Full Length Research Paper

Causal relationship between macro- economic indicators and stock exchange prices in Pakistan

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Stock market plays an important role in the economic development of a country. A number of studies have been investigated on the causal relationship between macro- economic indicators and stock exchange prices. But in the context of Pakistan, not many studies can be traced in literature, moreover this study has used the set of macro-economic indicators which has not been previously used by researchers in Pakistan. It has examined the causal relationship between macro-economic indicators and stock market prices in Pakistan. The data from June 1990 to December 2008 have been used to analyze the causal relationship between various macro-economic variables and stock exchange prices. The set of macro-economic indicators includes; inflation, exchange rate, balances of trade and index of industrial production, whereas the stock exchange prices have been represented by the general price index of the Karachi Stock Exchange, which is the largest stock exchange in Pakistan. The statistical techniques used include unit root Augmented Dickey Fuller test, Johansen's co-integration and Granger's causality test. The study found co-integration between industrial production index and stock exchange prices. However, no causal relationship was found between macro-economic indicators and stock exchange prices in Pakistan. Which means performance of macro-economic indicators cannot be used to predict stock prices; moreover stock prices in Pakistan do not reflect the macro-economic condition of the country.

Key words: Macro-economic indicators, causality, exchange rate, index of industrial production, inflation, money supply, Pakistan.

INTRODUCTION

Managing risks in the stock market is critical to financial sustainability in companies. Risk management is the process of measuring, or assessing risk and then develo-ping strategies to manage the risk while attempting to maximize prices. For this reason, causal relationships be-tween financial elements should be determined by holistic risk management practices. In the context of risk mana-gement, both macro and micro economic indicators should be considered by risk managers. Also, causal relationship between these indicators with market risk factors should be analyzed in the process of risk management. Risk management provide sound information about useful indicators to predict market risks which includes stock market variables, stock market-related information, stock prices, macro-economic performance in timely manner, etc. In unstable stock exchanges, both investors and market regulators need models for assessing, managing and minimizing risks. Market investors need risk management models to manage the risks associated with their open positions in the market. Market regulators on the contrary must guarantee the financial integrity of the stock markets and the clearing houses by suitable margining and risk containment systems (Varma, 1999).

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The search for the causal relationships and interactions among macroeconomic variables and stock exhange prices are important to the implementation of risk management systemicaly. Determination of both causal relationships and the interactions among them are useful to the minimization of the financial market risks.

Stock exchange performance has attained significant 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 enable firms to acquire 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. The review of literature contains considerable number of studies that examine the stock prices movements. Perhaps one important subject that has received increasing attention from economists, financial investors and policy makers is on dynamic effects of macroeconomic indicators on stock prices. Ibrahim (1999) found that macroeconomic forces have systematic influences on stock prices via their influences on expected future cash flows. Chakravarty (2005) also viewed that stock exchange prices are highly sensitive to fundamental macroeconomic indicators. Mehr (2005) observed that the effects of public policies on economic growth can be measured by the increase in stock exchange prices.

Studies on the linkages between stock market and macroeconomic variables on industrialized economies have extended the analysis to the cases of developing economies. An illustrative list of studies for developed economies includes Schumpeter (1912), Fama (1981, 1990), Chen (1986), Hamao (1988), Poterba and Summers (1988), Chen (1991), Macdonald and Power (1991), Thornton (1993), Kaneko and Lee (1995), Cheung and Ng (1998), Darrat and Dickens (1999). These studies identify such factors as industrial production, inflation, interest rate, money supply and so forth as being important in explaining stock prices. The few notable studies for developing economies include Mookherjee and Yu (1997) and Maysami and Koh (2000) for Singapore and Kwon and Shin (1999) for South Korea, and Habibullah and Baharumshah (1996) and Ibrahim (1999) for Malaysia. Using bi-variate co-integration and causality tests, Mukherjee and Yu (1997) note significant interactions between M2 money supply and foreign exchange reserves and stock prices for the case of Singapore.

