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Macroeconomic variables and equity market co-integration (empirical evidence from kse-100 Pakistan)

Waqar Ahmad¹, Kashif Hamid², Muhammad Hassan¹ and Mohsin Saleem¹ ¹Management Science, University of Central Punjab Lahore- Pakistan. ²Institute of Business Management Science, University of Agriculture Faisalabad- Pakistan.

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ABSTRACT

Equity markets are the reflection of macro-economic policies of the state is generally considered as a controversial hypothesis. Therefore it is required to explore the relationship among economic variables and equity prices in context to Pakistan economy. This study comprised on monthly data regarding to the period (6/2004-6/2010). Variables under study are Foreign exchange rate, Money supply M1, Inflation rate, Interest rate, Industrial production index and Karachi stock exchange (KSE 100 index). Descriptive statistics, Augmented dickey fuller test, Johansen's cointgeration test is used to test the hypothesis and for the purpose of impact study, Ordinary least squares applied. The results indicate that only Interest rates have long run relationship to the equity market. All remaining variables have negative while interest rate has a positive, but having insignificant impact on the equity returns. The results are not favored in predicting the equity returns in Pakistan context.

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Introduction

The position of stock exchange is very considerable in a modern financial system. It is helpful to diversify the domestic savings into productive channels and to perform this important task; the equity market should have a significant relation with macro-economic variables. For this purpose a long term funds are transferred from savers to the borrowers for productive investment. The stock market is a key element for the modern economy. The economic growth is only possible if the capital market works efficiently. Due to globalization stock market works rapidly. Economist in past indicated that the financial system works efficiently if the demand of financial services increased. The reason to explore the interrelation between these variables is that both macroeconomic factors and equity market acting a significant role in the progress of any country. There is most important factor that effect the stock market returns is a risk. Most of the investors have a great network of the risk management. It means if the investor more diversify the risk, to get more sort of profit. The diversification of risk is great element to influence the whole capital market. Now the stock market is a main indicator conducting to the real progress of economy. The stock exchange has no more tangible entity but all the shares of listing companies are traded here. The limitations about that research are there is a lot of material available researched for the other countries, but a very little work is performed in the perspective of Pakistan. The researchers of Pakistan who find the relationships among economic variables and equity prices are (Husain, 2001); Shaheen, (2004); Mehr, (2005); Saleem, (2007); Ihsan, Ahmad, Ihsan and Sadia (2007). The significant results of their studies found. So these observations are taken try to explore of the causality and correlation among macroeconomic and stock prices related to Pakistan. The stock market is a key element to judge the progress of any country. It is a best way to use the savings of the economics. The stock exchange is a healthy indicator to show the growth of the country. The investor cannot get sufficient returns if he is not connected to the complete information about the market (koh, 2003). The stock markets are the sources to convert the savings of the peoples invest in productive funds, to accelerate the growth speed of the economy. The capital market diversifies the risks about the investments. In Pakistan many people have not a clear idea about, how to invest in a capital market. The Karachi Stock Exchange (KSE) is founded in 1947. There is about 837 companies are listed to (KSE). The Karachi stock exchange comprises on about various 37 sectors. It regulates each kind of securities and approved by the Ministry of Finance Pakistan. The Market Capital was US\$ 32.5 billion in 19 August, 2010 and the volume is US\$ 12 billion. It is the prime and former stock exchange of Pakistan; here international companies are also listed. The performance of KSE was best announced in the world for the year 2002. But it was much fluctuated for the last some years. The fluctuations were observed during the latest crises 2005, 2006 and 2008 - 2009. There are many problems with Pakistan stock markets since its independence 1947. The problems are bureaucratic, political, over population, the Govt. strategies and closed doors for foreign investors etc. Moreover continue struggle and reforms were introduced in 1991. The important thing is that to open the doors for foreign investors. This thing explores a positive and fastest growing rate. Now stocks are traded in international markets. The KSE is a well emerging equity market in the world. In our research we have to explore the correlation among the macro-economic variables and equity market. The observations are considered from the period of (6/2004 -6/2010). There is lot of researches found in this context, but in

national to the investments for the prosperity of the country

Pakistan there are limited researches with wide variables and long run performance.

