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Exploring the Nexus; Stock Market, T. Bills, Inflation, Interest Rate and Exchange Rate

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Abstract: The main objective of this study is to examine the relationship between Karachi stock exchange and macroeconomic variables i.e. inflation rate, exchange rate, treasury bills and interest rate. Monthly time series data from January 2005 to December 2010 have been used to investigate the causal association among macroeconomic indicators and Karachi stock market. The co-integration test and Granger Casualty have been applied to drive the short and long-term investigation. The results found bi directional Granger causality among KSE and exchange rate and One way Granger causality exists among KSE and interest rate, no Granger causality found among KSE and inflation rate and KSE and treasury bills. Which means performance of macro-economic variable somehow affects the stock index; moreover, stock prices in Pakistan do not reflect the macro-economic condition of the country. This study emphasizes on the crash of macro-economic indicators on the capital market performance of developing countries. The performance of capital markets of developing countries calculated by these macro-economic indicators.

Key words: *Karachi Stock Exchange, Macroeconomic Variables, Time series analysis*

1. Introduction

Financial sector developments and reforms in many South Asian countries aimed at shifting their financial systems from one of bank-based to security market-based has orchestrated the establishment of many stock markets over the last two decades. There are different indicators to measure the performance of the economy such as GDP, Inflation Rate; Interest Rate, Exchange Rate, and Debt Position, which are commonly used to analyze growth of an economy. Effective capital markets are those where stock prices change quickly when new information becomes available (Maysami et al., 2004). Many studies identify correlation among changes in world economy and macroeconomic indicators. These studies also examined that stock market indexes are very much sensitive when fundamentals of economy change (Ahmed, 2008). In Pakistani context different researchers have been found mixed result between macroeconomic indicators and stock market like (Nishat and Saghir, 1991, Nishat and Shaheen, 2004, Hussain and Mehmood, 2001). Investments promote the economic growth in development of a country. In last few decades, the researchers and financial economists are interested to work on macroeconomics variables and capital market. Karachi stock exchange faces different issues that affect the stock prices; some main reasons are decline in export, excess flow of foreign exchange and decrease in the stock prices of textile industry (Ahmed, 2008). It has been commonly noticed that if country economic situation better than capital market works more efficiently. Stock index depends on micro and macroeconomic indicators information in capital market. Information related to inflation rate, exchange rate, interest rate, and treasury bills etc. some non-economic factors like political instability affect the stock market index. The stock market performs well when disclosure quality of information is more accurate for both economic and non-economic factors. This information is helpful for investor to take appropriate decisions. The present paper analyzes to find how different macro-economic indicators exaggerate the Pakistan's stock markets. The main purpose of this paper is to investigate the impact of different macro-economic indicators such as inflation, interest rate, exchange rate, treasury bills on KSC stock index.

2. Literature Review

Many studies conducted to find out the association among macroeconomic indicators and stock market index or stock price using different models, studies includes (Famma, 1981, Cheung, 1998). It has been seen that time series data give fake results on function like simple regression analysis due to non stationary in nature.

For this purpose, Wassel and Saunders (2005) found that there is significant relationship among social security and private saving and examined the importance of suitable time series data analysis. Dima et al. (2006) obtained the result of macroeconomic variables and mutual funds index in Romania. Some notable studies related to macroeconomic indicators and stock market in different countries (kwon and Shin, 1999) in South Korea, Ibrahim (1999) for Malaysia. Ewing (2002) examined the response of return between NASDAQ Financial 100 index to shocks of macroeconomic variables, i.e. output, risk, monetary policy and inflation by applying new techniques of general impulse response analysis. Inflation has negatively influence and change in economic growth has initially positive impact on NASDAQ 100 index. It has been observed that exchange rate has positive impact on Karachi stock market (KSE) since the liberalization in 1991 stock prices increase largely Mohammad et al. (2009). In macroeconomic and econometrics unit root and co integration analysis played a key role (Escudeso, 2000; Dolado et al., 1999). There is positive association between the capital market growth and long run economic growth when controlling the variables like GDP, fiscal policy, monetary policy, and investment in human capital, political instability, and exchange rate policy Levine and Zervos, (1996). Some other factors like low growth, lack of entrepreneurship and inadequate demands for stocks are influenced the performance the Ghana stock exchange (Aidoo, 1989). The study also suggests that if economic and political condition are favorable the demand and supply increase rapidly. Stock market development increase economic growth (Harris, 1997). Evidence also finds in literature that high inflation and exchange rate over-valuation are the important symptoms of macro-economic volatility (Agenor, 2000). Stock prices have been positive relationship with industrial production in Pakistan (Nishat and Shaheen, 2004). Inflation is fundamental macroeconomic indicator to examine the economic situation of the economy. Famma (1990) argued that macro-economic variables have analytical power to calculate the stock exchange performance and the stock market performance affected the economy of country. It has been observed that influence of foreign exchange market instability on stock market is largely incoherent. These have been in the dispute of industrial economies. In china Soenen and Johnson (2001) found that consumer's price index (CPI) has not a major impact on stock prices. Karam and Ruhee (2011) found that capital markets indexes are based on macro-economic indicators, even though the same data in all cases cannot be significant.