However, Maysami and Koh (2000) document significant contribution of interest rate and exchange rate in the long-run relationship between Singapore's stock prices and various macroeconomic variables. Evaluating the Korean equity market, Kwon and Shin (1999) provide evidence for the exchange rate, dividend yield, oil price and money supply as being significant macroeconomic factors. In a similar vein, Kwon and Shin (1999) found a long-run association between stock prices and four macroeconomic variables like industrial production index, exchange rate, trade balance and money supply for Korea. Habibullah and Baharumshah (1996) employ co-integration analyses to evaluate the informational efficiency of the Malaysian stock market index and sectoral indices using monthly data from January 1978 to September 1992. Bhattacharya (2001) and Chakravarty (2005) have also investigated macroeconomic indicators and stock exchanges in India. Mookerjee (1988) and Ahmed (1999) found unidirectional causal relationship between stock prices and investment spending for the case of India and Bangladesh.

In the Pakistani context, the studies by Nishat and Saghir (1991), Hussain and Mehmood (2001), Naeem and Rasheed (2002), Nishat and Shaheen (2004), Mehr (2005), Saleem (2007), Ihsan et al. (2007) is notable. However, mixed results have been found by different researchers regarding causal relationship between macroeconomic indicators and stock exchange prices for the case of Pakistan. This study will use more recent available data of macro-economic variable to analyze their causal relationship with stock market prices in Pakistan. Most representatives of macro-economic variables have been included in the study for this pursuit.

Financial sector reforms in Pakistan have resulted in significant change in the financial structure of the economy. Since the inception of the financial sector reforms various actions including a numerous structural and institutional changes in different aspects of financial markets have brought efficiency in the functioning of the financial markets.

Karachi Stock Exchange (KSE) was established in 1949, and is Pakistan's largest stock exchange. The Pakistani capital market mainly comprises of three Stock Exchanges (Karachi Stock Exchange 100-Index, Lahore Stock Exchange 25-Index and Islamabad Stock Exchange 10-Index) with a number of stock brokerage firms and a regulatory authority - the Securities and Exchange Commission of Pakistan replaced the Corporate Law Authority in Jan 1999. The Securities and Exchange Commission of Pakistan has succeeded the erstwhile Corporate Law Authority, which was attached with the Ministry of Finance. Asian Development Bank (ADB) initiated Capital Market Development Plan of the Securities and Exchange Commission of Pakistan Act was approved by the parliament and enforced in December 1997. Following this Act, the Securities and Exchange Commission of Pakistan started its operations from January 1, 1999, having an autonomous status. Capital market in Pakistan has grown enormously since the institution of the Karachi Stock Exchange. In 1991 the KSE-100 Index was launched and it became the most generally accepted reflector of the stock market condition. Karachi Stock Exchange has been stated as the "Best Performing Stock Market of the World for the year 2002", due to best performance and liquidity. As on June 01,

2009, 651 companies were listed with total market capitalization of US $ 26.48 billion, having listed capital of US $ 9.65 billion. KSE has been growing into the 4th year for being one amongst "Best Performing Markets" of the globe as acknowledged by the international magazine "Business Week". Likewise, the US newspaper, USA Today, named Karachi Stock Exchange as one of the "Best Performing Exchange" of the world. The companies listed at Karachi Stock Exchange are divided into various sectors and they are representing almost all sectors of the economy. Government has introduced several reforms to stabilize the performance of the capital market. These reforms are aimed at a balanced development of the Pakistan capital markets and financial sector. The reforms assist in reducing systemic vulnerabilities in a bank-dominated financial system. These reforms have yielded dividends in the form of improvement in key financial performance and soundness indicators. KSE showed very significant and record performance during 2005-2008 and KSE 100 index crossed 14000 which is life high performance of Pakistani equity markets (as cited by Hussain, 2004).