The relationship between macro-economic factors and equity market always attract the practioners and researchers. The relationship among them has been a debatable since the study of Chen, Roll and Ross (1986). It has been a very interesting topic for both financial and macro economists. This relationship has been observed in many studies, but has not provided a casualty direction among these variables. There are many difficulties and ambiguities to find the causality and correlation between the economic variables and equity returns in the relevance of Pakistan. This paper have to find out how much effects among these variables in Pakistan. There is try to explain the relationships among the variables, which provide the base for the requirements of the aim of research paper.

Literature Review

There is a strong association between macroeconomic variables and equity market prices and widely researched in developed countries. But there is a few studies reference to the Pakistan.

Chen, Roll and Ross (1986) explore the long run relationship between the stock market prices and economic variables and high volatility explain in relationship with industrial production, yield curve, risk premium and unanticipated inflation.

Paul and Malik (2001) also explain the extended relationship among the financial sector and equity market returns. There is investigating a causal relationship among inflation rate, T bills and adjusted Gross Domestic Product and financial index through multivariate co-integration analysis. Autoregressive distributed lag (ARDL) model is used and explore there is a negative impact of interest rate on equity returns of financial sector. But inflation has not a significant effect on equity market.

Fazal and Mahmood (2001) also observe a causal relationship among investment and consumption activity and stock prices. There is employed a co-integration analysis for the annually forty years period and explore significant relationship among variables.

Kessal (1956) observes a positive relation among equity and unexpected inflation value. Some more studies like (Firth 1979; Gultekin 1983; Boudhouch and Richardson 1993) investigate a positive relation among inflation rate and equity returns.

Fama (1981) also observes that inflation is negatively affected the stock market. Spyrou (2001) also observes a negative impact of inflation on the equity market for period (1990- 1995). Spyrou (2001) finds mix findings in his study.

Amidhud (1996) explores a negative relation of inflation and equity market in a short period and positive in a long run. Shahid (2008) also observes the impact of money supply, foreign direct investment, interest rate and industrial production on the stock market. Shahid (2008) explores in India that equity prices conduct economic activity in general.

Gay (2008) investigates the relation between exchange rates and oil prices in support of the 4 developing countries. Gay (2008) use Autoregressive integrated moving average model, and he found no correlation among exchange rate and oil prices. Humpe A and Peter M (2009) also observe the correlation and causality between the macroeconomic factors and stock market in the countries U.S and Japan. The monthly data is used for the 40 years in U.S and Japan. There are five variables are taken like

IP, CPI, Interest rates, money supply and equity market. There are also five models are applied for the purpose of research. The models are Cointgeration model to observe the short or long run relationship of variables, second one is Arbitrage Pricing Theory (APT), third one is Present Value Model (PVM), fourth one is Granger Model and the fifth and last one is Engle Granger Model. In U.S there is one cointgeration found while in Japan two integrations are found between IP, Inflation rate, equity market and Interest rate. Here results concluded that in U.S, the IP effect the stock market positively, Inflation rate and Interest rate effect negatively but the Money supply have not a significant ipmact on stock prices. There were two integrations were found, one of two show that IP effect positively and Money supply impacts negatively. The second one integration find the IP was negatively related to Interest and inflation rate. The difference of both stock markets U.S and Japan was a stock market behaviour.

Hasan and Nasir (2008) find a relationship between macroeconomic factors and equity prices. They used ARDL method to find long run relationship among the variables and equity prices. CUSUM and CUSUMSQ model is used to identify the stability of model. The results show, there is no significant long run and short run relationship among Industrial production, Oil prices, Inflation and Equity prices. The results explore the significant long run and short run relationship among Interest rate, Money supply, Exchange rate and Equity prices. In a further study by Hasan and Javed (2009) conclude that money supply has a positive relationship to liquidity hypothesis. Moreover interest rate shock has a negative effect on market returns and exchange rates also have a negative impact on market returns in the short-run scenario. However inflation has very little impact on market returns. They argued that monetary variables are important elements in determining stock market movements in Pakistan economic framework.