3. Methodology

The methodology designed that we get appropriate and pragmatic results. Good analysis and methodology interpret accurate result. For this purpose unit –root test applied to check that either the time series data is stationary or not. For the stationary of data, we take the first difference of the data series.

Data source and Procedure: The data of stock exchange obtained from yahoo finance, month wise from period of 2005 to 2010. Data of interest rate, exchange rate and obtained from State Bank of Pakistan. The data of inflation rate obtained from Government of Pakistan Statistics Division Federal Bureau of Statistics. Different researchers describe a regression model to perform different econometric test. First it must be analyzed that the date series is stationary or not for time series analysis. If the data series is stationary when its mean variance is constant (not changing with respect to time). With the help of ADF, test stationary data serious has been tested. Dickey and Fuller (1981) anticipated the concept of ADF test.

$$KSE = a_0Tbrt + a_1 Exrt + a_2 Inrt + a_3Inf rt \text{_____} (i)$$

KSE, Karachi stock exchange, **TB**, treasury bills, **Ex**, exchange rate, **In**, interest rate, **Inf**, inflation rate, a_0 is constant and rt , is change in time.

Augmented Dickey Fuller test: Prior to deciding on the appropriate econometric method to be employed for the estimation, a preliminary examination of the data is analyzed. Time series data are generally non-stationary and so running a regression without controlling for that problem will yield spurious regression results meaning the results may appear good but do not make economic sense. In other words, economic time series tend to have a strong trend, which causes these series to depict rising or falling patterns. Augmented Dickey Fuller test is latest edition of Dickey Fuller test, which proposed to include in regression, several lags of the difference in series, if error terms are not correlated than the ADF test used.

$$\Delta y_t = a_0 + \beta y_{t-1} + \sum_{i=1}^k \gamma_i y_{t-i} + U_t \quad (ii)$$

Where Y_t represents the variable in question, T is the trend, k is the lag length and U_t is a random variable assumed a white noise.

Johansen's co-integration test: The concept of co integration test regarding non-stationary series introduced by Johansen (1988). They established the relationship that if two variables are co integrated, they cannot change over time.

$$\Delta \log KSE = a_0 + a_1 \Delta \log T_{brt} + a_2 \Delta \log E_{xrt} + a_3 \Delta brt + a_4 \Delta Inft \quad (iii)$$

4. Results and Discussion

For descriptive statistics, five variables have been obtained for empirical investigation, analysis done with the help of E-views statistical software show in table I. The variables are KSE 100 index, treasury bills, exchange rate, interest rate and inflation rate (CPI). results obtained from descriptive test are given in the table I, the values of mean, median, Stander deviation, skewness, kurtosis, Jarque Bera and probability are given for all five variables in table 1. All share Index and interest rate are negatively skewed, consumer price index, exchange rate and Treasury bill rate exhibit a positively skewness which implies that they have a long left tail. All the variables are relatively normally distributed as indicated by the p values of Jarque Bera statistic.

Table 1: Descriptive test

	LNKSE	LNTBILLS	LNEXCRATE	LNINTRATE	LNCPI
Mean	9.195600	2.362255	4.229068	2.391009	5.112434
Std. Dev.	0.240617	0.179327	0.152589	0.201451	0.217308
Skewness	-0.30895	0.15873	0.429191	-0.56228	0.254137
Kurtosis	2.703408	1.34449	1.325274	3.458899	1.626154
Jarque-Bera	1.409306	8.524446	10.62458	4.425666	6.437386
Probability	0.494280	0.01409	0.004931	0.109390	0.040007

Augmented Dickey Fuller test (ADF): Most time, series are trended over time and regressions between trended series may produce significant parameters with high R^2 , but may be spurious or meaningless (Granger and Newbold, 1974). When using the classical statistical inference to analyze time series data. First check either the time serious data is stationary or not, for this purpose applied Unit root test if p value > than 0.05 so the given series is non-stationary in nature and vice versa. ADF is former procedure to determine that the data of series are stationary or non-stationary .The Augmented Dickey Fuller test (ADF) results are given below in table II all series are found stationary at first difference. Treasury bills, interest rate, CPI, exchange rate and KSE series are found stationary at first difference 1%, 5% and 10% level of significant. KSE, interest rate, Treasury bills and CPI rejected the null hypothesis at 1 %, 5% and 10% level of significant. Only exchange rate variable rejected the null hypothesis at 5% and 10 % level of significant given in table II. These empirical results are consistent with previous research (Choudhry, 2001; Maysami et al., 2004).