There are number of factors contributing to this promising condition in the stock market. These factors include expansion in the country's economic activities, strength in the exchange rate, decrease in lending interest rates and improvement in recovery of outstanding loans, rescheduling and payment of foreign debts, large scale mergers and acquisitions, better relationship with the neighbor countries, and operations of world best financial brokers and investment banks in Pakistan. The policies on privatization, liberalization and deregulation have attracted investments which also has powerful effect on the business of the stock market. The major move forward to the market is caused by the interest shown by overseas investors with big funds in hands. Corporate earnings, mainly in the banking and non- banking financial sectors, have been outstanding, causing foreign investors to extend their actions mostly in this sector. Two research questions are central to this study:

i. Is stock exchange performance a valid indicator that reflects the economic conditions of the country?
ii. Can macro-economic indicators be used to predict stock exchange prices in Pakistan?

Nishat and Shaheen (2004) noted industrial production as the largest positive predictor of equity prices in Pakistan, while inflation is the major negative determinant of stock prices in Pakistan. According to them macroeconomic indicators have effects on stock price movement, the reverse causality was found between industrial production and stock prices.

This study will be conducted in the light of efficient market hypothesis, which states that stock exchange prices always reflect the fundamental macroeconomic indicators (Fama 1970, 1990).

REVIEW OF LITERATURE

Numbers of studies have been conducted to examine the effects of macroeconomic variables on stock market of industrialized economies. The focus in now being extended towards the analysis of stock markets of developing economies, due to their enormous profit potentials. An illustrative list of studies for developed economies includes Fama (1981, 1990), Famma and French (1989), Chen et al. (1986), Hamao (1988), Chen (1991), Thornton (1993), Kaneko and Lee (1995), Abdalla and Murinde (1997), Cheung (1998) and Darrat and Dickens (1999). These studies identify such factors as industrial production, risk premiums, slope of the yield curve, inflation, interest rate, money supply and so forth as being important in explaining stock prices.

The few notable studies for developing economies include Mookerjee and Yu (1997) and Maysami and Koh (2000) for Singapore, Kwon et al. (1997) and Kwon and Shin (1999) for South Korea, and Habibullah and Baharumshah (1996) and Ibrahim (1999) for Malaysia. Using bi-variate co-integration and causality tests, Mookerjee and Yu (1997) note significant interactions between M2 money supply and foreign exchange reserves and stock prices for the case of Singapore. However, Maysami and Koh (2000) document significant contribution of interest rate and exchange rate in the long-run relationship between Singapore's stock prices and various macroeconomic variables. Evaluating the Korean equity market, Kwon et al. (1997) provide evidence for the exchange rate, dividend yield, oil price and money supply as being significant macroeconomic factors.

Friedman (1988) stated that monetary growth bumpiness increases the amount of supposed ambiguity. Where investor's expectations are based on price level of financial assets, Boyle (1990) proposed that changes in uncertainty of money supply will affect prices of financial instruments. Boyle (1990) suggests that changes in monetary uncertainty modify the stock prices risk premium to replicate the added expected prices that investors demand for assuming the risk of keeping stocks. In this way, monetary uncertainty is supposed to depict a negative association with stock prices. Ghazali and Yakob (1997) looks at meeting two objectives firstly, to test for the subsistence of a correlation between the uncertainties linked with the unevenness of growth in money supply and the equity market prices.

Inflation is one the most important macroeconomic indicators to analyze the economic conditions of the economy. Few studies address the linkage among the stock market and inflation, Famma (1990); suggests that macroeconomic variables have projecting power for the stock exchange performance, although they do not consent to the anticipating authority of stock performance for the economy. Aggarwal (1981), Soenen and Hennigar (1988) in relationship of exchange rates and stock prices