Ali,Rehman, Yilmaz ,Khan and Afzal (2010) find causal relationship by granger casualty test among macroeconomic indicators and stock prices in Pakistan. There is no causal relationship found among variables in Pakistan. This study found an inverse relationship of macroeconomic variables on stock prices found by Nishat and Shaheen (2004). There is no significant study considered in Pakistan having wide range of variables and long run data.

Data and Research Methodology

This study discusses the effect of macroeconomic variables on the equity market (KSE 100). There are six variables like Foreign Exchange Rate, Narrow Money M1, Inflation Rate, Interest Rate, Industrial Production Index and Karachi Stock Exchange (KSE 100) Index are observed. The facts are observed from the period (6/2004 - 6/2010) on the monthly basis.

Data Description Independent variables

Foreign Exchange Rate (FEXR)

The FEXR is the exchange price in terms of one currency to the other currency. In this research the FEXR is adversely affect the stock prices if home country depreciates its currency.

Money Supply (Narrow Money M1)

The second variable effect the equity prices is Narrow Money, proxy of the money supply. The increase in M1 have a positive impact on stock prices.

Inflation rate

To observe the inflation rate Consumer Price Index is used. CPI is used to determine average changes in prices of goods and

Variables	KSE	FEXR	M1	СРІ	IPI	INTR
Mean	9.097	4.447	14.904	4.82	4.686	0.092
Median	9.14	4.52	14.97	4.78	4.7	0.09
Max	9.62	4.66	15.23	5.18	4.93	0.14
Min	8.56	4.17	14.59	4.51	4.37	0.02
S.D	0.279	0.168	0.186	0.213	0.118	0.03
Skewness	-0.339	-0.405	-0.116	0.226	-0.863	-0.558
Kurtosis	2.378	1.498	1.701	1.575	3.651	2.726
J B	2.363	8.126	4.856	6.237	9.509	3.688
Prob	0.306	0.017	0.088	0.044	0.008	0.158

Table 1: Descriptive Statistic

Unit Root Test Table 2 shows the results of Augmented Dickey Fuller test. Table 2: Unit Root Analysis

Table 2: Unit Koot Analysis					
Variables	ADF at level	ADF at first diff			
KSE	-0.813446	-4.79117			
FEXR	-0.336068	-3.244124*			
M1	-0.222429	-4.030989			
СРІ	0.824443	-3.147221*			
IPI	-3.292834*				
INTR	-2.386001	-4.738175			
1 % Critical Value	-3.5253	-3.5267			
5 % Critical Value	-2.9029	-2.9035			
10 % Critical Value	-2.5886	-2.5889			

Table 3: Johansen's Cointgeration Test

Variables	Eigen volue	Likelihood	5 % Critical	1 % Critical	Hypothesized
	Eigen value	Ratio	Value	Value	No. of CE(s)
KSE	0.447649	91.79618	94.15	103.18	None
FEXR	0.333408	55.58834	68.52	76.07	At most 1
M1	0.207275	30.8481	47.21	54.46	At most 2
CPI	0.098404	16.67911	29.68	35.65	At most 3
IPI	0.085481	10.36021	15.41	20.04	At most 4
INTR	0.077329	4.909429	3.76	6.65	At most 5*

*(**) denotes rejection of the hypothesis at 5 % (1 %) significance level, L.R rejects any cointgeration at 5 % significance level

Table 4: Ordinary Least Squares (OLS) Test

Variables	Coefficients	St. Error	T Statistic	P Values
DFEXR	-0.707	0.844	-0.838	0.405
DM1	-0.283	0.671	-0.422	0.674
DCPI	-1.377	1.539	-0.895	0.374
DIPI	-0.046	0.218	-0.214	0.831
DINTR	3.96	2.163	1.83	0.072
С	-0.001	0.021	-0.085	0.932

services for a definite period. The inflation rate is added in Nominal interest rate, so incresae in inflation conduct to the nominal discount rate increases. So the increase in inflation rate leads to decrease or adversely effect the stock returns.