Johansen Co integration test: The next step is investigating the existences of a long-run relationship among these variables. For this purpose, the co-integration rank, r , of the time series has been tested by making use of both maximum eigenvalue test and trace test of the Johansen (1988). Co-integration test explained the link among dependent variable and independent variables. All trace statistics is < than 0.05 critical value, The maximum eigenvalue test is conducted under the null-hypothesis of $r_0 = r$ against the alternative of $r_0 > r$, whereas the trace test is conducted under the null hypothesis of $r_0 \leq r$ against the alternative of $r_0 > r$ so there is no co-integration exists among two variables. Therefore, there is no significant relationship exist between macroeconomic variables and KSE in long run all hypotheses accepted. These empirical results are consistent with previous research (Maysami and Koh 2000; McAdam, 2003).

Table 2: Unit Root Tests

Variable	5% Critical Value	t-statistic	prob.*	Order of Integration
KSE	-2.902358	-7.280673***	.000	(1)
TB	-2.902358	-7.578184***	.000	(1)
ER	-2.902953	-3.353090***	.016	(1)
IR	-2.902953	-5.883895***	.000	(1)
CPI	-2.902358	-6.469722***	.000	(1)

Note: The regressions in level include both intercept and trend whereas in first difference include intercept only. *** indicates rejection of null hypothesis of non-stationary of the variable at 1% level of significance.

Table 3: Results of Johansen Test for Co integration

Rank <i>r</i>	Trace Statistics	5% Critical Value	Max. Eigenvalue	5% Critical Value
$ro = 0$	15.47340*	15.49471	12.43895**	14.26460
$ro \leq 0$	6.257111	15.49471	4.545733	14.26460
$ro \leq 0$	11.36226	15.49471	10.03321	14.26460
$ro \leq 0$	8.314239	15.49471	5.993032	14.26460

Note: * and ** indicate the rejection of null-hypothesis at 10% and 5% significance levels respectively.

Table 4: Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
RKSE does not Granger Cause RCPI	72	2.00585	0.1427
RCPI does not Granger Cause RKSE		1.29911	0.2797
RKSE does not Granger Cause RINRATE	72	3.43004	0.0383
RINRATE does not Granger Cause RKSE		1.22763	0.2996
RKSE does not Granger Cause REXCRATE	72	4.41273	0.0159
REXCRATE does not Granger Cause RKSE		5.44591	0.0065
RKSE does not Granger Cause RTBILLS	72	1.74228	0.1831
RTBILLS does not Granger Cause RKSE		3.13119	0.0502

Granger causality test: Granger (1969) introduced Granger causality test. Granger suggested that if causal relationships exist among variables, then both variables can predict each other. All variables Results from Granger causality test are shown in Table 4. Finally, the results show that there is Granger causality between KSE and exchange rate. The results found bi directional Granger causality among KSE and exchange rate hypothesis rejected short term significant relationship exists shown in table 4. One way Granger causality exists among KSE and interest rate, p value shows that one way relation exists between two variables hypothesis rejected short term significant relation exists. The results cannot found Granger causality among KSE and inflation rate, KSE and treasury bills. Nishat and Shaheen (2004) established causal association among macro-economic indicators and stock exchange index in Pakistan. However, this study found causal relationship between two variables. One strong point of this variation in results is stock exchange performance during 2005-2008. Throughout this time, the stock market performance reached to its maximum stage in all respects e.g. shares prices, market capitalization and stock index.

Scope and Recommendation: The current study has further scope for more wide-range results, more macro-economic variables can be added and it can be extended over a longer period. In future, research area can be extended by investigating the fundamentals of economy and stock markets of different developing and developed countries. Further, a more robust and super-consistent estimates of the effects of macroeconomic variables on stock market index could be obtained by employing the vector error correction model and vector auto regression analysis (VAR). This methodology provides both the short run and long run estimates of the effects of macroeconomic variables on stock market returns. This provides another avenue for future research.

5. Conclusion

The study analyzes the causal association among macro-economic variables and Karachi stock exchange prices in Pakistan. The macro-economic indicators were represented by Treasury bills, interest rate, exchange rate, and inflation rate (CPI). Whereas stock exchange prices were represented by general index of, all share prices of Karachi Stock Exchange. In today's globalised era, where stock markets are steadily more incorporated, it has become essential to identify the core fundamentals affecting the markets at domestic and global level. Thus, macro-economic indicators, i.e. treasury bills, inflation rate, exchange rate and interest rate of Pakistan have been taken as explanatory variables and Pakistani capital market KSE is dependent variables. The present paper found Granger causal relationship among KSE and exchange rate in both directions and one way Granger causal relation exists among KSE and interest rate, no Granger causality exist between KSE and Treasury bills, KSE and inflation rate. The results show that Pakistani equity markets are not having causal relationship with macro-economic variables like inflation rate and treasury bills. Bi-directional causal relationship exists between exchange rate and KSE and one-way causal relationship exists between KSE and interest rate. The main finding of this study is that government of Pakistan should focus on promoting equity shares as leading financial instruments. As the treasury bills and inflation, rate increase but there is no significant impact on Pakistani stock markets. This study may provide some insights on how the formulation and implementation of appropriate monetary and fiscal policies could help to stabilize the financial market and financial sector reform.

Limitations of study: The current study is limited from 2005 to 2010 and the analysis, the impact of four variables on KSC 100 index. Additional variables and more range of periods may give results that are more accurate.

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