measured the relationship between these variables. Literature showed that any change in the exchange rates would affect corporate foreign business and profitability. This will, as a result, affect firm's equity prices. The type of change in equity prices would base on the global distinctiveness of the firm. Aggarwal (1981) noted strong positive relationship between the US dollar and US equity prices while Soenen and Hennigan (1988) found a considerable negative relationship. Index of industrial production indicates a measure of total economic activity in the economy and influences equity prices by effecting on future earnings (Fama, 1990). Mukherjee and Naka (1995) explored the relationship between industrial production and stock prices in Japan and found positive relationship between industrial production and stock exchange prices. Bhattacharya and Mukherjee (2002), Nath and Smantha (2002) note the type of causal relationship between stock prices and macro-economic factors in India. He applied methodology of Toda and Yamamoto for the period of 1992-1993 to 2000-2001, stating that change in industrial production affects the stock prices. Nishat and Shaheen (2004) found industrial production having largest positive relationship stock prices in Pakistan.

Chakravarty (2005) has also examined positive relationship between industrial production and stock prices using Granger causality test and observed uni-directionality from industrial production to stock prices in India. Balance of trade has also been taken by many researchers to analyze its effects on stock exchange prices; however it is observed that it has no significant effects on stock exchange prices, for instance Bhattacharya (2002) found negative relationship between trade balance and stock exchange prices in India.

RESEARCH METHODOLOGY

The study used secondary data collected from monthly bulletins of Federal bureau of Statistics of Pakistan ranging from 1990-2008. The study applied Unit Root Augmented Dickey Fuller (ADF) test, Johansen's co-integration test and Granger- causality test proposed by C.J Granger in 1969. E-Views statistical package was used for these analyses.

Data and analysis

Litzenberger and Rama Swamy (1982) initially analyzed the linkage between main macroeconomic variables on stock prices. The study has examined the causal relationship between stock exchange price (KSEP), inflation (CPI), money supply (M2), index of industrial production (IIP), exchange rate (EXR) and balance of trade (BOT). This study has used monthly data series of the six variables for the period of July 1990 to December 2008. For stock exchange prices, the monthly data of Karachi Stock Exchange (KSE) general prices index was taken, KSE is dominants stock exchange in all three stock exchanges of Pakistan. The data has been complied from monthly various issues of bulletins of Federal Bureau of Statistics of Pakistan.

The tool used to determine the causal relationship between macroeconomic indictors and stock exchange prices includes descriptive statistics, Unit Root Augmented Dickey Fuller (ADF) test proposed by Dickey and Fuller (1979, 1981), Johansen's (1988, 1991) co-integration test and Granger-causality test proposed by Granger (1986); Engle and Granger (1987) and Granger et al. (2000). E-Views statistical package was used for these analyses. Similar types of test analysis techniques have been used by Chen (1986) and Mukherjee and Naka (1995) for measuring causal relationship for the case of Singapore and India respectively.

Procedure

The monthly data of macro-economic indicators and stock exchange prices was taken from monthly bulletins of Federal Bureau of Statistics of Pakistan. The objective behind collection of monthly data was to have in-depth analysis of these variables. The data was entered into MS Excel sheet, which was then exported to E-Views software for analysis purposes. Firstly, the descriptive analyses were conducted through E-Views to know the mean, median, standard deviation, skewness, kurtosis and the like statistics. Then unit root (ADF) test was applied to check the stationary status of the data, in order to have good analysis. After which Johansen's co-integration test was applied to check the co-integration between and among the variables. At the end the Granger causality test was applied to measure the causal relationship between macro-economic variables and stock exchange prices in Pakistan.

RESULTS AND DISCUSSION

In this section, results derived from descriptive statistics, Augmented Dickey Fuller test, Johansen's Co-integration test and Granger causality test are presented and discussed in detail.

Descriptive statistics

Table 1 provides self-explanatory descriptive statistics analysis done through E-Views statistical software. Money supply has the mean of 14.09142 million rupees with standard deviation of 0.723578.

