments has influenced the economy, particularly the real sector. Moreover, the relationship between stock prices and the real sector variables is also important in view of the various economic reforms started in early 1990s. The measures taken for economic liberalization, privatization, relaxation of foreign exchange controls, and in particular the opening of the stock markets to international investors are supposed to have great impacts on the economy including the real sector.

The theoretical basis to examine the link between stock prices and the real variables are well established in economic literature, e.g., in Baumol (1965), Bosworth (1975). The relationship between stock prices and real consumption expenditures, for instance, is based on the life cycle theory, developed by Ando and Modigliani (1963), which states that individuals base their consumption decision on their expected life time wealth. Part of their wealth may be held in the form of stocks linking stock price changes to changes in consumption expenditure. Similarly, the relationship between stock prices and investment

spending is based on the q theory of James Tobin (1969), where q is the ratio of total market value of firms to the replacement cost of their existing capital stock at current prices. Finally, the relationship between stock prices and GDP, a measure of economic activity, indicates whether the stock market leads or lags economic activity.

The empirical evidence, particularly in the South Asian region, regarding the direction of causality between stock prices and the real variables is not conclusive. For example, a unidirectional causality from stock prices to consumption expenditures is observed by Nishat and Saghir (1991) in Pakistan and Ahmed (1999) in Bangladesh whereas Mookerjee (1988) observes the opposite case in India. Similarly, Mookerjee (1988) and Ahmed (1999) report a unidirectional causality from stock prices to investment spending for India and Bangladesh respectively whereas the opposite case is reported by Nishat and Saghir (1991) for Pakistan. Regarding causal relation between stock prices and economic activity Mookerjee (1988) finds evidence that GDP leads stock prices in India whereas Nishat and Saghir (1991) find the opposite evidence in Pakistan. On the other hand, Ahmed (1999) finds the evidence that Index of Industrial Production (IIP) leads stock prices in Bangladesh. In another study for Pakistan, Husain and Mahmood (2001), covering the data from 1959/60 to 1998/99 report a uni-directional causality from the macro economic variables, GDP, consumption, investments, to stock prices implying that the stock market lags economic activity and thus cannot be characterized as the leading indicator of the economy in Pakistan.

The objective of this paper is to extend the analysis by Husain and Mahmood (2001) by including the recent data as well as by taking care of the expected shift in the data due to the start of the economic liberalization program in the early 1990s. The program resulted in

significant improvements in the size and depth of the Pakistani stock market. The remaining part of the paper is organized as follows. Section II discusses the data and explains the methodology for testing the stationarity, the existence of cointegration, and the direction of causality. Section III reports the results regarding the causal relationship between stock prices and the real sector variables. Section IV examines the expected shift in the causal relations of stock prices due to the liberalization measures in early 1990s. Finally, section V presents the summary and conclusions.

II. Data and Methodology

We use annual data from 1959/60 to 2004/05 to investigate the causal relations of stock prices with the variables of the real sector in Pakistan. The sample is further classified into two sub-samples to take care of the economic liberalization program started in the early 1990s. Hence, Sample I, from 1959/60 to 1990/91, covers the period prior to the start of the liberalization program whereas, Sample II, from 1991/92 to 2004/05 represents the post-liberalization period. Similarly in regression analysis we include a dummy from 1991/92 onwards to take care of the possible shift in relations between variables due to economic liberalization program.

Stock prices are represented by State Bank General Price Index (SBGI) with base 1980-81. Similarly, consumption expenditures, investment spending, and GDP at constant prices of 1980-81 are used as variables representing the real sector of the economy. The principal data source is the *National Accounts of Pakistan*, prepared by the Federal Bureau of Statistics. The other data sources include *Economic Surveys* by Finance Division and *Annual Reports* by State Bank of Pakistan, the central bank.

We start by presenting the descriptive statistics that show the basic characteristics of the variables used in the analysis. An easy and quick way to know the relationship between stock prices and macro variables is to find the correlations between them. Therefore, the correlation coefficients are calculated. The formal investigation starts with examining the stochastic properties of the variables used in the analysis. Hence, the Unit Root Test is performed on the variables to test the stationarity of the variables. In this context, the widely used Augmented Dickey Fuller (ADF) is used. Next, we apply the Engle-Granger Co-integration test to explore the long run relations among the variables. Finally, the causal relationships between these variables are examined through Granger causality and/or Error Correction Models (ECM). In all cases lag lengths are decided on the basis of minimum Final Prediction Error (FPE) and/or Akaike information criteria.