Industrial Production Index (Ipi)

IPI calculates the economic growth that effect the future cash flows. Moreover industrial production enhance more economic prosperity. So increase the Industrial production increase the stock prices or positively effected.

Interest Rate

The rise in the interest rate positively impact discount rate. So rise in interest rate negatively impact future cash flows and there for negatively impact the stock returns. In this research the Govt. Treasurery Bills are used as proxy of interest rate.

Dependent Variables

Karachi Stock Exchange (KSE100)

The stock market returns has been calculated through equation by,

$$K_t = Ln\left(P_t \square / \square P_{t-1}\right)$$

Where K_t is the return for the month't' and P_t and P_{t-1} are the closing values of KSE 100 index for the time't' and't-1'. The Karachi Stock Market index role play as dependent variable for this resarch. The stock market provide a place where shares of listed companies are traded and it play a consistent role in the prosperity of any country. It transform the savings of the people in to different investments, which may be short run or long run.

Hypothesis

 H_{I} Foreign exchange rate is negatively affect to the equity market and have long-

run relationship.

 H_2 Rise in Money Supply M1 has a positive relationship to the equity market and

have long- run relationship.

 $\mathrm{H}_{3}~$ An increase in Inflation is negatively related to the equity market and have long-

run relationship.

 $H_4\;\;A$ rise in Industrial production is positively related to the equity market and have a

long-run relationship.

 $\rm H_5~A$ rise in Interest rate is negatively impacting to the equity market and have a long run relationship.

Data and Methodology

The relationship of economic variables with the equity market experienced by the following model,

 $Ln K_t = \alpha + \beta_1 LnFEXR_t + \beta_2 LnM\mathbf{1}_t + \beta_2 LnCPl_t + \beta_4 LnlPl_t + \beta_5 INTR_t + \mu_t$ Where

 $K_t = \text{KSE 100 Index}$

FEXR = Foreign Exchange Rate

M 1 = Money Supply (Narrow Money)

CPI = Consumer Price Index (Inflation Rate)

IPI = Industrial Production Index

INTR = Interest Rate

The different kind of methods are used in research methodology to fulfill the research purpose. Firstly the descriptive statistic method is used like standard deviation, mean, median, coefficient of variation, kurtosis, skewness probability, etc to identify the nature and distinctiveness of the variables. For the investigation of relationship among the macroeconomic variables and stock market (KSE 100), the correlation technique is used. Further Unit Root test is applied to check the stationarity of data. For this purpose Augmented Dickey Fuller (ADF) (1981) test is applied.

Unit Root Analysis

The check the stationairity of the time series unit root test is applied. For this purpose Augmented Dickey Fuller (ADF) test (1981) is applied. The ADF Test augmenting the equation by,

$$\Delta y_{t=} \pi y_{t-1} + \sum_{\substack{i=1 \\ \text{Or}}}^{\kappa} \gamma_i \Delta y_{t-i} + \epsilon_t, \qquad (1)$$

$$\Delta y_{t=} \alpha + \pi y_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta y_{t-i} + \epsilon_t, \qquad (2)$$

Or

$$\Delta y_{t=} \alpha + \pi y_{t-1} + \beta \overline{t} \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + \epsilon_t.$$
(3)

To understand the this process e.g. A and B are two variables. If we apply Augmented Dickey Fuller test and if it is below than its critical value then A is stationary and if it is not then Augmented Dickey Fuller is tested on change in A means Delta A (which is the difference of A) and if difference in A is stationary then A is integerated One. There is another element if both A and B are integerated we will have to enusure it with the Johenson' s cointegerated technique. There after OLS test will be applied to check the impact of macroeconomic forces on the equity market.

Johansen's Co-integration Test (1988, 1991)

The best method to find the co-integration for more than two variables is Johansen's co-integration test. This can be shown in equation by,

$$A_k(L)_{X_t} = \Psi D_t + \varepsilon_t \tag{4}$$

Johansen's test starts from the Vector Auto regression (VAR) by $y_t = \mu + A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t$ (5)

Where as $\mathcal{Y}t$ is the vector of variables for $\{n\times 1\}$ integrated order one I(1) and $\mathcal{E}t$, is the vector of innovation for $\{n\times 1\}$. This can be rewrite as this equation narrates.