Exchange rate has the mean of 3.841879 and standard deviation of 0.610092 million rupees. Inflation is having a mean of 4.495600 and standard deviation of 0.400074 million rupees. Index of industrial production is having a mean and standard deviation of 5.408499 and 0.251684 million rupees respectively. Balance of trade is having a mean and standard of -21548.78 and 36207.26 respectively. Similarly, stock exchange prices are having mean of 5.471148 and standard deviation of 0.673284. The values of median, skewness, kurtosis, jarque-bera and probability are also given for all six variables in the Table 1.

Augmented Dickey Fuller test (ADF)

Augmented Dickey Fuller test has been applied to test the stationary status of the data using E-views software. Table 2 shows the Money supply (M2) is stationary at 1st

Table 1. Descriptive statistics.

	M2	EXR	CPI	IIP	BOT	KSEP
Mean	14.09142	3.841879	4.495600	5.408499	-21548.78	5.471148
Median	14.05302	3.947215	4.563550	5.367377	-7207.800	5.482512
Maximum	15.38244	11.26948	5.266052	6.118758	70488.50	10.96996
Minimum	12.73862	3.084201	3.734627	4.783316	-156698.4	4.548600
Standard deviation	0.723578	0.610092	0.400074	0.251684	36207.26	0.673284
Skewness	0.003980	8.017622	-0.261617	0.212255	-1.871720	2.533707
Kurtosis	2.045673	100.0951	2.339095	3.276287	6.879341	21.17531
Jarque-Bera	8.424938	89582.41	6.572768	2.373018	268.8293	3293.192
Probability	0.014810	0.000000	0.037389	0.305285	0.000000	0.000000
Observations	220	220	220	220	220	220

Table 2. Results of augmented Dickey Fuller test.

ADF test statistic – M2	-11.38097	1% critical value*	-3.4620
		5% critical value	-2.8750
		10% critical value	-2.5739
ADF test statistic – EXR	-4.416295	1% critical value*	-3.4619
		5% critical value	-2.8749
		10% critical value	-2.5738
ADF test statistic – IIP	-4.165506	1% critical value*	-3.4619
		5% critical value	-2.8749
		10% critical value	-2.5738
ADF test statistic – CPI	-5.718414	1% critical value*	-3.4620
		5% critical value	-2.8750
		10% critical value	-2.5739
ADF test statistic – BOT	-8.809642	1% critical value*	-3.4620
		5% critical value	-2.8750
		10% critical value	-2.5739
ADF test statistic	-9.506999	1% critical value*	-3.4620
		5% critical value	-2.8750
		10% critical value	-2.5739

Variable	Coefficient	Std. error	t-Statistic	Prob.
D(M2(-1))	-3.520870	0.309365	-11.38097	0.0000
D(EXR(-1),2)	-7.309024	1.655013	-4.416295	0.0000
IIP(-1)	-0.150068	0.036026	-4.165506	0.0000
D(CPI(-1))	-0.805126	0.140795	-5.718414	0.0000
D(BT(-1))	-2.506769	0.284548	-8.809642	0.0000
D(KSE(-1))	-2.597937	0.273266	-9.506999	0.0000

difference, exchange rate (EXR) is stationary at 2nd difference with 2 lag value. Index of industrial production (IIP) was found stationary at level, consumer price index (CPI) at 1st difference, balance of trace (BOT) at 1st difference and KSE general price index (KSEP) was found stationary at 1st difference.

Table 3. Results of Johansen co-integration test.

	Eigen value	Likelihood Ratio	5% Critical value	1% Critical value	Hypothesized No. of CE(s)
M2	0.211589	136.7350	94.15	103.18	None **
EXR	0.162135	85.14637	68.52	76.07	At most 1 **
IIP	0.113548	46.75957	47.21	54.46	At most 2
CPI	0.057457	20.60496	29.68	35.65	At most 3
BT	0.034230	7.764155	15.41	20.04	At most 4
KSE	0.000949	0.206056	3.76	6.65	At most 5

*(**) denotes rejection of the hypothesis at 5%(1%) significance level. L.R. test indicates 2 co-integrating equation(s) at 5% significance level.