III. Empirical Results

We start by presenting the descriptive statistics of the variables used in the analysis in Table 1. The table indicates that the stock market in Pakistan provides an average annual return of over 8%. On the other hand, the average annual growths in real variables are lower, i.e., a little over 5% in GDP and consumption whereas about 4% in investments. However, the volatility in the stock price index, measured by the standard deviation, is much higher relative to the real variables. The real variables seem to be much stable during the sample period. A comparison of the descriptive statistics between the two sub-periods indicates decline in the average growth in real variables. Hence, real GDP fell from 6% to 4% whereas real investment

decreased from 5% to 2%. However, the decline is significant only in GDP. Though the

magnitude of the average growth in stock price index increased in the second period it is not significantly different from that of the first period. On the other hand, the stock price is the only variable that experienced significant increase in volatility in the second period. In the case of real variables the variances are not significantly different between the two sub-periods.

Table 1: Descriptive Statistics for Growth in Stock Prices and Macro Variables

	Stock Prices	Real GDP	Real Consumption	Real Investment
Full Sample: 1959/60 - 2004/05				
Mean	0.0844	0.0537	0.0521	0.0435
Std. Dev.	0.2279	0.0212	0.0437	0.0739
Observations	45	45	45	45
Pre-liberalization: 1959/60 - 1990/91				
Mean	0.0757	0.0596	0.0548	0.0544
Std. Dev.	0.1434	0.0190	0.0439	0.0803
Observations	31	31	31	31
Post-liberalization: 1991/92 - 2004/05				
Mean	0.1038	0.0406	0.0460	0.0194
Std. Dev.	0.3575	0.0207	0.0442	0.0518
Observations	14	14	14	14
Equality of Means and Variances				
Mean (t-value)	0.28	2.92**	0.62	1.75
Variance (F value)	6.21***	1.19	1.01	2.41

The correlation coefficients of stock prices changes with changes in real consumption expenditure, real investment spending, and real GDP are presented in Table 2.

Table 2: Correlation Coefficients between Stock Prices and Macro variables

Variables	1960-61 2004/05	1960-61 1990/91	1991/92 2004/05
Changes in Real Consumption	-0.019	-0.107	0.070
Changes in Real Investment	0.036	-0.012	0.168
Changes in Real GDP	0.187	-0.076	0.532**

The table shows that the correlations are low and are almost equal to zero in the cases of consumption and investment. Similarly, in the first sub-sample, consisting of pre-reform period, the correlations are almost zero. However, the post reform period shows a significant increase in correlation coefficients indicating the beginning of association of stock prices with real variables following liberalization measures. In particular, the correlation between stock prices and GDP is very high.

The formal investigation of causal relations between stock prices and the variables representing the real sector is done with the help of Co-integration and Error Correction Model framework. At the first step, the ADF unit root test is applied to all the variables to examine the stochastic properties of these variables. The test is applied to both the original series and to the first differences of the series. Moreover, both the models with and without trend are tested. The results are reported in Table 3 which indicate that the variables are integrated of order one, I(1).

Tables 3: Unit Root Tests (ADF) for variables

	Levels		First Differences	
Variables	W/O Trend	W. Trend	W/O Trend	W. Trend
Stock Prices	0.342	-2.024	-3.689***	-3.813**
Real GDP	-2.570	-0.801	-5.874***	-6.709***
Real Consumption	-0.909	-0.678	-6.117***	-6.509***
Real Investment	-0.960	-1.648	-4.361***	-4.270***

At the second step, the co-integrating regressions suggested by Engle-Granger are estimated to examine the long run relations of stock prices with the real variables. The results are shown in Table 4.

Table 4: Co-integrating Regressions

Regressions	Constant	Coefficients	ADF
GDP on SP	9.781***	0.559***	-2.071**
Cons on SP	9.699***	0.544***	-2.042**

Inv on SP	8.759***	0.441***	-2.543**

The ADF is significant in all cases indicating the existence of a long run relation between stock prices and real variables. At the third and final step, the Error Correction Models are estimated to examine the direction of causality between the two variables. The results are reported in Table 5.