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t, \qquad (6)$$

Where

$$\sum_{\prod=i=1}^{p} A_{i} - | and \Gamma_{i} = -\sum_{j=i+1}^{p} A_{j}.$$
(7)

The maximum Eigen value test used in this test can be written as,

$$J_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i)$$

$$J_{max} = -T \ln(1 - \lambda_{r+1})$$
(8)
(9)

'T' indicates the size of the sample and λ_i is reflects the largest canonical relationship. Whereas trace statistics is used to test the null hypothesis for the co integrating vector 'r' against the 'n' co integrating vector which is alternative. The maximum Eigen value is applied for testing the null hypothesis for 'r' against the alternative null hypothesis 'r+1'.

Johansen's co-integration Test is applied to visualize the long run relationship among the explanatory and explained variables.

Descriptive Statistic

Descriptive Statistic explains the nature and distinctiveness of thAnnahables Tab96) shows the ctedulits fulfides can be watched and the statistic explains the nature and distinctiveness of thAnnahables. direction of data, kurtosis is the peakness or flatness of data,

Here in table 1 the results are interpreted as like, KSE (mean 9.097, S.D 0.279), FEXR (mean 4.447, S.D 0.168), M1 (mean 14.904, S.D 0.186), CPI (mean, 4.820 S.D 0.213), IPI (mean 4.686, S.D 0.118) and INTR (mean 0.092, S.D 0.030). The results explain that, the standard deviation of all variables is low and interest rate is very low compare to the other variables that show low volatility from its mean value. The results also explain that all the variables are negatively skewed except Consumer Price Index (CPI) which is positively skewed and kurtosis explain that all the variables are positive explain all variables at peaked from normal distribution.

The results show that KSE, FEXR, M1, CPI, and interest rate (INTR) are not stationary at level. Only IPI is stationary at level at 5 % critical value. Then the first difference is taken among the variables. All the variables are stationary at first difference except FEXR and CPI is stationary at first difference but at 5 % critical value.

Johansen's Cointgeration Test

The results explain that all the economic variables like, Karachi stock exchange (KSE 100), Foreign exchange reserves (FEXR), Money supply M1, Consumer price index (CPI), Industrial production index (IPI) and Interest rate (INTR) have no co-integration to each other. Only interest rate (INTR) having co-integration at 5 % critical vale, in which L.R rejects any cointegration at 5 % significance level.

Ordinary Least Squares (OLS) Test

OLS test is observed for the impacts of independent variables on dependent variable.

First of all difference is taken of the self-variable values and then apply least square test. Here the results explain that DFEXR, DM1, DCPI and DIPI have a negative impact on the KSE and only DINTR having positive impact on the equity market KSE. The T statistics values of all the variables are less than 2 and P values of all the variables are above than significance value 0.05, that explain all the variables having insignificant impact on the KSE. The results show that all hypothesizes are rejected.

Conclusion

The aim of this research to investigate the macroeconomic variables and equity market cointegration in Pakistan is fulfilled. The monthly data is observed for the period (6/2004 -6/2010). The variables are Foreign Exchange Rate FEXR, Money Supply M1, Inflation Rate, Interest Rate, Industrial Production and Karachi stock exchange is taken. The various statistical tools are observed especially Ordinary least squares test is applied to check the effects of economic variables on KSE 100. The results explain that Foreign exchange rate, Money Supply M1, Inflation Rate and industrial production negatively impact the stock market, while Interest rate is positively imact the stock market, but all having insignificant impacts on KSE 100 in Pakistan. So all hypotheses are rejected. The results explain that economic variables are not usefull to predicting the equity returns in Pakistan. The reason is that Pakistani equity markets are not fully developed compare to the developed countries. The people are not interested to invest in these markets due to variation of equity prices effecting by lack of law and justice and immature behaviour of Govt. of Pakistan towards the law and order situation convey to these markets. The performance in 2005 -2008 is also is not in favor of the economic variables.

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