Table 4. Results of Granger causality test.

Null hypothesis:	Observation	F-statistic	Probability
KSEP does not Granger cause M2	220	0.02545	0.97488
M2 does not Granger cause KSEP		0.39769	0.67237
KSEP does not Granger cause IIP	220	2.29991	0.10273
IIP does not Granger cause KSEP		3.12272	0.04604
KSEP does not Granger cause EXR	220	0.00175	0.99825
EXR does not Granger cause KSEP		0.00083	0.99917
KSEP does not Granger cause CPI	220	7.84050	0.00052
CPI does not Granger cause KSEP		1.04467	0.35358
KSEP does not Granger cause BOT	220	6.78524	0.00139
BOT does not Granger cause KSEP		2.78191	0.06415

Johansen's co-integration test

Johansen's co-integration test will explain whether there is any effect between dependent variable and independent variables in short term or long-term period (Fadhil, Azizan and Shaharudin, 2007) . The results of Johansen's co-integration test are shown in Table 3, which depicts that only money supply and industrial production are having co-integration, whereas exchange rate, inflation, balance of trace and stock prices are having no co-integration between themselves.

On analysis of co- integration between macroeconomic indicators and stock exchange prices, it was found that only index of industrial production having co-integration with stock exchange prices. Inflation is also having co-integration with stock exchange prices at 5% significance level. Whereas, money supply, exchange rate, balance of trade are having no co-integration with stock exchange prices in Pakistan.

Granger causality test

The study has applied Granger causality test proposed by C. J. Granger (1969). Granger proposed that if causal relationship exists between variables, they can be used to predict each other. Results from Granger causality test are given in Table 4.

The result shows no Granger causality between KSE prices and money supply in any direction, no Granger causality between KSEP and index of industrial production, no Granger causality between KSEP and exchange rate, no Granger causality between KSEP and inflation, and no Granger causality between KSEP and balance of trade. Overall, the study found no bi-directional Granger causality between macro-economic indicators and stock exchange prices in Pakistan.

Nishat and Shaheen (2004) found causal relationship between macro-economic variables and stock exchange prices in Pakistan. Where as this study found no causal relationship between macro- economic indicators and stock exchange prices. One strong argument of this difference in findings is stock exchange performance during 2005- 2008. During this period the stock market performance reached to its life high in all respects e.g. market capitalization, share prices, stock indexes. However, the macro-economic indicators do not showed any significant improvement. Particularly, index of industrial production which did not showed such improvement when compared to stock exchange prices index.

Conclusion

The study has analyzed the causal relationship between macro-economic indicators and stock exchange prices in Pakistan. The macro-economic indicators were repre-sented by money supply, index of industrial production, exchange rate, inflation and balance of trade, whereas stock exchange prices were represented by general index of all share prices of Karachi Stock Exchange. The study employed Granger causality test to analyze the causal relationship between macro-economic indicator and stock exchange prices in Pakistan.

The study found no causal relationship between macro-economic indicators and stock exchange prices in Pakistan. Individually, the study found no Granger causality between KSE prices and money supply in any direction, no Granger causality between KSEP and index of industrial production, no Granger causality between KSEP and exchange rate, no Granger causality between KSEP and inflation, and no Granger causality between KSEP and balance of trade. Overall, the study found no bi-directional Granger causality between macro-economic indicators and stock exchange prices in Pakistan. The findings of this study are inconsistent with Nishat and Shaheen (2004), who found "causal" relationship between stock exchange and macro-economic variable in Pakistan. The discrepancy in findings of the study is due to blazing stock exchange performance during 2005-2008, which was not supported by the macro-economic performance of the economy of Pakistan.

The study shows that Pakistani equity markets are not having causal relationship with macro-economic indica-tors. Which employs that macro-economic (fundamental) news cannot be used to predict stock exchange prices in Pakistan. Moreover, stock exchange performance also does not represent the macro-economic movement in the country, these findings answers our research questions.

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