Table 5: Error Correction Models

	Real GDP	
	DSP	DGDP
e(-1)	-0.184**	-0.016
DSP(-1)	-0.060	0.003
DGDP(-1)	-0.414	0.059
F-value	1.445	0.533
	Real Consumption	
	DSP	DCS
e(-1)	-0.169**	0.013
DSP(-1)	-0.059	0.033
DCS(-1)	0.290	-0.070
F-value	1.394	0.491
	Real Investment	
	DSP	DIN
e(-1)	-0.246**	0.032
DSP(-1)	-0.098	0.049
DIN(-1)	0.058	0.193
F-value	1.397	0.936

The table indicates that in all cases the error term is significant only in the equation of stock prices indicating a uni-directional causality from the real sector variables to the stock prices in the long run. On the other hand, the lagged variables as well as the F-values are not significant anywhere suggesting that in the short run these variables are independent of each other. Hence we can conclude that the stock market in Pakistan is not that developed to influence the real sector and therefore can not be considered as the leading indicator of the economy. However, the results may be affected by the shifts in the data due to the liberalization of the stock market as well as

the economy in the early 1990s. We now proceed to examine such shift.

IV. Shift in Stock Prices and Real Variables

To take care of the shifts in variables representing the stock market as well as the real sector due to the liberalization measures we introduce a dummy variable in the analysis that takes the value of one from 1991/92 onwards. Once again we start by estimating the co-integrating regressions reported in Table 6.

Table 6: Co-integrating Regressions including Shift in Variables

Regressions	Constant	Dummy	Coefficients	ADF
GDP on SP	9.616***	-0.129	0.600***	-2.322**
Cons on SP	9.502***	-0.154	0.593***	-2.116**
Inv on SP	8.568***	-0.149	0.489***	-3.144**

The table shows that the dummy variable is not significant anywhere implying that the relations of stock prices with the variables representing real sector are not affected by the liberalization measures. Hence, we may not expect any significant change in our conclusion derived above. Nevertheless, we proceed to estimate the Error Correction Models. The results are presented in Table 7. It can be seen that the results incorporating the expected shift in the variables due to the liberalization measures in early 1990s are similar to those obtained with out taking care of the shifts. This is expected as Table 6 clearly indicates the absence of any significant shift in the relation of stock prices with real variables. Hence we can conclude that despite significant developments the stock market in Pakistan is still not in a position to influence the real sector. Thus the conclusion derived in Husain and Mahmood (2001) that the stock market cannot be characterized as the leading indicator of the Pakistani economy remain the same despite significant developments in the stock market.

Table 7: Error Correction Models

	Real GDP	
	DSP	DGDP
D	-0.004	-0.026
e(-1)	-0.323***	-0.027
DSP(-1)	-0.126	0.010
DGDP(-1)	-1.256	-0.243
F-value	2.521	2.942
	Real Consumption	
	DSP	DCS
D	0.030	-0.011
e(-1)	-0.299***	0.013
DSP(-1)	-0.142	0.036
DCS(-1)	0.348	-0.090
F-value	2.424	0.505
	Real Investment	
	DSP	DIN
D	0.017	-0.029
e(-1)	-0.403***	0.023
DSP(-1)	-0.195	0.054
DIN(-1)	0.010	0.153
F-value	2.666	1.031

V. Summary and Conclusions

The purpose of the paper is to re-examine the causal relationship between stock prices and the variables representing the real sector of the economy like real GDP, real consumption expenditures, and real investment spending, in Pakistan. We use annual data from 1959-60 to 2004/05, examine the stochastic properties of the variables, and take care of the expected shift in the series due to the start of the liberalization program in the early 1990s. State Bank General Price Index (SBGI) with base 1980-81 is used for stock prices whereas for real variables GDP, consumption, and investment, at constant prices of 1980-81 are used.

The descriptive statistics indicate a much higher expansion in stock prices relative to real variables. However, the stock prices also experienced much higher volatility during the sample period whereas the real variables seem to be stable. The correlation analysis shows low correlations between stock prices and real variables. However, there is evidence of significant increase in these correlations in the post reform period indicating the beginning of the association of stock prices with real variables.

In the formal investigation, the co-integration regressions indicate the presence of a long run relationship between stock prices and real variables. Regarding the cause and effect relationship the error correction model suggest a unidirectional causality from the real variables to stock prices implying that in Pakistan fluctuations in real sector cause changes in stock prices. These results have not changed by the incorporation of the expected shift in the variables resulting from the liberalization measures.

The findings suggest that the stock market in Pakistan is still not that developed to play its due role in influencing the real sector of the economy. It can be implied, however, that the government can use the real sector to influence the stock market. An important implication of the findings is that the stock market in Pakistan cannot be characterized as the leading indicator of the economic activity. The study clearly indicates that it lags economic activity. It seems that the phenomenal growth in stock market variables like market capitalization, trading volume, the market index, etc, do not seem to influence the economy of Pakistan.

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